STATE OF IOWA

1916

REPORT OF THE

State Highway Commission

FOR THE

Year Ended December 1, 1916

ISSUED BY THE
STATE HIGHWAY COMMISSION
AMES, IOWA

J. W. HOLDEN, Chairman
A. MARSTON
H. C. BEARD
State Highway Commissioners

THOS. H. MACDONALD, Chief Engineer

Published By
THE STATE OF IOWA
Des Moines

LETTER OF TRANSMITTAL.

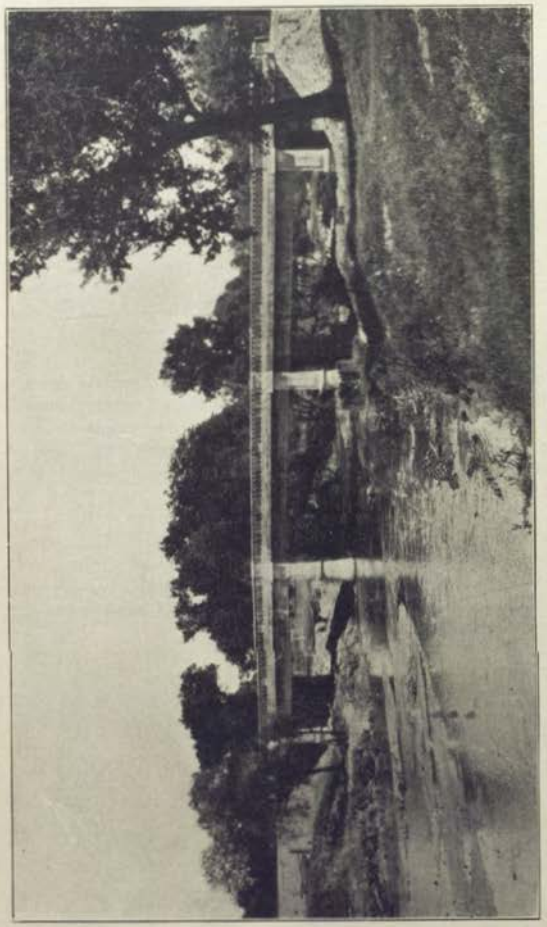
HON. GEORGE W. CLARKE, *Governor:*

Pursuant to the provisions of the Iowa Road Law, the State Highway Commission presents this, its third annual report, for the year December 1, 1915, to December 1, 1916. The report on the Iowa Lakes and Lake Beds, required under Section 2900-e, Supplemental Supplement, 1915, is submitted as a supplementary report.

J. W. HOLDEN,
Chairman.
H. C. BEARD,
A. MARSTON,
Commissioners.

Ames, Iowa, December 30, 1916.

ROBERT HENDERSON, STATE PRINTER
J. M. JAMIESON, STATE BINDER
JANUARY, 1917



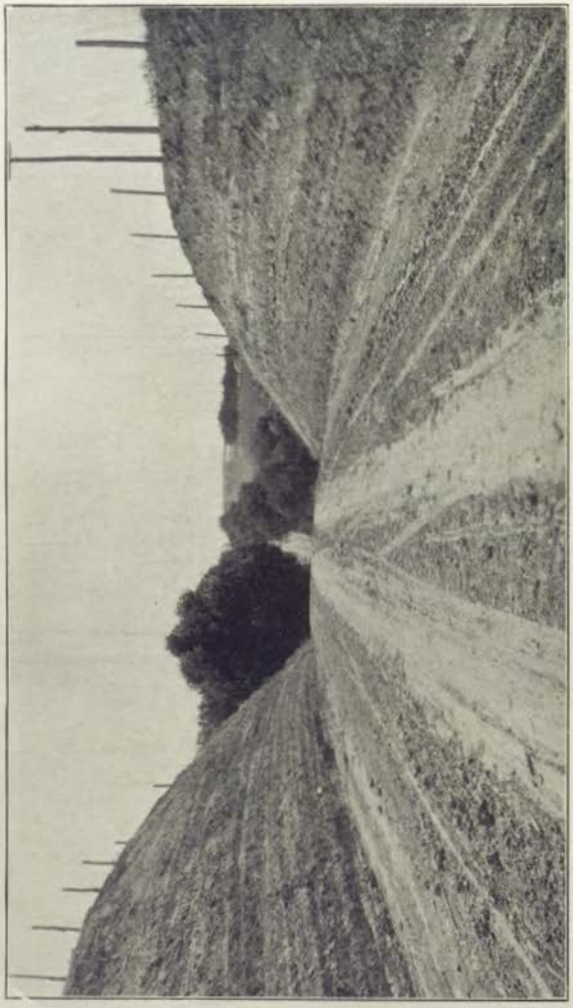
The North Bridge at Iowa State College—This handsome structure is of the type of reinforced concrete girder bridge. It is over Squaw Creek on the north road at Iowa State College. It was built by convict labor at a total cost of $8,794.79. Exclusive of the cost of equipment, form lumber, etc., the unit cost per cubic yard was $14.13. Equipment, form lumber, etc., cost $1.70 per cubic yard. The bridge consists of three 42' girder spans and two 20' approach spans.

PART I

WORK OF THE

State Highway Commission

1916



Deep cut on the Eldora-Hubbard Road.—This cut is on what is known as Fisher's Hill. The grade has been reduced to 6.5%. Approximately, 3,455 cubic yards of dirt were moved here at a cost of 18 cents per cubic yard, or a total cost for this entire improvement of $621.90. Hardin county farmers have hauled countless tons of produce over the hill that was here. Judge for yourself if the improvement is worth $621.90.

STATE HIGHWAY COMMISSION

THIRD ANNUAL REPORT

Chapter I—Summary of Work for 1916

In presenting this third annual report, the State Highway Commission has prepared a brief summary of its chief activities.

Part One of this report contains the report of the work of the Commission, and Part Two, which is required by law to be filed not later than February 1st, will contain the summary of the road and bridge work and all county expenditures as reported by the ninety-nine county engineers. These reports are filed with the Commission as soon as the county books are closed after January 1.

The report of the Commission on the lakes and lake beds of the state is filed as a supplement to this report.

The Year, 1916.

The year 1916 as contrasted to the year 1915 has had very favorable weather conditions for road and bridge construction. For a time during the spring months, the roads generally showed an exceptional number of wet, muddy stretches, particularly on north hill slopes, and frequently near the tops of hills or knolls. Even roads that were thoroughly tile drained were affected.

It will be remembered that the ground was full of water when the roads froze in the fall, and the condition above noted is accounted for by ice or frozen strata at some distance below the surface, which thawed very slowly.

The summer and fall weather conditions have been favorable for new construction. The repair and maintenance expenditures have been less than during 1915, and the number of temporary culverts required has been very much smaller than during the preceding year.

1916 Prices.

There was a marked advance in prices for all classes of materials and labor over those prevailing in 1915. The records of the Commission show for the first six months of 1915 the following average prices for typical contracts: Reinforcing steel, $1.45 per cwt.; lumber, $26.73 per M.; concrete, $11.06 per cubic yard; fifteen-inch corrugated pipe, 65 cents per foot.

For the first six months of 1916 the average prices were: Reinforcing steel, $2.49 per cwt.; lumber, $27.38 per M.; concrete, $13.89 per cubic yard; fifteen-inch corrugated pipe, 86.2 cents per foot.

For the second six months period of 1915 the prices were: Reinforcing steel, $2.11 per cwt.; concrete, $13.06 per cubic yard; fifteen-inch corrugated pipe, 79¼ cents per foot.

For the second six months' period of 1916 the prices were: Reinforcing steel, $3.12 per cwt.; lumber $30.00 per M.; concrete, $16.24 per cubic yard; fifteen-inch corrugated pipe, 90¼ cents per foot.

Between the first period of 1915 and the second period of 1916 reinforcing steel advanced 115 per cent, lumber 23 per cent, concrete 46 per cent, and corrugated culverts 38 per cent. Structural steel, cement and all other materials used in highway construction in the state have advanced an alarming percentage over the year 1915.

For the year 1917 it would be advantageous to the counties to curtail, in so far as possible, their bridge building and devote more of the available funds to road work proper. The cost of grading, gravelling and drainage has not advanced in proportion to the advance in the cost of bridge materials and construction.

The Commission is of the opinion that the advance in the price of some of the materials, notably cement, is not justified by economic reasons or the market conditions.

The Year 1917.

The outlook for 1917 prices is not encouraging. The demand for certain materials and products on account of conditions abroad, has certainly had both direct and indirect effects, but the Commission is informed that there is also an unusually heavy domestic demand. Certain it is that so far as can be foreseen now, there is little hope of generally lower prices or increased supplies of construction materials or labor during the coming year, and the Commission urges as a general policy for 1917 the curtailment of bridge

building whenever practicable. The past three years have been marked by the activity in bridge building and the Commission is of the opinion that under present conditions, road construction and maintenance should receive the larger share of the energies of the county and township officials, and a correspondingly increased proportion of the highway improvement taxes. It is not now foreseen that there will be a readjustment of prices to the lower levels prevailing two years ago, but until the time that foreign conditions are greatly changed, the Commission is of the opinion that the counties of the state should adopt a conservative attitude toward extensive highway improvement projects. This will allow many of the counties to place their funds in better condition to take advantage of lower prices in the future, and will also give road officers an opportunity to maintain properly the roads under their jurisdiction.

Roads.

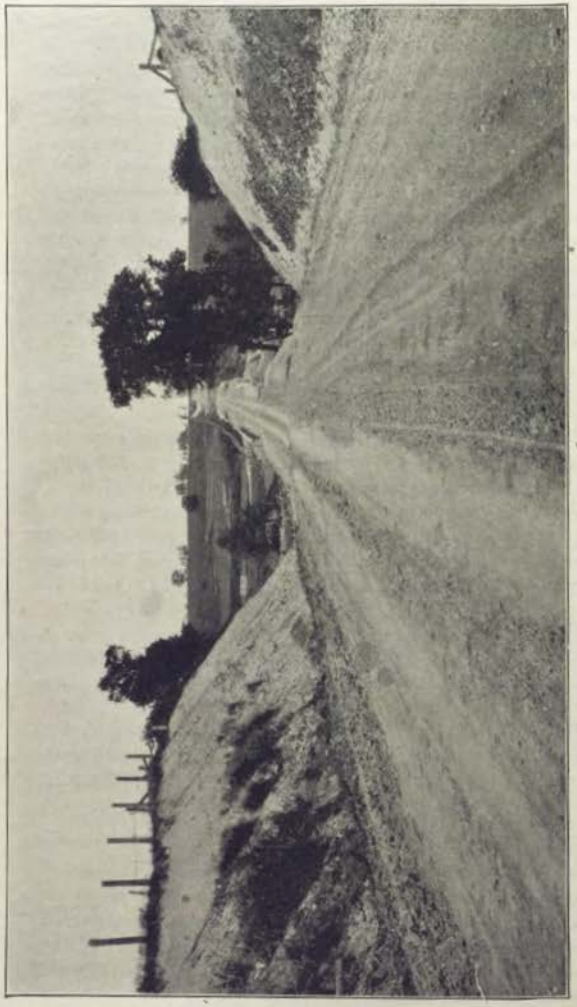
During the year the Road Department of the Commission has checked and approved plans for permanent grading of 880 miles of road, requiring the moving of 4,739,000 cubic yards of earth, approved thirty-five contracts for road construction, totaling $260,554.00, and investigated one hundred and fifty-one road complaints. The average price per cubic yard of the above contracts, involving the moving of 1,001,335 cubic yards of earth, was 22.109 cents.

Roads at State Institutions.

Engineers from the Road Department have made the surveys, plans, estimates, and supervised for the Board of Control of State Institutions, the grading of seven and one-half miles of road, gravelling one and one-half miles, laying 15,600 feet of tile drains, constructing fourteen culverts, building one railroad crossing viaduct, and the general maintenance of approximately fifty miles of road through and adjacent to state lands.

Changes in County Road Systems.

The Commission has passed upon sixty-eight resolutions by county boards, requesting changes in the county road systems of thirty-seven counties. Fifty-five of these requests were approved, making a net addition of 123.9 miles to the county road systems. Of the thirteen requests not approved, seven did not fall within the legal requirements for such additions.



Convict Built Road at Iowa State College—This photograph shows a view of the newly built north road through the Iowa State College farm at Ames. It gives access to the college from the north. The earth removed from the deep cut, shown in the foreground of the picture, was used in making the 1,500' fill across the Squaw Creek bottom. An industrial railroad, with small steel cars, moving on tracks, was used to transport the earth. The convicts loaded the cars in trains of from four to six cars each which after loading, were allowed to coast down the grade to the point where the earth was to be used on the fill.

Standard Specifications.

The Commission issued for the year 1916, the following standard specifications:

Highway Bridges and Culverts,
Corrugated Metal Culverts,
Earth Road Construction,
Classification of Road Work and Expenditures.

Road Complaints.

Through its organization, the Commission has investigated one hundred and fifty-one complaints relative to road conditions. Of

Route of the North Road at Ames—This view was taken before work was started upon the construction of the north road at Iowa State College. The deep cut shown in another view, starts in the middle foreground of this picture and the road is on the section line indicated by the row of trees down the center of the picture.

these, sixteen were caused by poor work, the remainder by neglect. The records show that of the complaints investigated, 85 per cent were adjusted satisfactorily to the complainant. In 1915, two hundred and fifty-four such complaints were investigated.

Bridge Plans.

During the year, the Commission has prepared detailed plans for 472 bridges in sixty-eight counties, estimated to cost $1,511.000.00; checked and approved 288 bridge designs from forty-three counties, estimated to cost $582,000.00; checked and approved 176 detailed shop drawings for steel structures from fifty-four counties,

estimated to cost $324,000.00, and developed thirteen new standard designs.

Bridge Contracts.

The Commission has approved 208 contracts for bridge construction, totaling $2,070,800.00, and sixty-eight contracts for materials.

Railroad Crossings.

During the year, the Commission has prepared plans and estimates for thirty-two railroad crossing projects involving the improvement of sixty crossings, has held twenty-eight conferences and adjusted twenty-three separate projects. Five projects have been appealed for settlement to the Railroad Commission, four have been adjusted by this Commission, twelve crossings have been eliminated entirely, seven improved by grade separation, and twenty-four grade crossings improved.

The total estimated cost of crossing improvements agreed upon under the plans prepared by the Commission during 1916, is $110,259.00; of which the railroads will pay $68,341.00, or approximately 62 per cent. The estimated cost of the crossing improvements undertaken by the Commission since the work was started in 1914 is $217,583.00, of which $137,463.00 has been appropriated by the several railroads concerned.

District Engineers.

The five district engineers have represented the Commission at 277 road, bridge and material lettings, at which contracts in excess of $3,000,000.00 have been awarded. They have passed on road plans in the field, for the improvement of 880 miles of road, and have spent 175 days in the examination of bridge sites and emergency bridge work.

Road Experiments and Tests.

The Commission is of the opinion that the only kind of surfacing that can be used extensively on the roads of the state, under present conditions, is gravel or some equally low cost material. In the vicinity of the larger cities, there is a limited mileage which cannot be maintained economically with gravel surfaces. In general, however, where the natural earth roads cannot be maintained satisfactorily under the traffic, gravel surfaces, properly cared for, will prove the best present investment from the standpoint of both cost and service to the public.

Fifty-six counties of the state have deposits of sand and gravel, varying from an abundance for all road purposes to only limited quantities along the streams. Nine counties in which there is little or no gravel, have limestone deposits.

The Commission, in co-operation with the Engineering Experiment Station of the Iowa State College, has built stretches of gravel roads in three counties for observation purposes.

The Commission has assisted four counties in road oiling experiments, assisted in an investigation of road surfacing materials, including all forms of paving, the samples being taken from the streets of the city of Des Moines, and assisted in the repair of concrete roadways in Louisa and Des Moines counties.

The Commission is also co-operating with the Experiment Station on tests of bridge paints and materials for culvert pipe.

Bridge Patent Litigation.

During the year, the Commission has assisted the Department of Justice in preparing technical evidence, models, and necessary data to be used as evidence in the following patent cases: Bone vs. Walsh Construction Company; Thatcher vs. Polk County; Thatcher vs. City of Des Moines, and Luten vs. Marsh Engineering Company.

Of the above, the first was withdrawn by the complainant; the second and third were decided in favor of the defendants, and the fourth is now ready for submission to the court.

Road Meetings and County Inspections.

The Commissioners and members of the force have attended 164 road meetings and have spent a total of 161 days in forty-seven counties on inspections and conferences with highway officers. The Commissioners have also spent a total of ninety-eight days on other appointments, including lake bed inspection trips and patent litigation conferences.

Organization of Commission.

The organization of the Commission by department is as follows:

STATE HIGHWAY COMMISSIONERS.

J. W. Holden, Chairman.
H. C. Beard.
A. Marston.

ADMINISTRATIVE DEPARTMENT.

Thos. H. MacDonald	Chief Engineer
F. W. Parrott	Chief Clerk
J. W. Eichinger	Bulletin Editor
Annie Laurie Bowen	Clerk
May Vanderlinden	Stenographer
Thora Tallman	Stenographer

SPECIAL INVESTIGATION, EXPERIMENTAL WORK AND TESTS.

C. D. Curtiss	Assistant Engineer
Velda C. Rowland	Stenographer

BRIDGE DEPARTMENT.

J. H. Ames	Bridge Engineer
E. F. Kelley	Assistant Bridge Engineer
E. W. Blumenschein	Structural Engineer
E. Williams	Assistant Engineer
J. E. Kirkham	Consulting Engineer
Ethel S. Paulsen	Stenographer

ROAD DEPARTMENT.

F. R. White	Road Engineer
J. S. Dodds	Assistant Road Engineer
W. E. Jones	Assistant Road Engineer
L. S. Gates	Assistant Engineer
F. H. Mann	Assistant Engineer
Anne Vanderlinden	Stenographer

DRAFTING DEPARTMENT.

J. A. Paulsen	Chief Draftsman
L. H. Doughty	Designer
W. N. Adams	Draftsman
W. A. Reeves	Draftsman
V. Enslow	Draftsman
R. J. Freshour	Draftsman
Hans Hansen	Clerk
J. S. Nichols	Draftsman

DISTRICT ENGINEERS.

C. Coykendall,
W. H. Root,
L. M. Martin,
W. F. Beard,
J. S. Morrison.

DRAINAGE INVESTIGATION.

R. W. Clyde	Drainage Engineer
S. A. Schackle	Assist. Drainage Engineer
H. S. Leicht	Assist. Drainage Engineer
W. M. MacGibbon	Assist. Drainage Engineer

Chapter II—Recommended Legislation

The foundation of the Iowa road laws is good, and on this foundation is being built an administrative system adequate to the needs of the state. During the preceding sessions of the General Assembly, all the principal road laws have been completely revised, and no general or radical changes are now necessary. Business efficiency, and the elimination of the so-called "red tape" can be secured by a careful study of the requirements of the statutes and corrective legislation.

Two kinds of legislation are needed. The first consists of a number of simplifying acts which will eliminate friction and produce more direct results. The end will be gained in part by repealing acts or parts of acts which have long outlived their usefulness and in part by simplifying others. We now have a number of old statutes which seriously conflict with later acts, but which have not been expressly repealed, and thus are included in the most recent code supplements. Such conflicting statutes lead to much uncertainty on the part of road officers and to needless reports, notices and unnecessary expense.

The state of New York, when confronted by a situation of this kind, repealed by direct action, worn out statutes, and simplified living statutes into a single easily understandable set of road laws.

The second kind of legislation is of the constructive type. There is serious need for the state to foresee the changes that are taking place in highway administration, construction, maintenance, and traffic, and to meet or regulate these changes by legislative enactment. Regulatory measures will injure no property or other rights if inaugurated in anticipation of the acquirement of those rights. Motor truck traffic, for instance, is just developing in this state, but it has already become a serious problem in the eastern states. It will cause the state of Iowa much less embarrassment to provide regulatory measures for this traffic now than after it becomes well established.

The recommendations for legislation submitted by the Commission, have been divided into two parts; the measures requiring corrective or simplifying acts and those requiring constructive acts.

SIMPLIFYING LEGISLATION RECOMMENDED.

Section 1527-F, 1913 Supplement.

Permanent Road Improvement Districts—How Formed.

This act should be repealed. There is a serious question whether it has ever been legally operative, on account of a conflicting statute. However that may be, only one mile of road has been built under this act. The Commission does not consider that its provisions are equitable or that a satisfactory district plan could be written on this foundation, and recommends, therefore, its repeal.

Section 1656-A, 1913 Supplement.

Weeds—Destruction of.

Under the present weed law, county boards of supervisors do not have authority to enforce an order for the destruction of weeds on the county road system. Such authority rests only with the township trustees. The Commission recommends that the weed law be re-written, and that the board of supervisors be given the same authority with reference to destroying weeds on the county roads as the trustees have with reference to the township roads.

Section 1570-b1., 1913 Supplement.

Road Dragging Districts.

This act occupies three pages in the 1913 code supplement, but its provisions have been supplanted by more recent acts. It requires the appointment of a "township drag superintendent," fixes his compensation, and fixes a method of notification and return cards, none of which are applicable to the present method of administration.

The definite repeal of this act, Sections 1570-b1-b2-b3, will clarify the requirements of the law relative to road dragging and will definitely do away with the appointment of a township drag superintendent.

Obsolete Township Road Laws.

Originally, the township was the administrative unit upon which devolved all the power and responsibility with reference to road building and repair. Many laws were passed. Some to give publicity to the acts and expenditures of the township at a time when

no newspaper medium was available; some to prescribe in detail, methods of working out or collecting road poll tax. There are now a number of these laws which remain to confuse the trustees and township clerks. Reports and processes are still legally demanded which serve no purpose and which involve the useless expenditure of both time and money.

In addition to these laws which should be repealed, many of the other township road laws can be greatly simplified to cut down expense and to produce more direct results.

Section 578—Code.

This section requires the township clerk to post up on general election day, near the polls, an itemized report of all receipts and expenditures during the preceding year, which report shall be certified to by the township trustees. This section should be repealed, as the trustees are required to report in full to the board of supervisors in January of each year, all receipts and expenditures for the year.

Road Poll Tax.

The law requires that on or before the fifteenth day of April of each year, the township clerk is required to certify to the township superintendent a list of persons within the township who are required to pay a road poll tax. The township superintendent is then required to give persons subject to the poll tax, at least three days' notice of the time and place where such person is to appear for work on the road. If such person fails to report for work, he is required to pay a forfeiture of $3.00 per day for each day's delinquency, or $6.00 for the two days. The superintendent is supposed to collect such forfeiture. In making such collection, he must necessarily keep a record of all persons who have worked poll taxes, all persons whom he has notified to work and who have failed to do so, and all persons who have paid such forfeiture for failure to work out road poll tax.

If a person fails to work out his road poll tax when directed, the superintendent is expected to start action in his own name, for the collection of such forfeiture. Here the laws appear to conflict. Section 1559 of the code provides that when the road supervisor starts an action to recover for failure to work out road poll tax, the amount to be collected shall be ten dollars. There is an apparent discrepancy here as Section 1552 of the code provides that the

amount to be recovered shall be a forfeiture of three dollars per day, or six dollars for the two days.

After collecting funds for poll tax forfeitures, the superintendent is required to disburse such funds for road work, and must necessarily make a report of such disbursement. At the end of the year, he is required to certify to the township clerk a list of all persons subject to pay forfeitures for failure to work out their road poll tax and the amount of forfeitures to be paid by each. The township clerk is then required to certify this list of forfeitures to the county auditor, and the county auditor in turn certifies the same to the county treasurer, who collects them in the same manner as other taxes.

Most of this bookkeeping and these reports can be eliminated by doing away with road poll tax, or by making the road poll tax a cash payment.

There is complaint concerning the reports which the township officers are required to make. The Commission has spent considerable time in an effort to determine accurately all the legal requirements for such reports, and is well convinced that the township officers are entitled to relief.

It should also be noted that there is no fixed cash value of the road poll tax. There are communities in which this tax has merit. For instance, in some townships there are mining camps, and the road poll tax is the only contribution made toward the expense of maintaining the roads, that is made by perhaps a majority of the residents of the township. The farmer who works a day with his team is charged a higher road poll tax than the man who pays perhaps two dollars in cash.

The Commission recommends that the road poll tax, therefore, be abolished or made a definite cash tax. If this is done, fully 50 per cent of the work and bookkeeping on the reports will be eliminated for the township officials, in addition to ending the loss of time and expense of collecting a tax that has, in its present form, outlived its usefulness.

The Commission has prepared eleven blanks for the keeping of township records of expenditures and for making annual reports. If this recommendation is adopted, three of these blanks, Nos. 171, 172 and 173, would be eliminated entirely, and three others, Nos. 134-a, 169 and 170, would be greatly simplified. Also Sections 1552, 1555 and 1559 of the code, and Sections 1550, 1551 and 1554.

Supplement to the Code, 1913, can be repealed. Section 1540-a, Supplement to the Code, 1913, can be repealed in so far as it refers to poll tax.

Township Road Revenues.

Under the present laws the township road revenues are divided into three funds, amounting to a possible levy of ten mills; the township dragging fund of one mill, the township road fund of four mills, and the township drainage fund of five mills. (Section 1528 and Section 1570-b2, Supplement to the Code, 1913.)

The township bookkeeping and reports would be greatly simplified by combining all these levies into one. The trustee should be authorized to pay for road dragging, construction, repairs and drainage out of this one fund. The township clerk would then account for one fund instead of three.

The Commission recommends that this fund be limited to not more than seven mills instead of ten mills as now authorized. In level townships, extensive drainage is required, but the road work is comparatively light. In hilly townships, the road work is more extensive but less drainage is required. The Commission is of the opinion that if the trustees are authorized to utilize their funds for dragging, road work and drainage, as their needs require, a single fund of not more than seven mills will be fully as adequate as the ten mills now authorized.

Township Road Superintendent.

Section 1527-s13, Supplemental Supplement, 1915, requires the township trustees to appoint one or more road superintendents, not exceeding four. This superintendent has charge of all dragging, maintenance and repair work on the township road system. All bills for such work must be certified to by a road superintendent before payment can be made.

This requirement has caused considerable friction and difficulty for the townships. Many townships have had difficulty in securing a satisfactory road superintendent, yet it is illegal for them to do any dragging, maintenance or repair work without having such an officer. In many townships, some of the trustees are practical road men. Some of them have wanted to take active charge of the road work, but it is now illegal for them to do so.

It should be considered here that the services of the county engineer are available to the township trustees, and that the county boards of supervisors are authorized to contract with the trustees

to do the heavier road work and to use the county machinery for this purpose. The practice of using organized county crews with their equipment of machinery for doing the township road work of an extensive character, has found favor among the trustees. This practice will without question, develop rapidly in the future. Thus the need of a superintendent of roads in the townships has been practically met from this source, and the Commission recommends that the appointment of a township road superintendent be made optional, and that the trustees be permitted to take personal charge of the dragging, maintenance and repair work if they so wish. If this is done, it will be necessary to revise Section 468-a, Supplement to the Code, 1913, and Section 1527-s15, Supplement to the Code, 1913, which prohibit the trustees from furnishing labor to the township.

Section 1527-s11, Supplemental Supplement, 1915.
Advertising for Bids.

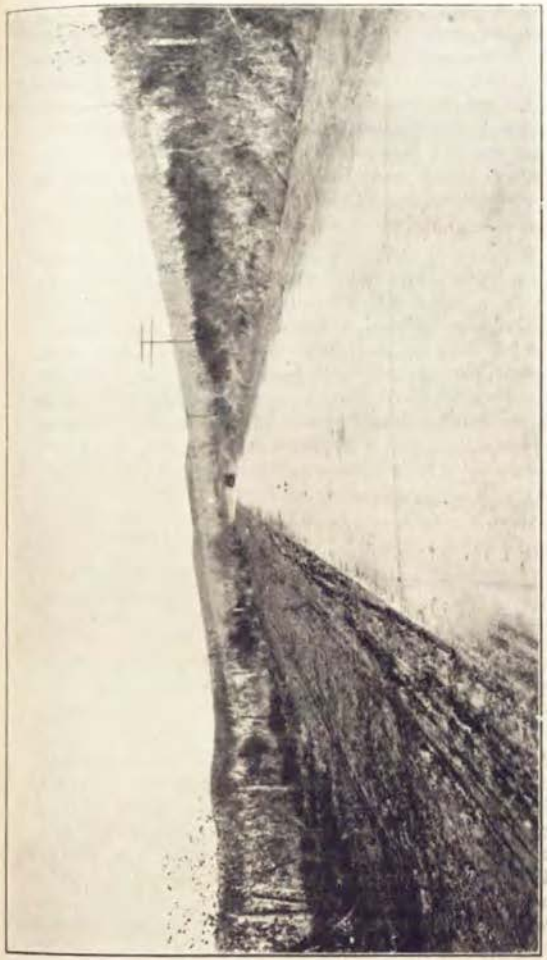
This section provides that the standard specifications for bridges, culverts and railroad subways and overhead crossings shall be furnished by the Commission, and also requires the approval of the Commission, on all plans for permanent road work. It should be made clear that the approval includes not only the specifications for earth road work, but also for the forms of surfacing which the counties may desire to use and a provision made for standard specifications for grade railroad crossings.

That part of the section referring to the work which must be advertised, has been the source of considerable misunderstanding and annoyance to county officials. It is apparent that if the cost of any one bridge or culvert is estimated in excess of $1,000, such work must be advertised. The requirements are not so clear if a county contemplates constructing a number of culverts or miles of road, each estimated at less than $1,000.00, but the total estimated cost amounting to several thousand dollars.

It is desirable to clarify the law so that the board can construct the smaller culverts and cheaper roads without advertising for bids, but the law should state specifically whether the limit imposed refers to the estimated cost of one structure or to the total estimated cost of a number of structures. This section can be clarified and simplified without material changes in the wording of the section.

Emergency Road Work.

In order to avoid delays incident to advertising in emergency cases, such as floods, washouts or the destruction of bridges or roads



An Iowa Paved Country Road—This photograph gives a view of a 16' concrete road built under the Farr Paving Law district plan. Under this plan, Sioux City has constructed approximately 20 miles of concrete roadways. These roads have been built on the main, travelled highways leading into the city from five different directions. While inside the city limits, almost the entire mileage is through strictly rural territory. Note that on each side of the road in the picture, there are cornfields. The entire mileage cost approximately $30,000.

from sudden or unforseen causes, where it is to the best interests of the county to get the bridges or roads reconstructed as quickly as possible, the Commission requires that legal authority be conferred upon it to certify to such work as emergency work. Such certificate would authorize the board of supervisors to proceed with the reconstruction work immediately without waiting to receive bids. Under the general authority given the Commission, this method has been followed in some cases, through the district engineers, and the results have been uniformly satisfactory.

County Road Funds.

The county road funds consist of the county road cash fund and the county motor vehicle fund. The county road cash fund must be used for road work proper, but the motor vehicle fund may be used for building permanent culverts. In 1915, approximately $700,000.00 from the road funds were used for bridge and culvert building. The bridge work is progressing rapidly at the expense of the road funds. The Commission recommends that the proceeds from motor vehicle licenses be restricted to permanent road grading and surfacing. Specific authority should be given for the use of this fund to meet the Federal Aid apportionments to the counties.

Section 1527-s8, Supplemental Supplement.

Temporary Culverts.

Under this provision of the law, temporary culverts cost the township nothing, and the township trustees in many instances request the board of supervisors to furnish them with an unreasonable number of such temporary culverts.

An instance may be cited in Boone County, where a township requested the board to furnish sixty-nine temporary culverts. The county was able to furnish only twelve. This gave the trustees an excuse for complaint. It is fair to assume that the average cost of such culverts would have been not less than $22.00 each. At this rate, the sixty-nine culverts requested would cost $1,518. Also, it is reasonable to assume, a cost to the township of about $5.00 each for installing such temporary culverts. At this rate, the cost for installing these culverts would have been $345.00. Accordingly, a fair estimate of the cost of the sixty-nine culverts installed would be $1,863.00. This is equal to almost the entire road revenue of this township for one year, including both the road and drag funds.

The Commission is of the opinion that such a condition would be relieved by requiring that the board of supervisors must furnish temporary culverts on requisition of the township trustees, but that 50 per cent of the cost of culverts must be paid by the townships. Such a requirement will retain to the public the saving due to purchasing in large quantities and will also act as a check upon the townships in making unreasonable or unnecessary requests for temporary culverts.

The importance of economy in buying and installing temporary culverts can be easily understood from the fact that during 1915, some 27,000 such culverts were installed.

CONSTRUCTIVE LEGISLATION RECOMMENDED.

Town and City Participation in Road Improvement.

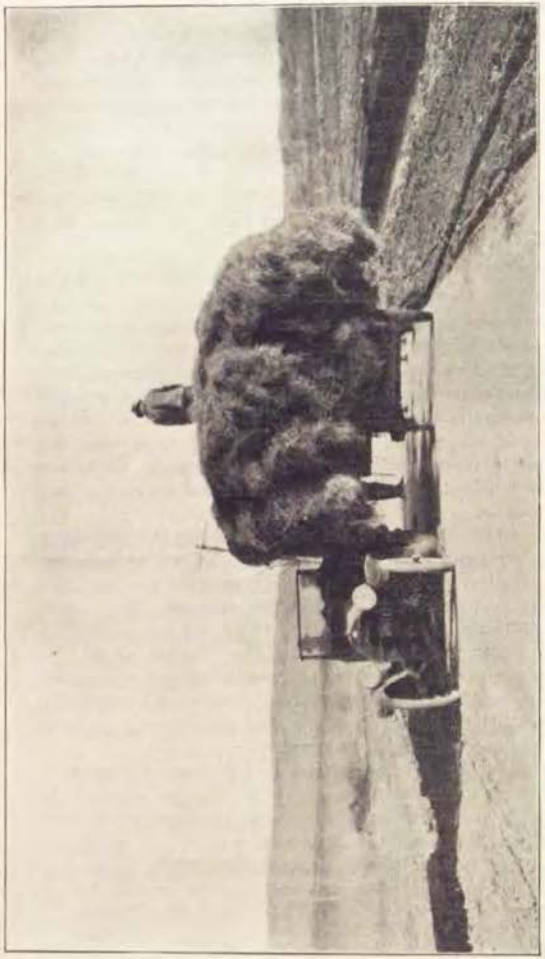
It is the contention of many of farm owners that city and town traffic is making necessary extensive road improvements, and that city and town property is not taxed for such improvements in proportion to farm property. An analysis of the tax levies in part substantiates this contention. The cities and towns pay all the cost of road and street improvements within their corporate limits, either in the form of taxes or special assessments against the property benefited. Farm property pays none of the costs of such improvements.

The equitable division of the cost of rural road improvement between the nation, the state, the county, the city or town, and the benefited property itself, is the most involved problem which extensive road improvement policies has produced. This division undoubtedly should be made in proportion to the benefits received, but the measure of these benefits is difficult to determine. That the cities and towns do benefit from rural road improvement was definitely established by the Supreme Court of Wisconsin when the court upheld the rights of the state to tax city property to aid in the improvement of rural roads.

The Commission is of the opinion that the present basis of collection of road taxes in this state does not correctly represent the distribution of the benefits between urban and rural property, received from the expenditures of these taxes.

Rural road taxes authorized by law are as follows:

Property outside of cities and towns, 14 mills.
Property inside of cities and towns less than the first class, 1½ mills.
Property in cities of the first class, ½ mill.



A 16' Concrete Roadway—This photograph shows an automobile and an extremely wide load of hay, passing on one of the 16' concrete roadways leading out of Sioux City. The auto can safely pass the load of hay on this width of roadway. Near cities and towns, double track roads should be provided. In the rural districts single track roads will, for the most part, meet present traffic demands. In some of the eastern states motor trucks have been developed of such width as to render a double track road serviceable only for single track traffic. Iowa should anticipate such a development of the motor truck by passing adequate law limiting the size and weights of such machines.

The average levies for eighty-five counties in 1916 for rural roads are:

Property outside of cities and towns, 7.84 mills.
Property in cities and towns less than first class, 0.69 mills.
Property in cities of the first class, 0.46 mills.

The above levies are for road work only. They do not include the bridge levy. The bridge levy averaged 4.75 mills. It applies to all property except property in cities of the first class.

Changed methods of transportation have so increased the average radius of daily travel of a large percentage of the population of the state, that former boundary lines between urban and rural population have become obliterated. The corporation line no longer limits the interest or concern of the urban population. Wherever in the United States a system of roads adequate to the service needs of the community has been developed, the cost has been shared by all the property even though remotely benefited, whether urban or rural. This has been true uniformly, but the unit of administration varies.

The commission is of the opinion that the cities and towns of the state must be provided with some legal method under which they may become a part of a road improvement district for improving the roads beyond the corporate limits. The method of forming such a district, the method of paying for the improvement of the roads, and the method of administration, can and should be fixed by legislative enactment. The size of the district would necessarily be determined in each individual instance.

The Commission recommends that authority similar to that now existing under sec. 840-h (et seq.) S. S. 1915 (in which cities and towns having more than 2,000 population may improve the main roads within the corporation limits) be granted to cities and towns to assist in the improving of roads outside their corporate limits.

It has been successfully demonstrated by the City of Sioux City that in the above Act, cities and towns above two thousand population have a practical method for improving the main market roads within their corporate lines. These are the only urban roads in which the farming population is greatly concerned, or by the improvement of which they are greatly benefited. The pavement of residence streets adds little to the general improvement of a system of service highways in any community. Many towns of the state have paved streets, while at the same time, between the

pavements and the corporation line are stretches of main highways which generally are in much worse condition than the county roads beyond. The district plan has demonstrated itself to be a practical method for relieving such conditions and should be legalized for use within or without corporations.

The Federal Aid Act provides for the construction of roads through towns having a population of less than twenty-five hundred and in the outlying districts of the larger towns. Legal authority should be given towns and cities to take advantage of this act.

Poorly Graded and Drained Earth Road—This photograph provides a typical view of a poorly graded, inadequately drained earth road. This happens to be a township road, but no doubt there are many equally as bad stretches on county road system. It is a waste of money to attempt to place such a road in serviceable condition by the addition of gravel or stone. Side ditches should be provided and the roadway crowned so as to drain the surface water into the ditches.

The Commission also recommends that it be made clear in the wording of the present law, that substantially built gravel roads will meet the requirements of the above mentioned act. (Section 840-H S. S. 1915.)

Road Maintenance.

The demand in Iowa is for serviceable roads in all parts of the state, rather than for a limited mileage of high cost roads. This

demand can be satisfied within a reasonable expenditure of money only by constant and systematic maintenance of the earth or other form of low cost roads. No equal expenditure of road funds for other work will give half the service to the public that will the money spent for adequate maintenance.

The Commission is of the opinion that the only way in which adequate maintenance can be secured is through the patrol system. The cost of such a system should be about $100 per mile per year. During 1915 the maintenance on the county roads cost $74 per mile and yet the roads were not satisfactorily maintained.

Under the patrol system the responsibility for the condition of any mile of road can be definitely fixed. Under the present system the responsibility cannot be so fixed. The present system of maintenance breaks down when maintenance is most needed.

The Commission recommends a law establishing the patrol system of maintenance for county roads. Such a system would increase the cost of maintenance possibly 25 per cent, but it would insure the upkeep of the roads. This system need not increase the present road expenditures, for the county funds are now ample to cover the cost of patrol maintenance. Under such a system only can we hope to secure the service from our roads that we are now demanding.

The Commission feels that it cannot, in justice to its responsibilities, too strongly urge adequate maintenance legislation. Many of the eastern states have found that they are facing reconstruction of the expensive first cost roads because of the lack of systematic maintenance. Iowa may profit by their example and conserve the investment already made in all built earth or gravel roads by providing an adequate maintenance system.

Iowa may well profit to a still greater extent from the established fact that a comparatively low cost road, adequately maintained, will render a longer satisfactory service to the public than a comparatively high cost road without maintenance.

Road maintenance of the right character is living, vital. The taxpayer who each year contributes his proportion to the road funds of the state is entitled to receive the greatest service from the roads that they are capable of rendering.

Systematic, continuous maintenance is the only method under which this service may be obtained from our great mileage of earth roads. It is the only method that will keep gravel surfaced roads from rapid deterioration. Iowa roads are entitled to receive

this systematic upkeep rather than a periodic upheaval. As has been pointed out, the cost of such care of the county road systems will not be too greatly increased over present expenditures and the results will more than justify the expenditure.

The Commission is convinced that even though progress which is not now apparent may be made in surfacing the roads of the state, Iowa must still be content to use for an indefinite period the ordinary earth road for the greater percentage of its highway traffic. The only type of surface which is at all practical at this time for any extended mileage is gravel. To both of these roads systematic maintenance is essential.

Motor Traffic Regulations.

In the 1915 report, the Commission called attention to the necessity for a uniform set of regulations governing motor vehicle traffic within the state.

With the increasing registration of automobiles and motor trucks, a uniform regulation of the use of these vehicles on the public highways is urgent. Even more urgent is the need of regulations governing the use of motor trucks. This traffic has not yet become as acute a problem to road officials in the Mississippi Valley States as it is in the eastern states. New York, New Jersey, Massachusetts and Maryland have found it necessary to adopt regulations for the use of motor trucks. In these states there is a large mileage of roads surfaced with macadam, concrete and brick, which insures a roadway for such traffic during every season of the year. In such a state as Iowa, where there is only a limited mileage of even gravel surfaced roads, it is not foreseen that the use of motor trucks on a large scale is imminent. Still, though such trucks may be limited in numbers, the use of such trucks on gravel or well built earth roads during wet periods, will result in a rapid destruction of the roadbed as well as the road surface. It has already been demonstrated in this state that farmers living within hauling distance of a market, can place their produce on the market in less time, with more convenience to themselves, and at no greater cost than by shipment over the railroads. The development of traffic of this kind can be readily foreseen, when the total amount of the products of the average community is considered.

It has been shown in the east that as fast as improved road surfaces are built, motor trucks are developed of increased capacity and weight. The size of some of the trucks has automatically

limited the serviceability of the roads already constructed. For instance, a 16-foot surface has been considered sufficient for two lines of traffic, but there are motor trucks in use which, used on a roadway of this width, relegates the roadway to a single track surface. The weight per inch of tire, the length and width of the trucks and the use of trailers have been made a subject of legislative enactment in various states.

There is now on foot a movement to standardize motor truck regulations between the different states, and the Commission is in sympathy with this movement, although it is believed that the difference which exists in road development between the different

Preventing Erosion in Side Ditches—This view illustrates the method of preventing erosion in the side ditches on hillsides on a Maryland state road. At frequent intervals walls or dams are constructed across the side ditches. The top of each wall is placed at the proper elevation to retard the flow of water, and yet not force the water out of the ditch. The slope of the ditch between excessive dams is flat enough to prevent washing. This same scheme can be cheaply applied to Iowa roads by using plank or logs to form the dams.

states should be taken into consideration in developing such a uniform set of standards. The road surfaces which are being built in the eastern states will carry heavier wheel loads than will the earth, sand, clay, or gravel roads of this state.

The Commission is of the opinion that the total maximum load, the maximum speed, and the load per inch width of tire, should be limited by legislative enactment. Reasonable limitations of these factors are, total load, eight tons; load per inch width of tire, 400 pounds, and maximum speed limit 12 miles per hour.

Not only should these requirements be made, but a tax should be fixed on the operation of motor trucks that will in a measure compensate for the wear which the roads will receive from them.

The use of lugs on the wheels of steam or gas tractors should be regulated so as to prevent these machines from damaging road surfaces any more than the legitimate use of such machines warrant. Such tractors now have lugs which loosen or disturb the surface of a gravel or earth road an inch or more in depth. The road is thus damaged far more than the use of such machines will warrant. Tractors with lugs should not be permitted on roads with gravel or other improved surfaces. With the increasing mileage of roads of this character, a regulatory measure has become essential.

Chapter III—Federal Aid for Rural Highways

The Congress of the United States, through an Act, (Public No. 156, 64th Congress) approved July 11th, 1916, has appropriated the sum of $75,000,000 for assisting the several states in the improvement of their rural post roads. This sum is distributed over a period of five years, beginning July 1st, 1916. The total appropriation is divided among the states on the triple basis of area, population and miles of post roads. Each of these factors is given equal weight, so that one-third of the apportionment will be based on the ratio that the area of each state bears to the area of all the states, one-third on the ratio that the population of each state bears to the total population, and one-third on the ratio that the number of miles of rural delivery and star routes bears to the total mileage of such routes.

The plan proposed is progressive in that the first apportionment of $5,000,000, available during the fiscal year 1916-1917 will be increased each year by $5,000,000, until for the year ending June 30th, 1921, the sum of $25,000,000 will be available, thus making it possible to develop an efficient administration of the fund by beginning with small amounts for each of the states. The distribution of the apportionment for each state within the state, will be through the state highway departments, and under this plan, the

Center Grove Railroad Crossing—The Center Grove viaduct which carries the Dubuque-Dyersville Post road over the Illinois Central railroad tracks, a short distance west of Dubuque, is the most important separation of highway and railroad grade yet attempted in Iowa. This is a triple crossing. At the same point at which the highway crosses the railroad track, Cat Fish branch flows beneath the railroad bridge. The bed of the creek, the Illinois Central low riveted truss bridge, the steel highway viaduct and the old steel through truss which formerly carried the road over the creek, are all visible in the photograph. Cost of improvement was $20,400.

establishment and maintenance of a state highway department is essential.

The states which accept Federal Aid must agree to keep in repair the roads constructed with these funds, and provision is made that any state, to continue to receive the Federal Aid funds, must continue to maintain the roads in good condition. Under the provision of the present measure, Iowa would receive during the five year period, an estimated pro rata amounting to about $2,200,000. The appropriation for the fiscal year 1916-1917 is $146,175.60.

That this subject may be better understood, the Commission believes it proper to include in this discussion, a brief review of the activities of the Federal Government in road building in the past early history of Federal Aid in road building.

Federal Aid was first made possible by an act of Congress passed April 30th, 1802, which admitted Ohio as a state and provided that five per cent of the net proceeds of the public lands lying within the state, sold by Congress, should be applied to laying out and making public roads, which should lead from navigable waters emptying into the Atlantic, westward to the Ohio river.

The Act of April 19th, 1816, providing for the admission of Indiana, the act of April 18th, 1818, providing for the admission of Illinois, and the act of March 6th, 1820, for the admission of Missouri, each provided for the extension of the Ohio plan of road building.

On December 19th, 1805, a committee of Congress recommended that the funds derived from the sale of these lands be expended in constructing a road from Cumberland, Maryland, to a point on the Ohio river opposite the City of Steubenville, Ohio. Following this report, an act was approved by President Jefferson on March 29th, 1806, providing for the construction of a road, which soon became known as the Cumberland or National Highway. The first appropriation of $30,000.00 was followed by thirty-three other appropriations aggregating $6,824,919.00. On April 21, 1805, Congress passed an act authorizing the extension of the road from a point near Cincinnati, by way of Vincennes, to the Mississippi river near St. Louis. As a matter of fact, this road was not extended beyond Vandalia, Illinois, on account of the rapid growth in the construction of railroads at about this time.

The first stage coach bearing the United States mail from Cumberland to Wheeling, was driven over this road on August 1, 1818. From Cumberland to Columbus, Ohio, the road was surfaced, but

beyond Columbus, it was surfaced only in spots. After a full century, this road is still paying dividends in public service, as it is now one of the most traveled roads in the states through which it passes. The appropriations were expended under expert supervision with the result that modern surfaces as now being placed over the foundations built so long ago, and the stone bridges built at that time are still in an excellent state of preservation, and are splendid examples of the finest class of highway construction.

One of the most extensive single pieces of highway construction undertaken in 1914, was the building of twenty-six miles of concrete surfacing over the old National Highway out of Columbus,

General View of Center Grove Crossing Project—This photograph shows the extensive fill and the steel viaduct which carries the Hawkeye Highway over the Illinois Central railroad at the Center Grove crossing west of Dubuque. The white house shown in the distance was moved from down in the valley because of the high fill which has been constructed. The fill near the far end of the viaduct is approximately 39' in height. This viaduct with the earth approaches was constructed by the co-operation of the Federal government, Illinois Central R. R. and Dubuque county. The railroad constructed and maintained the viaduct. The county and Federal government constructed and will maintain the earth approaches.

Ohio, eastward. The combination of old and new highway construction over which the traveler motors with delight and satisfaction, is typical of the cycle through which transportation has passed in the United States. From the stage coach days of 1818 to those of the modern motor car, complete the remarkable cycle of transportation stages in this country.

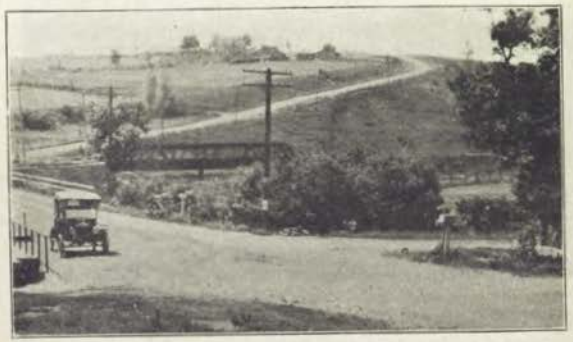
Federal Aid from 1838 to 1913.

No further aid in highway building was extended by the Federal Government after 1838 until 1893, when the Office of Road Inquiry

was established with an initial appropriation of $10,000.00 per year. The Office of Public Roads since that time, has developed into a large organization under the Department of Agriculture. The work of this Department has been advisory in character and much valuable information has been gathered and distributed on road building, irrigation, drainage, and farm architecture. Competent highway engineers have been sent into every state to assist in working out general and specific road problems.

Federal Appropriation for Post Road Construction.

In 1913, a special appropriation was included in the budget of the Post Office Department, amounting to $500,000 for the improvement of post roads under the joint administration of the Secretary of Agriculture and Postmaster General. This appropriation was distributed under the condition that the states or localities receiving any portion of the Federal funds should expend double the amount obtained from this fund, making in all about $1,500,000 available. With this fund as a nucleus, there has been built under the supervision of the Office of Public Roads, 465 miles of first-class roads in seventeen different projects. The following states and counties have participated in the fund which was



Site of the Center Grove Viaduct—This photograph shows the site of the huge steel viaduct which carries the Hawkeye Highway and the Dubuque Post road over the Illinois Central railroad bridge and Cat Fish Creek. Near the telephone pole in the center of the photograph the earth fill, which has been built, is nearly as high as the pole. The grade on the old road up the hill in the distance was 14%. This has been reduced by relocation and grading to 6%.

appropriated: Alabama, Lauderdale County; Iowa, Boone and Story Counties and Dubuque county; Kentucky, Bath and Montgomery Counties; Maine, Cumberland County; Maryland, Montgomery County; Mississippi, LeFlore County; North Carolina, McDowell County and Forsythe, Davie and Iredell Counties, two projects; Ohio, Licking and Muskegum Counties; Oregon, Jackson County; South Carolina, Aiken County; Tennessee, Montgomery County and Loudon County, two projects; Texas, Bexar, Guadalupe, Hays, Comal and Travis Counties; Virginia, Fairfax County and Spottsylvania; Hanover and Caroline Counties.

Federal Aid in Iowa.

In 1913, Boone and Story Counties made application for $10,000 from this fund, and agreed to appropriate $20,000, making a total available of $30,000 for the building of a fifty mile stretch of model earth road through the two counties. This project was completed early in 1914, and the entire length is now a portion of the Lincoln Highway. It has been brought to a permanent grade, well drained, and all culverts and bridges have been built permanently.

The same year, Dubuque County also applied for a portion of the Federal appropriation. The necessary funds did not become available until 1914, after a number of other states had failed to take up their prorated shares of the original appropriation. After an inspection of the road proposed to be improved in Dubuque County, an appropriation of $30,000 was made from the Federal fund, contingent upon the appropriation of double the amount by Dubuque County for the improvement of the road, exclusive of the bridges and culverts required.

Plans and specifications were carefully worked out for model gravel road construction, with permanent bridges and culverts and for the elimination of grade crossings. The length of the road is nineteen miles, extending from Dubuque to Dyersville. A portion is through as rough topography as there is in the State of Iowa. When the final plans were made for the completion of the road, it was found that the total project would cost at least $160,000. Every available source was canvassed to secure the additional amount needed to complete the entire road in accordance with the plans. Through the efforts of the Dubuque County Board of Supervisors, and the Dubuque Industrial Corporation, the money is now all provided and the completion of the entire road assured. The total amount will come from the following sources: Federal appropria-

tion, $30,000.00; County appropriation for road work, $60,000.00; County appropriation for bridges and grade crossing elimination, $20,000.00; Illinois Central Railway for grade crossing elimination, $20,600.00; Private citizens of Dubuque, $30,000.00. In the building of the Hawkeye Highway through Dubuque County, the State of Iowa has its first example of any extensive road construction that in any way adequately expresses in road building, Iowa's wealth and resources, and the possibilities of road construction by the local communities, when aroused to activity.

Federal Aid Administration Under Present Act.

The present act, providing Federal Aid for building rural highways, places the administration of the funds under the Secretary of Agriculture.

Under date of September 1st, 1916, the Secretary issued the rules and regulations to the several state highway departments for carrying into effect the requirements and purposes of the act. In addition to these rules and regulations, the Commission received a letter of instructions dated September First, in which Secretary of Agriculture, Mr. D. F. Huston sets forth the following requirements with which the Commission was requested to comply before submitting the first project:

First: That the road construction under Federal Aid projects in each state, shall conform to some definite program.

Second: That this program be sufficiently broad to cover the five year life of the Federal Aid Act.

Third: That the plan, under which the requirements of this act shall be met, be stated to the Department; this plan to include the sources and method of making available the money to meet the liability assumed by the state in applying for the Federal Aid apportionment.

Fourth: That the facilities possessed by the state for carrying out the duties devolving upon the state in connection with the expenditure of the Federal Aid apportionment be stated.

Fifth: That the method of maintenance of roads in the construction of which Federal Aid Funds are used, be set forth.

Sixth: That a map showing the proposed system of roads for the construction of which Federal Aid is to be requested, be submitted to the Federal Department.

Seventh: That a statement be made as to the service that the proposed system will render.

Application for Federal Aid from Counties.

The act provides that in states having a regularly organized state highway department, the assent of the governor of the state to the terms and conditions, shall make the apportionment to that state immediately available. This acceptance holds until the adjournment of the first regular session of the General Assembly following the passage of the act.

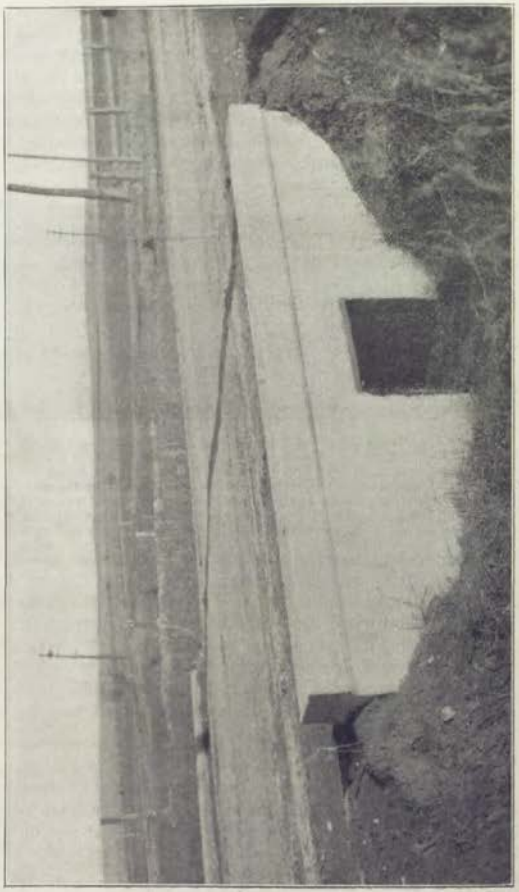
As soon as the Governor of Iowa, Mr. George W. Clarke, gave his assent and acceptance to the act, it became operative in this state. Immediately, therefore, the Commission began receiving applications from the counties for an apportionment of these funds. Many of the counties have made definite appropriations and specified the roads on which it is desired to expend their apportionment.

Farley Chert Gravel Pit—The pit from which the surfacing material for the Dubuque-Dyersville post road is being secured, is located 1½ miles north of Farley. The gravel is about 20' in depth and in the plot purchased by the county there is estimated to be enough material to build another 20 mile road like the post road. The gravel consists of angular fragment concretionary limestone, ranging in size from ¼" up. It contains 25% of clay binder. In the construction of the road it is necessary to add sand or gravel to the surface to take up the excess clay binder.

In view of the fact that so many of the counties have moved in sundry projects involving the expenditure of the Federal Aid funds, the Commission has had under consideration tentatively, with the Federal authorities, the matter of the apportionment of these funds, and to prevent undue advantage accruing to any county by reason of early action, has adhered to date, to the method of apportionment adopted in the act itself, and applied same tentatively to the counties that have already submitted projects involving Federal Aid.

Legislation Required.

No extensive legislation is required to provide for the carrying into effect to the Federal Aid act in this State. The organization is now such that the requirements of the act may be met by the Highway Commission and the county administrations as now constituted.



Concrete Box Culvert—87 concrete box culverts have been built, like the above, on the Dubuque Dyersville Post road, a distance of approximately 25 miles. This view shows a 2'-0" concrete box culvert with a 24' roadway, surfaced with gravel for a width of 12'.

The Commission is of the opinion that only one act is required to continue the Federal apportionment in this State, namely: the assent of the General Assembly to the terms and conditions of the Federal Aid Act. This really constitutes the moral acceptance of the obligations reposing in the act, for and on behalf of the State. There are, however, a number of enabling or legalizing acts that should be provided in order to give the several state and county officials, specific authority, and to set forth their duties in the administration of the Federal Aid funds. These are summarized as follows:

The Highway Commission should be authorized to perform all acts required by the Secretary of Agriculture in submitting and administering Federal Aid projects.

The board of supervisors should be authorized to make application to the Highway Commission for apportionments from the Federal funds and to appropriate from the county road cash funds, the amounts necessary to meet the Federal apportionment.

The county boards of supervisors should be authorized to enter into contract with the Highway Commission providing for the maintenance of the roads built with the Federal road funds.

The state treasurer and the county treasurers should be authorized and directed to receive the Federal funds from the United States Treasury and to pay out same only for the purposes of, and in the manner provided in the Federal Aid Act.

Cities and towns should be authorized to co-operate in Federal Aid projects and to levy taxes and anticipate their revenues to meet the Federal Aid apportionment.

Chapter IV—Bridge Patents and Patent Litigation

In 1913, the General Assembly, on the recommendation of the Highway Commission, passed an act empowering the Governor of the State to direct the Attorney General to appear for any county, city, town, or other municipality, or any officer thereof or contractor therewith, whenever any of these became a party to an cation charging infringement of any any patent involving any process or material entering into highway, bridge, or culvert construction. The Highway Commission urged this action because of the methods that were being used by patent owners and contractors

working under these patents, to secure contracts or to eliminate competition by threats of patent litigation. So bold did these owners and the attorneys representing them become, that threatening letters, copies of consent decrees and printed warnings, threatening litigation were freely circulated in the state amongst the county supervisors, and engineers employed by the counties to prepare bridge plans.

These patent owners, evidently foreseeing that highway improvement would in the future become one of the most extensive undertakings in which the state and the civil divisions thereof would participate, attempted to fix upon this developing industry a tax under the guise of patent royalty that, year by year, would produce increasingly greater returns.

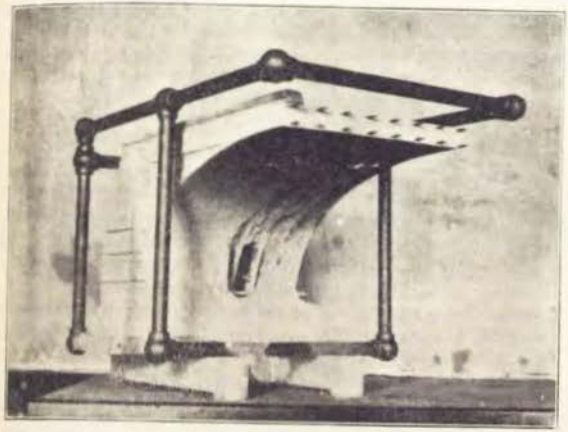
The patents pertaining to the use of reinforced concrete for bridges and culvert construction are the most numerous of any of the patents affecting highway construction. A determined effort was made to secure a monopoly on reinforced concrete construction through the use of a series of patents granted by the United States Patent Office. This seemed to be in a fair way toward accomplishment when abruptly halted in this state by the passage of the above act.

Shortly after this act became effective, Governor Clarke directed the Department of Justice to appear for the defendant in one of the patent cases then pending.

Mr. Henry E. Sampson, Special Counsel, was placed in charge of the patent litigation in which the Department of Justice appeared, and the Highway Commission was requested to co-operate with this Department in preparing technical material and models, and in gathering information in the field relative to the various forms and processes of construction which have been used in building bridges and culverts. Special patent attorneys have been employed by the state for the preparation of evidence and arguments for submission to the courts.

During the three years that this law has been operative, the state, through the Department of Justice and the Highway Commission, has prepared or assisted in preparing arguments and evidence for the defense in four patent cases in this state. The evidence gathered in these cases has been made available for the use of the defense in similar suits in Kansas, Nebraska, and Wisconsin. These states have likewise co-operated in making available to Iowa the

evidence gathered by them, which is pertinent to the Iowa cases. Through this arrangement much material has been gathered, the value of which can scarcely be reckoned to the public, when it is considered that this material will form the basis of an adequate defense in practically all of the litigation which has been begun or even threatened, to collect royalties on reinforced concrete bridge and culvert construction.



Patent Suit Model—This photograph shows a model used for illustrating the Von Emperger method of reinforcing in concrete bridge construction. The model was prepared for use in the suit of Thatcher vs. Polk County.

Patent Cases Pending or Settled.

Bridge patent cases which have gone into courts in this state are as follows:

Boone vs. Walsh Construction Company, Davenport. Suit for infringement of patent on retaining wall reinforcement.

Edwin Thacher vs. Polk County; Edwin Thacher vs. City of Des Moines. Suit for infringement on patent of arch reinforcement.

Lutes vs. Marsh Engineering Company. Infringement on patents of various details of bridge construction.

Of the above cases, the first, Boone vs. Walsh Construction Company, was dismissed on motion of the plaintiff when the case came before the court in April, 1916. The defense was fully prepared and ready for trial in this case, but the plaintiff, rather than face trial, moved for dismissal of the case.

The second case, Thacher vs. Polk County, was tried before Federal Judge Wade in June, 1916. Under date of September 17th, the court, in a sweeping decision, decided this case in favor of the defendant. Following this decision, on October 10th, the same court dismissed the complainant's petition in the third case. The fourth, Luten vs. Marsh Engineering Company, is now ready for submission to the court.

The effect of the law passed by the state authorizing the state to defend patent suits, of the entrance of the state into this litigation, and of the litigation which has already been decided adversely to the owners of the various patents, has been to stop abruptly the payment of patent royalties on bridge construction in this state.

Prior to 1913, many counties were paying royalties on certain types of bridge construction. Other patent owners, encouraged by this fact, began demanding payment of royalties for certain alleged infringement, until it seemed certain that the state would soon be paying an enormous annual charge in this way. Numerous letters were sent out to many of the county boards demanding payment of a royalty on specific structures, by the attorneys representing Thacher at the time he filed suit against Polk County. From five to ten per cent of the cost of the structures was demanded as the fixed royalty charge. When it is considered that in 1915 the state expended over four million dollars for permanent bridge construction, of which a considerable portion was for reinforced concrete construction, the possibilities of this tax upon the public runs into hundreds of thousands of dollars annually.

Payment of Royalty Has Ceased.

The Commission has no knowledge of any patent royalties being paid on bridge construction in this state since the beginning of the year 1914, and has reason to believe that a very large sum has been saved to the counties by the state's assuming this patent litigation.

The Commission is also of the opinion that the advanced position taken by Iowa in assuming the defense of this litigation, has not only resulted in a large saving within the state, but that this example has encouraged and assisted neighboring states to adopt in a measure the same policy, which policy, if consistently sustained, will save to the taxpaying public, large sums which otherwise would be paid out in patent royalties.

The questions of patent rights and patent monopolies with reference to materials and processes which must be used in highway improvement are so important to every commonwealth in this nation that is encouraging or assisting in an extensive program of such improvements, that the Commission believes it important to include in this report some of the records pertaining to the validity of various patents on reinforced concrete construction, which have been prepared by Mr. H. E. Sampson from the material gathered in preparing the evidence and arguments in the patent cases above mentioned.

The following is quoted from Mr. Sampson:

The opinion of the courts in recently decided cases, indicates that sooner or later the courts will definitely set up the ruling that the essential novelty in reinforced concrete is the combination of tensile resisting steel with the compression resisting concrete in such a fashion as to cause the materials to work together. This idea, of course, is quite old.

Systems Half a Century Old.

Francois Coignet, as early as 1861, pointed out the advantages resulting from a combination of metal and concrete, and his son, Edmund Coignet, published his theory as to the disposition of the two materials. The Monier system of combining steel and concrete dates as far back as 1867; although he was preceded by others, yet he was really the first to employ reinforced concrete in a large way. The Hennebique system was promoted in 1879, and a large span reinforced concrete bridge was constructed in France in 1899 under this design, one of the spans being 164 feet in length. Other early systems could be mentioned, but it is deemed unnecessary at this time. In addition to these several systems, there were a score or more of modifications of some one or other of them put out under the trade name of the particular promoter.

Foreign Systems Brought to the United States.

The Monier system was introduced into this country by Mr. E. Lee Heidenreich, now of Kansas City, in the early nineties. Most of the reinforced concrete bridges now being built in the United States are the outgrowth of this comprehensive system. The Melan system of reinforcing by the use of rigid structural iron framework was brought to this country by Frederick von Emperger, now of Austria, about 1893. In 1895, Mr. von Emperger perfected a system of his own, which was patented in 1897. Since Mr. von Emperger's return to Austria in 1895, the Melan system has been ably represented by Mr. William Mueser of New York. Edwin Thacher, then of Detroit, secured a patent in 1899 on a modified and simplified form of the Monier system and very like the structure shown in Figure 3 of the von Emperger patent No.

583,464 of 1897. Since 1900, the Melan, the von Emperger, and the Thacher systems have been exploited throughout the United States by the Concrete Steel Engineering Co., of New York.

Publication of Progress Made.

All of these systems and their modifications and the more important structures built under them were fully described, accompanied by photographs and drawings in the various publications and patents of that day. U. S. Letters patent were frequently taken out and the trade journals and text books of this country kept the American engi-

Curved Wing Wall Model—This photograph shows the model of a bridge on the Vanderbilt estate in New York. It was prepared for the suit of Luten vs. State of Iowa. It was used to illustrate the idea of using the curved wing wall to curb the toe of the slope of approach fills.

neers informed as to the progress being made by foreign engineers in the use of reinforced concrete in the construction of bridges.

Patents Expired.

It should be said that all of the previously mentioned systems can now be used by the public without liability for royalties, since all patents protecting them have expired.

The exploitation of these systems naturally increased the use of reinforced concrete in bridge and culvert construction, and opened up a new field of operation for bridge engineers.

Attempt to Monopolize.

There were a number of bridge designers and builders who could not withstand the temptation to get rich quick when they saw that

reinforced concrete bridges were to become the general type and that the several states were about to enter upon an extensive program of concrete bridge building. They saw an opportunity to commercialize their profession and sought to monopolize the entire field by taking out Letters patent on every conceivable device in connection with the designing, forming, reinforcing, building, finishing, and protecting of bridges and culverts.

The Luten Patents.

For the purpose of showing the extent to which this practice has been carried, the patent claims taken out by D. B. Luten will serve to illustrate.

The first Luten patent was applied for August 2, 1899, and granted May 15, 1900. Since that time he has made application for at least 75 different patents, and up to October 5th, 1915, forty-five different patents on so-called improvements in the method of building reinforced concrete bridges had been allowed. These forty-five patents contained a total of 433 specific claims. It is safe to say that if all or any considerable number of the 433 claims are valid, it is impossible to design a reinforced concrete bridge which would not infringe one or some of these claims, given the interpretation which the patentee and his attorneys have attempted to read into these patents in the cases which are now pending.

Two Main Defenses.

Numerous defenses may be urged in patent suits, but the principal ones are:

Patent void for want of invention.
Patent void for want of novelty.

Want of Invention.

Want of invention is a valid defense. The device must be the result of inventive genius. A patentable invention is a mental result—the product of original thought. Much that may be thought invention does not in fact pass beyond the domain of engineering or mechanical skill. The simplicity of many of these devices covered by these patents leads to the question of their patentability at all. Patent lawyers and leading engineers throughout the country are coming to consider that nothing but the exercise of ordinary engineering skill is not in any sense the result of inventive genius. Judge Nixon once contrasted invention and mechanical skill by saying that "invention indicates genius and the production of a new idea, while mechanical skill is applied to an old idea and suggests how it may be modified and made more practical. Mere mechanical skill can never rise to the sphere of invention. The latter involves thought and brings into activity a different faculty. Their domains are distinct."

Engineering Skill Not Invention.

The courts have uniformly held that patents are void if they do not embody invention. Also that the mere exercise of mechanical skill is

not invention. The device which displays only the special skill of the maker's calling and involves only the exercise of ordinary faculties or reasoning upon materials supplied by special knowledge, and the faculty of manipulation resulting from habitual intelligent practice, is in no sense creative work of the inventive faculty, such as the United States Constitution and patent laws aim to encourage and reward.

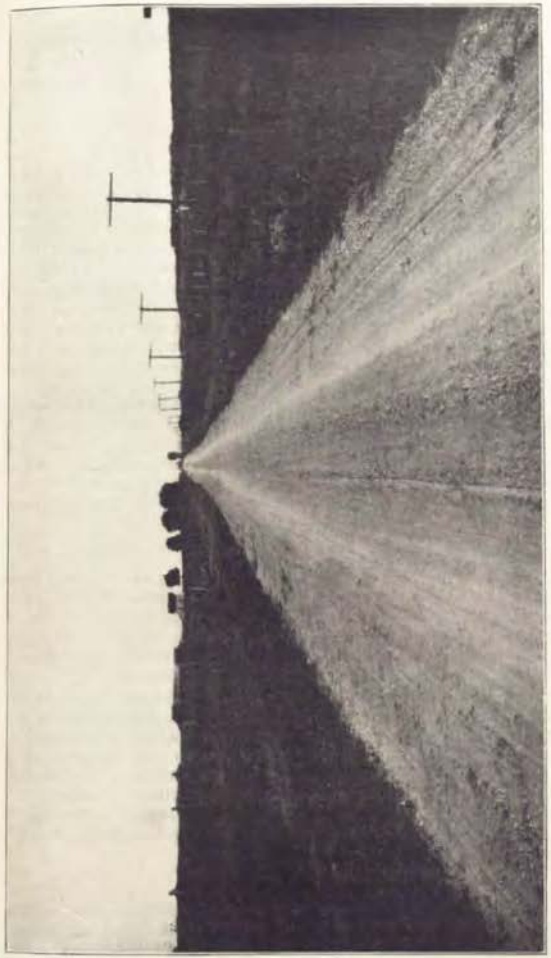
Want of Novelty.

Want of patentable novelty is also a valid defense. A patent may be voided by proving, (a) that it was previously known to others in this country; (b) that it was previously used by others; (c) that it was previously patented; (d) that it had been previously described in printed publication in this country or any other foreign country; etc.

Class "A" Gravel Road—This is a view of the Spirit Lake-Arnold's Park experimental gravel road. Class "A" gravel road requires approximately 2,450 cubic yards of gravel per mile for a 16' roadway. Specifications require that it be built upon a standard cross-section, permanently graded earth road. The lower course of gravel is placed in a trench 9' wide and 5" deep. The top or wearing course of gravel is distributed over a width 16' and 5" deep. A roller is used to compact the earth subgrade and both courses of the gravel.

Other Defenses.

Numerous other defenses may be urged, for instances, that the invention covered by the patent is not patentable subject matter under the United States statutes, that is, it is neither, (a) art, (b) machinery, (c) manufacturing, (d) nor composition of matter. It may also be urged that the patented device is neither new or useful; that it has been abandoned to the public by the applicant prior to the filing of his application; that it is void as claiming a principle or a function. It may also be urged that the patent in suit has expired; that the alleged infringing acts were done under a license; that the structure does not infringe; that the complainant is estopped to assert any demand under the patent in suit against the defendant; that the claimant is guilty of laches. Long delay in asserting his right under the patent may defeat the patentee's right of recovery. Under some circumstances laches is a complete defense.



Class "B" Gravel Road—This is a view of Class "B" gravel road at Eagle Grove in Wright county. Specifications require that this type of road be constructed on a standard cross-section, permanently graded earth road. It requires 800 cubic yards of gravel per mile for a 16' width of roadway. It is built by striking off the crown of the standard cross section earth road, using the dirt thus moved to form shoulders for the gravel. The gravel is placed in a single course, evenly distributed and allowed to pack by traffic.

Limiting Scope of Patents.

The claims of even a valid patent can sometimes be so limited and confined to such narrow operation that they do not include your structure, and that when so limited it will not interfere with engineering progress.

Thacher Litigation.

A brief history of the Thacher litigation is here given to show that an old patent might go down in defeat before the first real defense, even though it had been previously recognized as valid in suits where little or no defense was made. The first suit brought by Edwin Thacher was against Hendricks County, Indiana, wherein he secured a consent decree in October, 1914. The next suit was against Blair County, Pennsylvania, wherein he secured a consent decree on June 28, 1914. In May, 1914, a suit was instituted by Thacher against the City of Baltimore, Maryland. The city entered defense, but little was really done toward presenting the state of the prior art, and upon the record there was nothing the court could do but declare the patent valid and infringed, whereupon a decree was entered in favor of the complainant for five thousand dollars and costs.

The suit instituted in June, 1915, against the Transit Construction Company of New York, was successfully defended on the grounds of non-infringement and the complaint was dismissed by the court for this reason. In February, 1915, suit was started against the town of Falmouth, Maine, which suit was successfully defended, and on June 27, 1916, Judge Hale, of the United States District Court of Maryland, declared the Thacher patent invalid.

Thacher Patent in Iowa.

In July, 1915, Thacher sued Polk County, Iowa, alleging that some forty bridges infringed. Our department has defended the case which was submitted June 25, 1916, and the court has just decided (Sept. 17, 1916), that the patent was invalid; that the bridges did not infringe, and that the patentee had been guilty of laches. The decision is well rendered, sweeping, and reads in part as follows:

"So that in my view, the patent to plaintiff is invalid because anticipated by the von Emperger patent. Under this construction of the plaintiff's patent, even if it were valid, there was no infringement in this case. * * * I am also of the opinion that the plaintiff is estopped by laches from asserting any such construction of his patent as would bring the structure involved in this case within its meaning."

Following the decision Judge Wade recently dismissed complainant's petition in the case of Thacher vs. City of Des Moines, Iowa. Decided October 10, 1916.

Bone Litigation.

The fact that the courts may have declared a certain patent valid is not necessarily conclusive as to the public's right to use said patent, as is shown from the Bone litigation. Frank A. Bone, owner of patent

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Wavy Gravel Road—This condition was due to faulty construction together with lack of proper maintenance. Such a road is decidedly unpleasant for travel. It was repaired by scarifying and reshaping.

No. 705,782, has collected some large royalties on his patented retaining wall and his patent was declared valid in the case of Bone vs. City of Denver (1915) and in the case of Bone vs. City of Akron (Ohio), which decision was afterward affirmed in the Court of Appeals (221 Fed. 944), but later (January 26, 1916) it was declared invalid by Judge Albert B. Anderson in the case of Bone vs. Marion County (Ind.) In his oral opinion, Judge Anderson said that at the outset of the case he expected to follow the Akron decision, but that during the course of the trial, he had become convinced that the decision to that case was based on a wrong foundation; that surely the court did know the state of the prior art; that, in his judgment, based on the record in the case before him, Bone was not the first to reinforce the retaining wall in such a manner that the weight of the retained material would be utilized to impart tensile resistance through the reinforced members; that he (Bone) was not the first to conceive the idea of a retaining wall which was so shaped and constructed that the weight of the earth on the heel of the wall could withstand the pressure of the dirt on the wall. During his comments he said:

"Then he (the patentee) says further:

'The object (stability with reduced volume) is further accomplished by the peculiar shape of the cross-section of the wall allowable.'

Of course that is true, anybody could see that. Any boy who worked with mud could see that if you made the top of a wall three feet thick and the bottom two feet thick, it would not be as strong as if the proportions were reversed. So a man cannot predicate invention upon the peculiar shape of the cross-section of the wall."

Judge Anderson dismissed the bill for want of equity.

Bone Case in Iowa.

The Governor of Iowa directed the Department of Justice to assist in the defense of the suit of Bone vs. Walsh Construction Company then (January, 1916) pending in the U. S. District Court at Davenport, Iowa, which it did. When the case came on for trial in April, 1916, the case was dismissed by the complainant.

Many Invalid Patents.

What has been said on the preceding pages ought to be sufficient to indicate that many of these patents on reinforced concrete bridges are invalid, and that they will be so declared by the courts if the defenses are well prepared and presented and the court is fully advised as to the early state of the art.

Several States Active.

Just now the attorneys general of Kansas, of Oklahoma, of Nebraska, and of Iowa, are defending suits in the federal courts involving the invalidity of alleged patents on reinforced concrete bridges. Kansas is seeking by motion to have the court declare certain Luten patents void upon their face, it being their contention that the court has judicial knowledge and notice of all facts necessary to enable the court to determine, without evidence, that the patents involved, at most, express simply the result of some degree of mechanical skill, which is not the proper subject of a patent. Iowa is defending a case involving the validity of four of the Luten patents and is defending not only on the ground that the patents are void because of want of invention, but also because of want of novelty, and have produced a voluminous record showing prior knowledge, prior publication, prior patents, prior use, etc.

When Royalties Are Payable.

I believe in the justice and value to the public of the patent laws of this country, and would not take from any one holding a valid patent any right to which he is entitled under the patent laws of the country, but I do not believe that the tax-paying public throughout the country should be called upon to pay royalties on patents if they are void, or if, in fact, the devices used by the public do not infringe those protected by the patent.

If such royalties are ever to be paid out of public funds, it should only be after the right owner of said patent to said royalty has been determined in some court of competent jurirsdiction, and after a full hearing has been had upon the merits of the case."

Chapter V Administrative Department 1916

The personnel of the Commission for the past year consisted of J. W. Holden of Scranton, Chairman, H. C. Beard of Mt. Ayr, and A. Marston, Dean of Engineering of the Iowa State College. The two commissioners first named held their office through appointment by the Governor of the state, the term of the appointment being for four years. Commissioner Marston holds his membership ex-officio.

The function of the three commissioners is not to perform the detailed engineering and routine duties for which the organization was established, but to act in the capacity of a governing board or board of directors, to determine questions of policy, to hire and develop into a working organization a staff of engineers and assistants, and in general to perform such functions as fall naturally to the governing board of any large business organization. This is the plan in general use for administering many of the most important public as well as private organizations. All of the educational institutions of Iowa are administered in this manner, and it is the

plan in universal use for directing banking and commercial corporations.

The force under the Commission is at present organized into four general departments, the Administrative, the Bridge, the Road, and the Department of Drainage Investigation.

Under the Administrative Department is handled all the general organization duties, all publications, all accounting, tests and experimental work, and patent investigations. The general office work is all handled under this Department.

Scarifier Attachment on Blade Grader—This type of machine does very efficient work. The view shows the scarifier in action on the wavy road shown on a previous page.

The Road Department handles all the road contracts, plans, profiles, complaints, roads at state institutions, and special road work. The district engineers report all road matters to this Department.

The Bridge Department handles all bridge plans, all bridge designs, and all railroad crossing projects. The district engineers report all bridge matters to this Department.

The drafting organization is in charge of a chief draftsman, who in general reports to both the Road and the Bridge Departments. In addition to the road, bridge, and ordinary miscellaneous plans, this organization has prepared during 1916 all the lake survey maps, a large undertaking in itself.

The Department of Drainage Investigation has had charge of the lake survey work, but was originally formed to make measurements of stream flows for determining the necessary sizes of bridges, culverts, and tile for drainage in road improvement.

District Engineers.

Each district engineer has about twenty counties under his immediate direction, and the entire time of each district man is spent in consultation with county engineers, boards of supervisors, and township trustees in the counties under his jurisdiction. The Commission endeavors to have the district engineer present at each bridge or road letting. A report is immediately filed with the Commission by the district engineer, of the prices obtained at the lettings, and of all matters taken up with the board or engineer on each trip to the county. The Commission is thus enabled to keep in touch with prices which are being obtained on all classes of road and bridge material and construction in every county in the state. These prices are published at regular intervals in the Service Bulletin.

Road School.

On February 1st, 2nd, and 3rd, 1916, the Commission held its third annual road school and county engineers' convention at Ames, at which the county engineers were requested to be present. At this conference the engineers of the Commission took up the plans and specifications as revised for the year's work, and discussed them in detail.

The first day was given over to the discussion of road problems, the second day to the discussion of bridge problems, and the third day to problems affecting both. Lectures were given by engineers connected with the road work in other state departments, including Rodney Bell, Division Engineer of the Illinois Highway Commission, and W. S. Gearhart, State Engineer of Kansas. Professor T. R. Agg, J. S. Coye, and R. W. Crum of the Engineering Experiment Station of the Iowa State College, assisted on the program. County Engineers Chapman of Cherokee, Fishel of Crawford

County, Barber of Clay County, Dunn of Hardin County, Turlay of Dubuque County, Malloy of Scott County, Kerrigan of O'Brien County, Maxwell of Sac County, Price of Marion County, Lemkuhl of Adair County, Tourtellot of Clayton County, and McCullough of Buena Vista County, led discussions or prepared papers on the different topics. Bridge patents were discussed by H. E. Sampson of the Department of Justice, and instructions on the proper methods of accounting were given by J. F. Wall of the County Accounting Department of the State Auditor's office.

Gravel Humps on a Wavy Road Loosened by Scarifier—This view shows the wavy gravel road after the first passage of the scarifier. Successive passages tear up and loosen the whole surface of the road. The scarifier blade is then removed, the grader blade replaced and the loosened gravel reshaped. While the gravel is being repacked by traffic it is necessary frequently to reshape the surface to preserve the crown.

There were ninety-three county engineers and assistant engineers, seven supervisors, and one trustee, in attendance at this school, as well as a number of others who were not public officials.

The programs have in general been prepared entirely for the instruction of the county engineers. The supervisors who have been present, however, have been so interested that in following road schools the Commission expects to invite the supervisors to attend and take part in the discussions.

The purpose of these conferences is two-fold; the first to engender enthusiasm and to impress the significance of the responsibility that rests upon the county engineers and their work in the county; the second to bring out the latest and best methods developed in any counties of the state and other states and to make these generally available to all the counties.

County Engineers.

On February 21st, the Commission, after careful consideration of the engineering work in Lynn and Mills Counties requested the boards of supervisors of these counties to make other arrangements for carrying on their engineering work in the future.

On October 19th, the Commission approved and concurred in the action of the board of supervisors of Dickinson County, making a change in the office of county engineer of that county.

Appointments of Commissioners.

The Commission and members of the force have attended one hundred and sixty-four road meetings in eighty counties, and the Commissioners with the Chief Engineer have spent a total of one hundred sixty-one days in forty-seven counties on inspections and in consultation with highway officers. The Commissioners have also filled forty-six other appointments which occupied ninety-eight days' time. The appointments included patent litigation conferences, lake bed inspection trips, and attendance at national road meetings.

Official Communications.

During the year a number of official communications were sent to county engineers, auditors, supervisors, and township clerks. Occasions frequently arise necessitating the distribution of specific information to a certain class of officials. Such information can best be distributed by sending a communication to all officers affected thereby.

Contract Approval.

All contracts for road and bridge construction or for materials, after being checked by the road or bridge engineer, are referred to the Chief Highway Engineer and to the Commission for approval, and when finally approved, are entered on the minutes of the Commission.

Accounting.

The accounting work of the Commission is divided as follows:

Bills for salaries and expenses of the Highway Commission proper.

Bills for expenses in connection with the lake bed surveys.

Bills for construction and maintenance of state roads at the various institutions.

All bills originating in the first two classes are checked and approved by the Commission and then passed to the State Board of

Audit. Bills originating in the third class are approved by the engineers in charge of the work, then approved by the Supervisor of State Roads, who is the Chief Highway Engineer of the Commission, and then forwarded to the Board of Control of State Institutions. When the bills are approved by the Board of Audit and the Board of Control, they are passed to the Auditor of State for payment. Warrants issued in payment of the above named claims are sent to the Commission for distribution.

Records showing the classification of all bills audited as above described are kept in the office of the Commission. The accounting in connection with the bills for state road work is greater than on the Commission accounts proper and the lake survey work combined.

General Correspondence.

The amount of correspondence coming to the Commission has become quite voluminous. The varied lines of activity which have become a recognized part of the Commission's work have naturally greatly increased both the correspondence which originates within and that which originates outside the Commission office.

The correspondence may be divided into the following classes:

With county and township officials:
- In designing and approving plans for both road and bridge work.
- In approving contracts.
- Answering inquiries relative to accounting for county and township funds.

With other State Departments and members of the Legislature:
- In performing the duties imposed by law.
- In answering general inquiries.

With Federal Department of Public Roads and with the Highway Departments of other states:
- In a general exchange of information.
- In answering to inquiries pertaining to specific projects.

With Road and Bridge Contractors:
- In giving notice of lettings.
- In regard to specific improvements and contract approval.
- In regard to standards of material and construction.

With Railroad Officials:
- In regard to grade crossing improvements.

With General Public:
- In answering general inquiries for information.
- In answering complaints as to condition of roads and bridges or manner of administering local affairs.

Much of the general correspondence and nearly all inquiries involve the compilation of a great deal of statistical information. Practically all correspondence received by the Department is examined by the Chief Engineer and then referred to the various departments for attention.

Contracts and Purchase of Materials.

The road law provides that all materials the cost of which is one thousand dollars or above, must be advertised and open to bids. The Commission has provided a set of standard specifications to govern the quality of all materials which are used in any considerable quantity in road or bridge work. When bids are received, they are based upon these standard requirements, so that the quality furnished by all of the companies who bid is the same. Thus the bids are comparable, and, in general, all awards are made to the company which has the lowest bid. The Commission has held very firmly to the policy of requiring the contracts to be let to the low bidder, unless previous experience on the part of the county has shown the low bidder to be unreliable in his dealings.

The Commission is of the opinion that the prices alone should not govern the awarding of contracts, if there is any reason to question either the responsibility of the company or the service which is to be rendered. The use of single standards for materials, reaching every county in the state has had a great influence in improving the quality of materials shipped into Iowa. It is difficult to estimate how much has been saved to the taxpayers by the detailed specifications and careful inspection under which all materials are purchased.

Corrugated metal culvert specifications developed by this Commission, organized the selling of culverts in this state from a most chaotic condition to a well ordered standardized method. These specifications have been adopted as standards by other states and, in effect, by the manufacturers themselves. The principle of competitive bidding has conserved to the public all the advantages arising from competition on the part of the manufacturers, and the counties have organized their buying in such a manner that large contracts are placed, thus securing the lowest possible prices.

The commission must pass on all bridge contracts for structures costing $2000 or more, but in addition many of the counties send in all of their contracts for inspection and approval by the Commission. The approval of such contracts by the Commission includes the checking of the prices to see if these are in accord with the prevailing prices for the quality and quantity of material at the time, and if the prices are too high, the contract is not approved. The form of contract and the bond are also checked, and a full statement is entered on the records of the Commission.

Changes in County Road Systems.

Additions may be made to the county road systems under certain limitations, for the purpose of improving the service of the county road systems to the public. During the past year thirty-seven counties have made sixty-eight separate requests for changes in the county road systems, which have been investigated by the Commission through the Road Department or by the Commissioners.

The Commission has acted favorably on fifty-five of these requests, and have added a total of 142.4 miles to the county road systems. The addition of these roads involved the removal of 18.5 miles, so that the net increase in the county road systems was 123.9 miles.

Bridge Patent Suits.

The Commissioners and engineers have assisted the Attorney General's Department during the past year in the preparation of evidence in the following patent suits:

Bone vs. Walsh Construction Company, Luten vs. Marsh Engineering Company and Thacher vs. Polk County. The fourth patent case, Thacher vs. City of Des Moines, was decided on the evidence submitted in the suit against Polk County.

Commissioner Marston appeared as expert witness for Polk County in Thacher vs. Polk County, which involved a considerable amount of preparation and study of the prior art in reinforced bridge construction.

State Fair Exhibit.

In response to the invitation of the State Board of Agriculture, the Commission again exhibited examples of standard road and bridge construction at the State Fair in 1916.

In addition to the features introduced in 1915 and shown again in 1916, an exhibit of bridge models was presented. These models were built by the Commission and used in the bridge patent litigation conducted by the Attorney General's Office. The models illustrate patented methods of construction and the prior art. Models were also shown illustrating the type of construction used in Polk and other counties under the plans of the State Highway Commission. These designs were involved in the patent litigation. These models are now in the Historical Building.

The exhibit attracted more than ordinary attention. Opportunity is given at such an exhibit to disseminate much information of

Iowa's Newly Purchased Rock Quarry.—This photograph shows the outcropping quartzite on the land purchased for a quarry site by the Board of Control, near Granite, Iowa, in Lyon county. This is the only outcropping of this material yet found in the State of Iowa. All the material of this character which has been used heretofore in Iowa has been shipped from quarries in South Dakota, Minnesota and Wisconsin. Quartzite is very hard and dense. Geologically it is metamorphosed sand stone. It has been extensively and successfully used for concrete roads and streets in and near Sioux City. A rock crushing plant is at present being installed in which convicts will be employed in crushing up the rock for road material for the use of the various Iowa counties.

a technical nature to road officials. This knowledge cannot be imparted as thoroughly by means of bulletins as it can when the object under discussion can be touched and seen while it is being described. The gravel road section seemed to receive the most attention from visitors.

Publications.

Ten issues of the Service Bulletin were published during the year 1916; January-February and May-June numbers being combined in single issues. During the year there has been a constant increase in the number of articles reprinted from the Bulletin in the newspapers and magazines. This increase has been particularly noticeable in the columns of popular magazines, technical and semi-technical publications outside the state. This is an indication that what Iowa is doing, the methods she is using and the progress she is making in her road and bridge building, is being given more consideration outside the state.

There has also been a decided increase in the number of requests for special articles on Iowa's work, with illustrations, both for Iowa publication and outside the state. Material has been regularly supplied to the weekly Iowa State College publication, Better Iowa, Greater Iowa, published by the State Department of Agriculture and the various publications of the Greater Iowa Association.

During the year there have been issued the following technical publications:

Classification of Road Work and Expenditures. (Supplement to Vol. IV, No. 1.)
Standard Specifications for Corrugated Metal Culvert Pipes. (Supplement to Vol. V, No. 1.)
Standard Specifications for Highway Bridge Construction. (Supplement to Vol. IV, Nos. 1-2.)
Standard Specifications for Bridge, Lumber and Piling. (Supp. to Vol. IV, Nos. 1-2.)
An Investigation of Concrete Roadways.
Instructions relative to making out Township blanks and reports.
Concrete Box Culverts, Slab Bridges, Deck Girder Bridges (C, J, H Series).
Beam Spans, Low Riveted Truss Spans (V and X Series).

Photographs.

There are now in the photographic files of the Commission approximately 4,000 negatives. These negatives illustrate road and bridge work in almost every county in the state. They illustrate all phases of road and bridge building in both good and poor construction. The negatives are in constant use for the making of prints, cuts, enlarged views and lantern slides for use in publications and in road schools, lectures and exhibitions. Technical publications from other states are making frequent requests for views illustrating Iowa roads, bridges, methods and special constructive features.

The Commission now has about 600 copper half-tone cuts and zinc etchings. These have been used in the Service Bulletin, the special publications and the technical bulletins. Special sets from this list of cuts have been in constant use by daily and weekly newspapers, trade journals, automobile and good roads magazines. This has been especially true of the cuts showing the details of gravel road building and the oiling of both gravel and dirt roads. There has been a steady call for them from almost every community where such work is in contemplation. The cuts are supplied free of charge to the various publications requesting them, in the order the requests are received.

Conference with Corrugated Culvert Manufacturers.

In accordance with the request of Mr. G. A. Wrightman, Secretary of the Iowa Manufacturers' Association, the Commission held a conference with the representatives of the corrugated culvert manufacturers of the state, on December 22d, at which representatives of nine of the manufacturers selling their products in this state were present, together with the Secretary of the Iowa Manufacturers' Association, Mr. Wrightman, and the Secretary of the Metal Culverts Manufacturers' Association, Mr. Dowler.

The manufacturers stated that their purpose in requesting such a conference was to go over the proposed specifications for corrugated metal pipe, with the Commission, with the idea in mind of standardizing these specifications for all of the manufacturers handling this pipe.

The tentative specifications were read clause by clause, and the manufacturers given an opportunity to discuss such points as they might wish.

At the close of the conference specifications were approved by the Commission as standard, and ordered printed and distributed for use in the state.

Registration of Highway Routes.

Under Section 1527-S22, Supplement to the Code 1913, the Commission is authorized to register highway routes which are promoted by voluntary organizations, and issue certificates protecting the names and the markers used by the associations.

The registration of the names and the markers has a similar effect under this act to a copyright on a publication. No other person or association may use the names or color markings which have been registered.

There have been eighteen routes registered by the Commission, as follows:

Great White Way—Davenport to Council Bluffs—white band six inches wide with words "Great White Way" thereon.

Green Crescent—Cedar Rapids to Marshalltown—green crescent on white background.

Center Point Motor Club—Cedar Rapids, Iowa, to St. Paul, Minnesota—black cross on white background.

Red Ball Route—St. Paul, Minn., to St. Louis, Mo.—red ball on white background.

King's Highway—Davenport to Cedar Rapids—red star on white field, trimmed above and below with red.

Southwest Trails—Kansas City, Mo., to Chicago, Ill.—letters S. W. in black on white background.

Waubonsie Trail—Nebraska City, Neb., to Keokuk, Iowa—white band with black border.

Chariton and Leon Short Line—Chariton to Leon—white band two feet wide.

John D. Parmalee Trail—Pleasantville to Des Moines—black band on white background, combined with crimson arrow.

Capitol Highway—Des Moines to Lineville—blue band one foot wide.

Red Line—Missouri state line to Villisca, Iowa—dark red band on white background 2½ feet wide, with words "Red Line" stenciled on poles.

Farmers Highway—Exira to Greenfield—20-inch yellow band with 6-inch red band at top and bottom.

Black Hawk Trail—Davenport and return—diamond formed marker on white pole with words "Black Hawk Trail."

Jefferson Highway—Winnipeg, Man., Canada, to New Orleans, La.—12-inch band of white with 6-inch band of blue above and below.

Hamlin Short Route—Elkhorn to Guthrie Center—letter H in red, white and blue on orange background.

Hawkeye Cut-Off—Sioux City to Ft. Dodge—letters H and C in black on white background.

Black Diamond Trail—Cedar Falls to Marshalltown—solid black diamond on white background.

Lincoln Highway, Iowa Division—Clinton to Council Bluffs—white background with red band above and blue band below and letter L on white background.

Clermont Concrete Arch Bridge—A flood June 1, 1916, swept away the light steel truss which spanned Dibble Creek in the edge of the town of Clermont, Fayette county. The old truss and abutments were completely destroyed. Notes were secured for a new design and plans prepared by the Commission. The contract for the new bridge was awarded June 22d, the contract price being $2,000 for the 60' arch. Bridge was completed September 25, 1916.

Chapter VI Bridge Department

DECEMBER 1, 1915—DECEMBER 1, 1916.

During the period of one year as covered by this report, the bridge department prepared detailed plans for 472 bridges for sixty-eight counties, estimated to cost $1,511,000; approved 288 designs submitted from forty-three counties, the estimated cost of which was $582,000; checked and approved 176 detailed shop drawings for steel structures from fifty-four counties on work estimated at $324,000; checked for approval 208 bridge contracts totaling $2,070,800, from eighty counties; approved sixty-eight material contracts from thirty-seven counties; developed thirteen new standard designs for bridges; made seventy-nine special inspection trips to thirty-four counties; adjusted twenty-nine complaints on bridge work from twenty-one counties.

The district engineers representing the bridge department have attended 139 bridge lettings in eighty-four counties on advertised work, totalling $2,322,400; attended eighty-seven material lettings in sixty-six counties; spent eighty-four days in examining bridge sites; spent 163 days in supervising and inspecting bridge work, and twelve days in certifying to emergency work.

In addition to the above, this department has handled all of the field and office work on the preparation and checking of plans and estimates for railroad crossing improvements, and attended a number of conferences on this work. A detailed statement of the crossing work appears in Chapter Nine. The tabulation given below shows the summary and comparative statements of the detailed work of this department during 1915 and 1916, exclusive of the work done on crossing improvements.

SUMMARY AND COMPARATIVE STATEMENT OF THE DETAILED WORK OF THE BRIDGE DEPARTMENT ON BRIDGES AND CULVERTS, 1915-1916.

		1915	1916
Bridge designs	No. of designs	459	472
	No. of counties	76	68
	Estimated value	$1,182,000	$1,511,000
Approval of bridge plans	No. approved	288	288
	No. of counties	47	43
	Estimated value	$ 366,000	$ 582,000
Approval of shop drawings	No. approved	180	176
	No. of counties	66	54
	Estimated value of steel work involved	$ 241,000	$ 324,000
Approval of bridge contracts	No. approved	172	208
	No. of counties	81	80
	Total amount approved	$1,337,069	$2,043,393
Approval of material contracts	No. approved	49	68
	No. of counties	31	37
Bridge lettings attended	No. of lettings	140	139
	No. of bridges	2,140	2,301
	Estimated amount bridge work included	$1,679,000	$2,322,400
No. of material lettings attended		84	87
No. of inspection trips		73	79

Since the law went into effect in April, 1913, the engineers of the bridge department have designed, checked, or approved 3146 detailed individual plans for specific bridges, with a total estimated cost above $7,000,000; checked and reported for approval 554 bridge contracts, with a total contract price of $4,445,000; prepared detailed railroad crossing plans on work estimated at $561,000; approved 107 material contracts; attended 279 bridge lettings on advertised bridge work estimated above $4,000,000, and attended 163 material lettings.

Bridge Designs for Specific Locations.

The Commission through the bridge department offers technical designing service on important structures to all the counties of the state, without cost. Important bridges or structures requiring special designs may be sent to the Commission where designs will be prepared by the department and the detailed drawings furnished to the counties. An accompanying chart shows the relative amounts of the various types designed during 1915 and 1916.

Since the road law was enacted in 1913 the bridge department has prepared 1,760 designs for specific locations, which have an estimated cost of $4,429,900. The average estimated cost of the structures designed during 1916 is $3,200.

Among the designs prepared for specific locations in 1916 were several important structures. The Main Street Bridge over the

Wapsipinicon River in the City of Independence, Buchanan County, consisting of three 80-ft. concrete arch spans, carrying a 42-ft. roadway and two 6-ft. sidewalks, was let by contract for $38,777.00. The Rose Hill bridge over Skunk River in Mahaska County consists of a 150 ft.x18 ft. riveted steel truss on concrete substructure and including 520 lineal feet of I-beam approach spans. The main span carries a creosoted wood block floor. The contract price on the bridge complete was $21,700.00. The Nora Springs bridge over the Shell Rock River in the town of Nora Springs in Floyd County

TOTAL LENGTH OF SPAN OF IOWA BRIDGES AND CULVERTS.

In 1916 Iowa counties constructed bridges and culverts totalling 22897 feet in length of span. In 1916 the total length of span of all bridges and culverts built was 21,301, or a difference in favor of 1915 of approximately 600 feet. The steel span with a total of approximately 12,000 feet, each year, is the most popular type of Iowa bridge.

was designed in 1916. The bridge consists of two 70-ft. concrete arch spans with a 26-ft. roadway and 5-ft. sidewalk. The contract price was $12,700.00.

A three-span riveted truss bridge was designed by the Commission for Jefferson County in 1916. This bridge is known as the Merrimac Bridge and is placed over the Skunk River at Merrimac. The superstructure consists of three 124-ft. x 18-ft. riveted steel spans. This work was let by contract for $19,999.00.

Under Schedule Number One is given a detailed statement of the bridge designs prepared for specific locations in 1916. (Refer to Schedule Number One.)

Approval and Analysis of Designs Submitted.

The amount of work necessary to check and approve a design submitted for analysis depends very largely upon the importance of the structure, the completeness of the design, and the type of structure. On the small type of structure which follow closely the standards of the Commission, the detailed work of checking the design is accomplished with a comparatively small amount of work. On important structures and particularly bridges of the arch type the mathematical analysis and field inspections necessary require considerable time before final approval can be made. In many

Site of the Clermont Arch—This photograph shows all that was left of the pony truss which formerly occupied the present site of the Clermont arch shown in a previous picture. Every particle of the old bridge was washed away, including even the abutments.

cases during the past year it has been necessary to completely redesign the structure in order to secure a more economical design than the one submitted.

On steel structures the detailed plans for the steel work are checked and approved before the work is fabricated in the bridge shop.

Since April, 1913, the bridge department has checked 1,082 designs submitted, which were estimated at $1,620,000. In addition to the above, during the same period of time, a total of 304 shop drawings were checked on work estimated at $955,000. Under Schedule Number Two, not printed, is given a detailed statement of the designs and shop drawings submitted for approval during 1916.

Standard Plans.

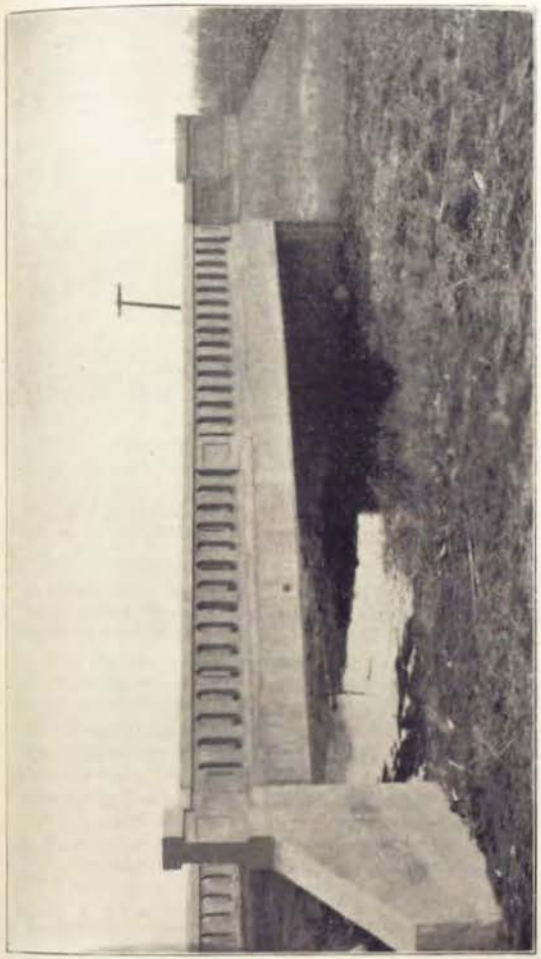
During the current year a total of thirteen new standard designs have been completed and considerable work has been done toward revising the present abutment standards.

The complete list of bridge standards in use at the present date is as follows:

Series C—Concrete box culverts for spans from 2' to 12'. 22 sheets of designs and one estimate sheet.
Series J—Concrete slab bridges for spans from 14' to 24'. One design sheet.
Series H—Concrete deck girder bridges for spans from 24' to 40'. Two design sheets.
Series C, J, and H are published together in booklet form.
Series X—Steel pony truss spans without joists from 35' to 100' with 16' and 18' roadways. 28 sheets of designs.
Series V—I-beam spans. Four sheets of designs.
V-1. Beam spans with concrete floor and angle railing.
V-2. Beam spans with wood floor and pile abutments.
V-3. Beam spans with concrete floor and concrete railing.
V-4. Beam spans with concrete floor and gas pipe railing.
Series X and V are published together in booklet form.
Series M—Concrete bridge piers.
Series D—Circular concrete culverts from 18" to 42" in diameter. Four sheets of designs and four sheets of estimates.
Series E—Metal culverts. One sheet.
Series F—Concrete pipe culverts. One sheet.
Series I—Concrete through girder bridges for spans from 24' to 40'. Nine sheets.
Series Y—Steel pony truss spans with joists for spans from 35' to 85' and 16' and 18' roadways. 22 sheets of designs, not complete. Designs completed for 40x16, 45x16, 45x18, 50x16, 55x16, 60x16, 60x18, 65x16, 65x18, 70x16, 75x16, 80x16 ft. spans.
Series T—Through riveted truss spans for spans from 90' to 150' with 16' and 18' roadways. 14 sheets of designs, not complete. Designs completed for 90x16, 90x18, 100x16, 100x18, 110x16, 110x18, 120x16, 120x18, 130x18, 140x16, and 140x18 ft. spans.
Series G—Timber and timber and steel construction. Three sheet of designs.
G-1. Pile trestle.
G-2. Pile abutments for steel bridges.
G-3. Creosoted pile trestle with steel joists.
Series K—Concrete abutments for heights of 10' to 18'. Three sheets of designs.
K-1. Typical details for abutments of steel truss spans.
K-2. Typical details for abutments of slab and girder bridges.
K-3. Dimension diagram and data sheet for all abutments.

Experience has shown that the above abutment standards are in some need of revision and during the past year a considerable amount of work has been done toward this end. During the past year the Commission has made one important change in the abutment designs, which change is not yet shown on any of the standards. This is the width of bridge seat for steel truss spans which is now being made 2'0" instead of 1'3", as shown on the standard plans.

It is anticipated that the revised plans will cover abutments for all of the standard types of superstructures for heights up to 30



Concrete I-Beam Span—This bridge is a 32' I-Beam span on concrete abutments, carrying a concrete floor. The outer beams are encased in concrete to give the appearance of a concrete bridge. Standard plans covering this type of construction were issued by the Commission during 1915. This bridge is located in Section 36, Jefferson township, Fayette county. It was constructed by day labor at a cost of $2,490.60.

feet and that some modification will be made in the system of reinforcing.

Standard Specifications.

The Commission has in the past issued standard specifications covering the following bridge or culvert construction:

Highway bridge and culvert construction.
Reinforcing steel.
Bridge lumber and piling.
Corrugated culverts.

During 1916 the standard specifications on Highway Bridge and Culvert Construction were completely revised and will be issued January 1, 1917, to cover all bridge and culvert work constructed in the state during the coming year.

Trips by Members of Bridge Department.

The department has made a number of inspection trips during the year at the requests of the counties. These inspections were made in a number of cases to determine the advisability of placing creosote wood block floors on light steel spans carrying heavy traffic. Field inspections were made during the year, of the general construction work secured on several of the larger steel spans erected in the state. The total number of inspections made during 1918 was seventy-nine, which is an increase of six over the number made during 1915.

Bridge Complaints.

Specific complaints on twenty-nine bridges and culverts were investigated during the year. In every case a complete report covering the conditions complained of was secured. In most cases it was found that the complaint was occasioned by a failure on the part of the person filing the complaint to notify the proper county or township officials before taking the matter up with the Commission. In every case where an inspection of the bridge or culvert disclosed the fact that the complaint was justified, proper steps were taken promptly to remedy the conditions complained of. It should be noted that the number of complaints on bridge and culvert work show a marked decrease during the past year. In 1915 a total of ninety-two complaints were filed with the Commission, while in 1916 only twenty-nine were received.

Approval of Contracts on Bridge Work.

The approval of contracts on bridge work is one of the most important duties of this department. During 1916 a total of 208 bridge contracts were submitted for approval. The total contract price of these contracts is $2,070,867.47. The tabulation below gives a summary and comparative statement of the bridge contract approval from April, 1913, to December 1, 1916.

Date of Report	Number submitted	Amount approved
Apr. 1, 1913-Dec. 1, 1913	53	$ 344,162.24
Dec. 1, 1913-Nov. 1, 1914	121	731,209.58
Nov. 1, 1914-Dec. 1, 1915	172	1,337,069.15
Dec. 1, 1915-Dec. 1, 1916	208	2,043,393.47
Total	554	$4,445,830.44

The above table shows a marked increase each year in the number of contracts approved as well as an increase in the average amount included in each contract submitted. The average contract price on contracts submitted during the period from April, 1913, to December 1, 1915, was $7,774.00. During 1915 the average was $7,830.00, and for 1916 this amount increased to $9,950.00, or 27%. Since April, 1913, a total of 554 bridge contracts have been submitted to the Commission for approval, with a total contract price of $4,445,000.00.

Schedule Number Three shows in detail the contracts which were submitted for approval for the period from December 1, 1915, to December 1, 1916. (Refer to Schedule Three.)

Approval of Contracts for Materials.

During 1916 a very marked improvement has been noted in the general form of the material contracts submitted for approval. During previous years the Commission has experienced considerable difficulty in securing sufficient information on the contract forms before they were sent in to this office. This year practically all of the contracts were in a form which contained sufficient information to enable their being considered for approval without the necessity of securing additional information from the counties. The insistence of the Commission that all contracts shall contain definite clauses relating to the amount and character of material to be purchased, and the furnishing of standard forms for contracts to the counties, have both operated to greatly improve the general nature of the contracts covering the purchase of material. The fact that there has been very little delay in the approval of material contracts this year is largely due to the improvement in the contract forms as mentioned above. During 1916, thirty-seven counties submitted a total of sixty-eight material contracts for approval.

This is an increase of 39% over the number submitted during 1915. Schedule Number Four gives a detailed statement of the material contracts submitted for approval in 1916. (Refer to Schedule Number Four.)

General Field Work in Connection with Bridge Department.

A large part of the detailed field work of this department is handled by the district engineers. This field work consists of assistance given at the request of the counties for determining the type and character of drainage structures, certification of emergency bridge work, inspection of work under construction, adjustments of differences arising between the contractors and counties, interpretation of the specifications, and general advice pertaining to bridge and culvert construction and repairs.

During 1916 the district engineers of the Commission spent a total of eighty-four days in examining bridge sites, 138 days in attending bridge lettings, seventy-nine days in attending material lettings, 163 days in supervision and inspection of bridge work, and twelve days on examination and certification of emergency work. The following tabulated statement shows in summary and comparative form the work of the district engineers on bridge work during 1915 and 1916.

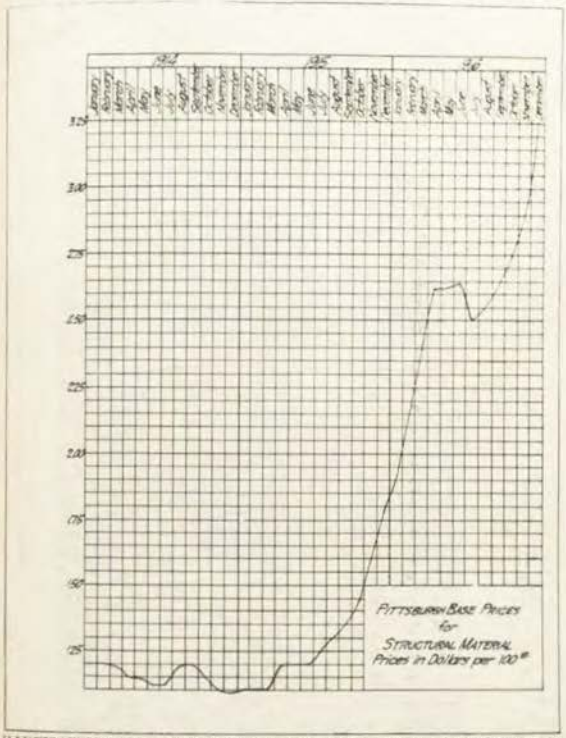
	Total Number of Days	
	1915	1916
Examination of bridge sites	146	84
Attending bridge lettings	155	138
Attending material lettings	84	79
Supervision and inspection bridge work	341	163
Emergency bridge work	33	12
Total	759	476

Road and Material Lettings.

The estimated amount of bridge work included in lettings attended during 1916 was $2,322,400, or an increase of $643,400 over 1915. Complete reports of the estimates in each of the 2,301 structures advertised, including bids received and awards made for both bridge and material lettings attended, are on file in this office. The total number of bridge lettings attended during 1916 was 139, and the total material lettings attended was eighty-seven.

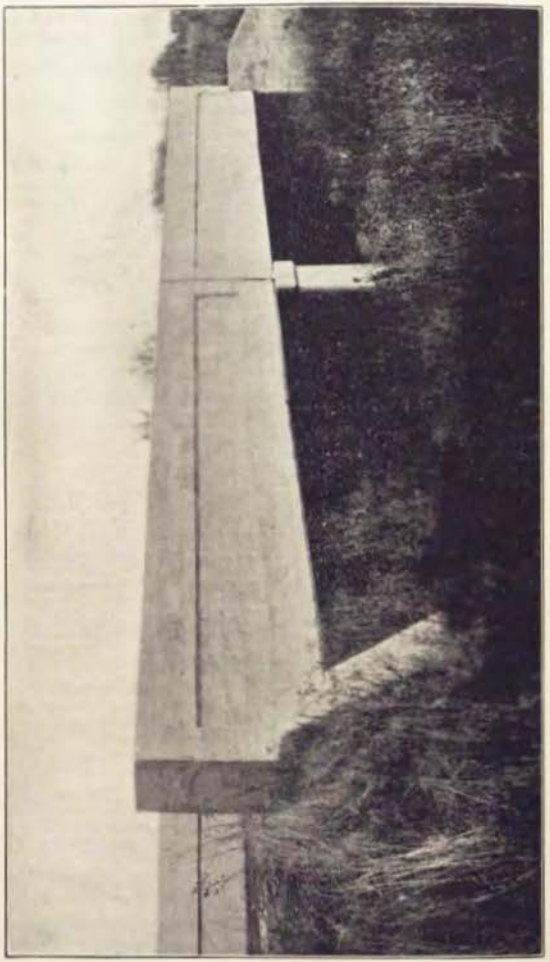
Practically all of the counties advertised for their material requirements for 1916, and many of the counties held two or three lettings throughout the year to cover their requirements. Due to the steadily advancing prices on all materials throughout the year, the counties that were able to hold material lettings early in 1916 profited greatly by the prices secured at that time. Some idea of

the phenomenal advance in the price of construction materials can be gained by a study of the accompanying curve. This curve is plotted to show the base price of structural steel for each month in



ILLUSTRATING INCREASE IN PRICE OF STRUCTURAL STEEL FOR HIGHWAYS.
In December, 1914, structural steel for highway bridges reached the remarkably low price of $1.07 per cwt. By December, 1915, the price had advanced to $1.80 per cwt. By December, 1916, the price had soared to $3.25, with material hard to get even at these prices. This is an increase of more than 200 per cent during the two years of 1915 and 1916.

the years of 1914, 1915 and 1916. In December, 1914, steel reached the remarkably low base price of 1.07 per cwt. During 1915 the



Concrete Through Girder Bridge—Photograph of a typical two-span reinforced concrete through girder bridge. This type of construction is useful on short spans that require a maximum amount of waterway with a limited head room. This bridge is designed to carry the Highway Commission's standard loading of a 15-ton traction engine.

price advanced from $1.10 base on January 1 to $1.80 base on December 30th. This is an increase during the year of 63.6%. During 1916 the advance in price of this material was from $1.80 on January 1st to 3.25 in December, or a yearly increase of 80.6%. The total increase in the base price of structural steel since January 1st, 1915, has been practically 200%.

SCHEDULE ONE—BRIDGE DESIGNS FOR SPECIFIC LOCATIONS

County	Number of Designs	Estimated Cost of Structures Designed	Cost of Engineering in Designing Department
Adair	2	$ 20,100.00	$ 106.11
Allamakee	3	53,907.00	60.16
Appanoose	6	21,372.00	44.41
Benton	1	4,568.00	9.23
Boone	5	19,285.00	157.60
Bremer	1	27,220.00	207.34
Buchanan	1	41,532.00	306.88
Buena Vista	2	6,972.00	12.38
Butler	3	10,964.00	90.95
Calhoun	2	4,960.00	19.54
Cass	7	24,891.00	179.44
Cerro Gordo	4	21,613.00	213.25
Cherokee	1	1,580.00	7.12
Chickasaw	25	50,951.00	226.76
Clay	25	59,250.00	89.04
Clayton	4	12,169.00	41.21
Clinton	1	1,751.00	28.11
Crawford	2	11,825.00	21.19
Dallas	2	12,861.00	44.91
Davis	4	18,654.00	38.77
Delaware	5	14,585.00	35.01
Des Moines	....	.....	*9.62
Dickinson	12	29,819.00	74.83
Dubuque	6	9,923.00	47.11
Emmet	1	9,207.00	13.34
Fayette	2	5,944.00	33.67
Floyd	6	35,478.00	273.29
Franklin	4	15,515.00	89.14
Greene	9	18,491.00	60.14
Hancock	1	4,202.00	5.78
Hardin	4	29,212.00	156.27
Harrison	13	109,047.00	760.43
Henry	83	50,835.00	295.96
Howard	7	14,514.00	57.26
Humboldt	14	31,718.00	110.57
Ida	5	11,435.00	51.65
Iowa	2	7,049.00	23.52
Jackson	1	1,038.00	4.06
Jasper	3	20,057.00	10.03
Jefferson	2	28,393.00	97.80
Kossuth	17	37,058.00	92.63
Lee	8	54,915.00	135.27
Linn	1	2,550.00	.95
Louisa	1	3,440.00	3.35
Lyon	4	30,224.00	71.29
Mahaska	8	40,460.00	234.42
Marshall	3	11,011.00	101.99
Mills	5	13,321.00	22.01
Monona	3	8,651.00	41.63
Monroe	1	2,007.00	6.79
Montgomery	....	.....	*2.41
O'Brien	6	18,648.00	70.82
Osceola	3	14,659.00	27.79
Page	1	3,106.00	293.01
Palo Alto	16	35,852.00	103.42
Plymouth	2	10,197.00	55.83

SCHEDULE ONE—BRIDGE DESIGNS FOR SPECIFIC LOCATIONS—Continued

County	Number of Designs	Estimated Cost of Structures Designed	Cost of Engineering in Designing Department
Pocahontas	9	30,790.00	94.76
Polk	1	3,963.00	8.27
Pottawattamie	...	...	*3.87
Poweshiek	9	24,746.00	134.20
Scott	1	2,160.00	8.05
Shelby	...	...	*.44
Sioux	3	14,621.00	34.79
Tama	24	77,317.00	232.19
Wapello	3	14,624.00	18.86
Warren	10	31,425.00	185.24
Wayne	3	4,885.00	12.41
Webster	12	33,244.00	172.95
Winnebago	5	10,844.00	18.29
Winneshiek	20	67,167.00	133.64
Worth	1	4,190.00	15.90
Wright	7	22,374.00	167.56
Totals	472	$1,511,096.00	$6,388.77

*Work done on plans which were later abandoned.

SCHEDULE THREE—BRIDGE CONTRACTS SUBMITTED FOR APPROVAL DECEMBER 1, 1915, TO DECEMBER 1, 1916.

County	Contractor	Date Approved	Amount Approved
Adair	Des Moines Br. & I. Wks.	July 14, 1916	$ 7,840.00
Allamakee	Worden-Allen	Aug. 11, 1916	40,695.00
Appanoose	B. S. Staley	April 6, 1916	19,770.91
Benton	Waterloo Const. Co.	April 12, 1916	12,601.00
	Waterloo Const. Co.	Oct. 30, 1916	1,394.00
	Waterloo Const. Co.	Oct. 30, 1916	2,692.00
	Waterloo Const. Co.	Oct. 30, 1916	2,410.00
	Waterloo Const. Co.	Nov. 2, 1916	6,325.00
Black Hawk	Waterloo Const. Co.	March 9, 1916	2,049.00
Boone	Thompson & Neese	June 17, 1916	2,014.00
	Pickus Eng. & Const. Co.	June 17, 1916	10,555.00
	Des Moines Br. & I. Wks.	Sept. 8, 1916	2,972.00
	Marsh & Brier	Nov. 1, 1916	11,726.00
Bremer	Thor Construction Co.	Feb. 14, 1916	6,998.00
	C. H. & J. H. Russell	Feb. 12, 1916	7,088.00
	Fred Bodecker	July 14, 1916	18,780.00
	Illinois Steel Br. Co.	Nov. 1, 1916	8,331.00
Buchanan	Alfred Olson	March 29, 1916	3,750.00
	F. E. Reinholt	May 6, 1916	14,387.00
	Alfred Olson	July 8, 1916	2,575.00
	F. E. Reinholt	Oct. 19, 1916	28,777.00
	Widell Company	Nov. 10, 1916	
Buena Vista	F. E. Marsh & Co.	Oct. 23, 1916	1,973.00
Butler	A. C. Tackman	June 19, 1916	7,720.00
	Waterloo Const. Co.	June 19, 1916	4,225.00
Calhoun	Iowa Bridge Company	Aug. 26, 1916	7,892.00
	Iowa Bridge Company	Oct. 24, 1916	2,500.00
Carroll	Pickus Eng. & Const. Co.	June 19, 1916	5,705.00
	R. E. Shackelton	Sept. 12, 1916	20,200.00
Cass	Des Moines Br. & I. Wks.	April 12, 1916	13,868.00
	Lana Construction Co.	April 13, 1916	10,207.00
Cedar	Alfred Olsen	March 27, 1916	8,500.00
	A. Phelps & Son	March 27, 1916	15,165.00
	S. R. Johnson	March 27, 1916	6,800.00
	Iowa Bridge Company	Aug. 24, 1916	21,600.00
Cerro Gordo	G. A. Halvik	Feb. 14, 1916	57,631.00
Cherokee	Federal Bridge Co.	May 20, 1916	

SCHEDULE THREE—BRIDGE CONTRACTS SUBMITTED FOR APPROVAL—Continued

County	Contractor	Date Approved	Amount Approved
Chickasaw	Iowa Bridge Company	Feb. 7, 1916	12,535.00
	A. C. Tackman	Aug. 11, 1916	5,675.00
	H. S. Bouton	Aug. 11, 1916	3,150.00
Clarke	Geo. LeHequet	March 8, 1916	6,412.60
Clay	Des Moines Br. & I. Wks.	March 29, 1916	15,600.00
	Ernest Landsman	March 29, 1916	5,610.00
	Des Moines Br. & I. Wks.	Aug. 14, 1916	7,982.00
	N. M. Stark & Co.	Aug. 14, 1916	10,502.70
	E. Landsman	Aug. 24, 1916	5,100.00
Clayton	C. E. Rich & Co.	Feb. 22, 1916	7,128.00
	C. H. Williamson	Feb. 22, 1916	10,389.00
	A. P. Schweikert	July 8, 1916	1,804.00
	J. Vogt	July 19, 1916	6,845.00
	A. P. Schweikert	July 19, 1916	4,384.00
	Dubuque Boat & Boiler Wks.	Aug. 12, 1916	4,300.00
	A. C. Boyle	Aug. 12, 1916	960.00
	Earl & J. A. Rust	Sept. 13, 1916	1,250.00
	Earl & J. A. Rust	Oct. 18, 1916	1,150.00
Clinton	Clinton Bridge Works	Feb. 8, 1916	1,350.00
	Thos. Carey & Sons	April 3, 1916	3,200.00
	John R. Kane	April 3, 1916	20,900.00
	John R. Kane	May 18, 1916	11,990.00
	John R. Kane	Oct. 17, 1916	10,722.00
Crawford	Herman Grill	April 20, 1916	18,680.20
	Herman Grill	Aug. 24, 1916	29,735.75
	Lana Const. Co.	Sept. 15, 1916	21,172.00
	T. A. Hickey	Sept. 15, 1916	1,780.00
Dallas	Marsh Engineering Co.		7,847.00
	F. E. Marsh & Co.	July 1, 1916	8,075.00
	Iowa Bridge Company	July 3, 1916	26,500.00
	F. E. Marsh & Company	Sept. 4, 1916	8,200.00
Davis	Ottumwa Supply & Const. Co.	July 1, 1916	12,420.00
Delaware	Gus Barnd	March 13, 1916	8,140.95
	Waterloo Const. Co.	July 20, 1916	6,345.00
	Clinton Bridge Works	July 25, 1916	1,120.00
	Clinton Bridge Works	Aug. 14, 1916	2,550.00
Des Moines	C. A. P. Turner Co.	March 6, 1916	5,250.00
Dickinson	Harry V. Brown	May 8, 1916	30,950.00
Dubuque	Conlin & Nachtrieb	April 26, 1916	7,344.00
	P. A. Besler	April 26, 1916	2,830.00
	Henry J. Froehle	April 26, 1916	2,145.00
	I. J. Leonard	April 26, 1916	13,773.00
	Peter J. Herkes	April 26, 1916	22,500.00
	Dubuque Boat & Boiler Wks.	May 9, 1916	6,960.00
	Morrison Const. Co.	Sept. 4, 1916	5,026.00
	Peter J. Herkes	Sept. 4, 1916	5,300.00
	I. J. Leonard	Sept. 4, 1916	6,319.00
	Dubuque Boat & Boiler Wks.	Sept. 4, 1916	3,865.00
	I. J. Leonard	Sept. 4, 1916	10,050.00
	Wm. Hantelman	Sept. 4, 1916	5,010.00
Emmet	T. J. Wagner	April 20, 1916	9,750.00
Fayette	Waterloo Const. Co.	July 8, 1916	10,540.00
	N. M. Stark & Co.	July 8, 1916	26,150.00
	C. H. & J. H. Russell	July 8, 1916	4,492.00
	N. M. Stark & Co.	July 25, 1916	11,521.00
	G. L. Thompson	Aug. 19, 1916	5,630.00
Floyd	Koss Const Co.	May 12, 1916	12,700.00
	J. O. Hughes	Aug. 12, 1916	11,857.00
Franklin	A. P. Munson	Feb. 26, 1916	9,100.00
Fremont	Evans & Jackson	June 1, 1916	13,811.00
Greene	F. E. Marsh & Co.	June 19, 1916	17,954.00
Grundy	L. F. Volberding	July 14, 1916	3,791.00
	I. R. Gueder	July 14, 1916	4,578.00
	Iowa Bridge Company	Aug. 11, 1916	3,360.00
Hamilton	I. A. Dunkel	April 20, 1916	3,215.00
	Koss Const. Co.	April 20, 1916	4,550.00
	A. F. Elkins	Aug. 25, 1916	2,750.00
	Morrison Const. Co.	Aug. 25, 1916	7,804.00
	Albert Swanson	Aug. 25, 1916	11,800.00

SCHEDULE THREE—BRIDGE CONTRACTS SUBMITTED FOR APPROVAL—Continued

County	Contractor	Date Approved	Amount Approved
Hancock	Geo. McNabb	Sept. 9, 1916	1,700.00
	Des Moines Br. & I. Wks.	Sept. 12, 1916	1,680.00
Hardin	D. M. Carr	May 12, 1916	18,140.00
	N. M. Stark & Co.	Oct. 14, 1916	7,377.00
Harrison	Lana Const. Co.	April 20, 1916	5,338.00
	Pickus Eng. & Const. Co.	April 20, 1916	27,741.00
	Omaha Str. Steel Works	July 24, 1916	10,360.00
	Des Moines Br. & I. Wks.	July 24, 1916	9,788.00
	Lana Const. Co.	Aug. 3, 1916	5,898.00
	Omaha Str. Steel Works	Nov. 23, 1916	9,722.00
Henry	Standard Const. Co.	March 3, 1916	47,788.00
Humboldt	Wm. O'Shea & Sons	April 20, 1916	6,253.00
	Koss Construction Co.	April 20, 1916	2,046.00
	Wm. O'Shea & Sons	June 21, 1916	4,837.00
	Kobb & Locke	June 21, 1916	1,629.00
Ida	Iowa Bridge Company	April 12, 1916	7,041.00
Jackson	J. Anderson & Son	Feb. 28, 1916	17,463.00
	J. Anderson & Son	June 28, 1916	10,840.00
Jefferson	Ottumwa Sup. & Con. Co.	May 9, 1916	9,753.00
Jones	V. L. Hanasen	April 3, 1916	11,300.00
	Wm. Flaherty	April 3, 1916	2,871.00
Kossuth	H. W. Phelps	Feb. 21, 1916	4,884.00
	T. J. Wagner	Feb. 21, 1916	5,790.50
	Marsh Engineering Co.	Feb. 21, 1916	7,150.00
	Marsh Engineering Co.	Sept. 19, 1916	10,130.00
	Marsh Engineering Co.	Sept. 19, 1916	1,550.00
	Marsh Engineering Co.	Sept. 19, 1916	1,850.00
	Marsh Engineering Co.	Sept. 19, 1916	8,025.00
	H. W. Phelps	Sept. 19, 1916	1,857.60
	H. W. Phelps	Sept. 19, 1916	3,683.31
Lee	Koss Construction Co.	April 26, 1916	9,995.00
	Clinton Bridge Works	Sept. 27, 1916	
Linn	Perry Jayne	Sept. 8, 1916	8,386.00
Linn & Benton	A. Phelps & Son	Sept. 8, 1916	4,200.00
Lyon	Western Br. & Const. Co.	Sept. 27, 1916	3,902.00
	Ward & Weighton	Sept. 27, 1916	8,261.00
	Western Br. & Const. Co.	Sept. 27, 1916	27,119.00
	Des Moines Br. & I. Wks.	Nov. 1916	2,155.00
	Western Br. & Const. Co.	Nov. 24, 1916	14,795.00
Mahaska	Des Moines Br. & I. Wks.	April 28, 1916	17,849.00
	H. E. Whitlatch	Sept. 2, 1916	1,785.00
	H. E. Whitlatch	Sept. 21, 1916	
	H. E. Whitlatch	Oct. 27, 1916	15,999.00
Marion	International Steel & Iron Co.	Feb. 8, 1916	34,318.00
Marshall	Thor Const. Co.	April 13, 1916	43,426.00
	Pickus Eng. & Const. Co.	July 8, 1916	28,900.00
	Ingersoll-Stouffer Eng. Co.	Aug. 25, 1916	21,774.00
Mills	Illinois Steel Br. Co.	March 11, 1916	
	Illinois Steel Br. Co.	May 15, 1916	2,154.00
	Wm. G. Morrison	May 30, 1916	3,496.00
	Morrison Const. Co.	Oct. 14, 1916	2,685.00
Mitchell	Clinton Bridge Works	Jan. 21, 1916	
	Worden-Allen	Jan. 31, 1916	11,688.00
Monona	Iowa Bridge Co.	June 10, 1916	35,500.00
	Iowa Bridge Co.	July 27, 1916	6,000.00
Montgomery	Standard Bridge Co.	Oct. 7, 1916	2,100.00
Muscatine	E. L. Geschaeour	May 15, 1916	18,700.00
O'Brien	Clinton Bridge Works	April 20, 1916	2,600.00
	Geo. Gordner	April 20, 1916	12,368.15
	Lewis Mead	May 9, 1916	5,451.00
Osceola	Ward & Weighton	April 18, 1916	11,131.00
Palo Alto	Des Moines Br. & I. Wks.	April 20, 1916	9,132.00
	Des Moines Br. & I. Wks.		3,753.00
	Des Moines Br. & I. Wks.		10,272.00
	Des Moines Br. & I. Wks.	Aug. 11, 1916	7,297.00
	Iowa Bridge Company	Aug. 11, 1916	7,366.00
	Pickus Eng. & Const. Co.	Sept. 29, 1916	2,336.00
Plymouth	Western Br. & Const. Co.	May 23, 1916	4,999.00

SCHEDULE THREE—BRIDGE CONTRACTS SUBMITTED FOR APPROVAL—Continued

County	Contractor	Date Approved	Amount Approved
Pocahontas	Iowa Bridge Company	Feb. 8, 1916	15,784.12
	Iowa Bridge Company	March 17, 1916	11,953.26
	Iowa Bridge Company	Sept. 19, 1916	7,884.00
Polk	N. M. Stark & Co.	June 19, 1916	18,850.00
Pottawattamie	F. E. Marsh & Co.		7,254.00
	Jos. Saguin	Sept. 2, 1916	6,750.00
Poweshiek	Iowa Bridge Company	April 28, 1916	37,750.00
Sac	Worden-Allen	Jan. 21, 1916	12,732.00
	Des Moines Br. & I. Wks.	Jan. 21, 1916	5,984.00
Scott	Chas. Winn	April 25, 1916	2,207.10
	Geo. L. Paustian	July 19, 1916	2,193.27
	T. J. McCarty	Oct. 20, 1916	1,550.00
	Clinton Bridge Works	Oct. 30, 1916	800.75
Shelby	Lana Const. Co.	May 23, 1916	7,240.00
	Jensen Const. Co.	July 14, 1916	10,200.00
Sioux	Des Moines Br. & I. Wks.	April 25, 1916	5,920.00
Story	Cole Bros.	March 3, 1916	34,400.00
Tama	A. P. Munson	April 3, 1916	12,687.00
	Waterloo Const. Co.	April 10, 1916	2,336.00
	Des Moines Br. & I. Wks.	April 26, 1916	24,261.00
Union	Morrison Const Co.	May 5, 1916	3,197.30
Wapello	Ottumwa Sup. & Const. Co.	June 1, 1916	3,488.00
	Ottumwa Sup. & Const. Co.		3,348.00
Warren	Iowa Bridge Company	March 27, 1916	13,060.00
	Iowa Bridge Company	April 10, 1916	7,273.00
	Iowa Bridge Company	July 25, 1916	10,450.00
Wayne	Akin & Flutter	Aug. 24, 1916	7,219.00
Webster	N. M. Stark & Co.	March 29, 1916	16,852.00
Winnebago	A. L. Martinson	Oct. 5, 1916	8,400.00
Winnishiek	Dubuque Boat & Boiler Works	May 5, 1916	14,260.00
Woodbury	Ward & Weighton	June 20, 1916	23,800.00
	Wm. O'Neil & Son	Aug. 1, 1916	5,115.00
	Ward & Weighton	Aug. 12, 1916	1,225.00
Wright	Iowa Bridge Company	April 3, 1916	13,081.00
	Ward & Weighton	April 3, 1916	6,326.00
			$2,070,867.47

SCHEDULE FOUR—MATERIAL CONTRACTS SUBMITTED FOR APPROVAL DECEMBER 1, 1915, TO DECEMBER 1, 1916.

County	Company	Material	Date Approved
Adair	Eattinger Lumber Co.	Cement	March 8, 1916
Benton	Citizens Lumber Co.	Lumber	Oct. 10, 1916
Bremer	Minneapolis Steel Mach. Co.	Corr. culverts	Feb. 3, 1916
	Clinton Bridge Works	Reinf. steel	Feb. 14, 1916
	Citizens Lumber Co.	Lumber	April 12, 1916
Butler	Waterloo Const. Co.	Reinf. steel	March 3, 1916
Chickasaw	Waterloo Const. Co.	Reinf. steel	March 3, 1916
	Minneapolis St. & Mch. Co.	Corr. culverts	March 3, 1916
Clarke	American Casting Co.	Cast iron pipe	March 11, 1916
	Klauer Mfg. Co.	Corr. culverts	March 17, 1916
	Cornes, Eddy & Co.	Cement	April 3, 1916
Clay	Wheeling Corrugating Co.	Corr. culverts	April 10, 1916
Clinton	Joyce Lumber Co.	Lumber	March 13, 1916
	Klauer Mfg. Co.	Corr. culverts	March 25, 1916
	Klauer Mfg. Co.	Corr. culverts	Sept. 4, 1916
Davis	Midland Metal Co.	Corr. culverts	April 12, 1916
Des Moines	Klauer Mfg. Co.	Corr. culverts	Feb. 28, 1916
Fayette	Union Iron Products Co.	Corr. culverts	March 3, 1916
Franklin	Midland Metal Co.	Corr. culverts	July 1, 1916
Grundy	Klauer Mfg. Co.	Corr. culverts	July 17, 1916
Hancock	Lyle Corrugated Culv. Co.	Corr. culverts	May 4, 1916

SCHEDULE THREE—BRIDGE CONTRACTS SUBMITTED FOR APPROVAL—Continued

County	Company	Material	Date Approved
Harrison	Ft. Dodge Culvert Co.	Corr. culverts	April 3, 1916
Humboldt	Lyle Corrugated Culv. Co.	Corr. culverts	May 15, 1916
Iowa	Klauer Mfg. Co.	Corr. culverts	May 12, 1916
Jefferson	Spalding & Kearns	Cement	Feb. 12, 1916
	Klauer Mfg. Co.	Corr. culverts	Feb. 21, 1916
Johnson	Fuller-Hiller Hdw. Co.	Reinf. steel	March 3, 1916
Keokuk	A. M. Neas & Sons	Piling	March 13, 1916
	A. M. Neas & Sons	Lumber	March 13, 1916
	Ia. Culvert & Sheet Metal Co.	Corr. culverts	March 13, 1916
	Fuller-Hiller Hdw. Co.	Reinf. steel	April 3, 1916
	Western Boiler Pipe Co.	Boiler pipe	April 13, 1916
Lee	Clinton Bridge Works	Reinf. steel	Jan. 21, 1916
Madison	Greenman Lumber Co.	Lumber	Jan. 31, 1916
	Western Boiler Pipe Co.	Boiler pipe	March 17, 1916
	Ia. Pure Iron Culv. Co.	Corr. culverts	March 17, 1916
	Marsh Eng. Co.	Reinf. steel	March 17, 1916
Mahaska	Klauer Mfg. Co.	Corr. culverts	March 29, 1916
Mitchell	Waterloo Const. Co.	Reinf. steel	Jan. 21, 1916
	Lyle Corrugated Culv. Co.	Corr. culverts	Jan. 28, 1916
Muscatine	Mrs. Hershey Lbr. Co.	Lumber	April 13, 1916
	American Casting Co.	Cast iron pipe	May 30, 1916
	Western Boiler Pipe Co.	Boiler pipe	May 30, 1916
Palo Alto	Des Moines Br. & Iron Wks.	Reinf. steel	March 3, 1916
Pottawattamie	Klauer Mfg. Co.	Corr. culverts	May 3, 1916
	Wilson Concrete Co.	Concrete pipe	May 5, 1916
	Clinton Bridge Works	Reinf. steel	May 19, 1916
Sac	Des Moines Br. & Iron Wks.	Reinf. steel	Jan. 21, 1916
	Good Roads Mach. Co.	Corr. culverts	Jan. 21, 1916
Scott	Wheeler Br. Lbr. & Supply Co.	Lumber	April 25, 1916
	Wheeling Corr. Co.	Corr. culverts	May 12, 1916
	Clinton Bridge Works	Boiler pipe	June 1, 1916
Shelby	Western Boiler Pipe Co.	Boiler pipe	March 13, 1916
	Lana Construction Co.	Lumber & Piling	March 13, 1916
Tama	Klauer Mfg. Co.	Corr. culverts	May 15, 1916
	American Casting Co.	Cast iron pipe	May 15, 1916
Union	Standard Bridge Co.	Reinf. steel	
Washington	Fuller Hiller Hdw. Co.	Reinf. steel	April 3, 1916
	Klauer Mfg. Co.	Corr. culverts	April 6, 1916
Wayne	Hayes Lumber Co.	Lumber	Oct. 19, 1916
Webster	Ft. Dodge Culvert Co.	Corr. culverts	March 29, 1916
Winnebago	Lyle Corr. Culvert Co.	Corr. culverts	May 12, 1916
Winneshiek	Clinton Bridge Works	Reinf. steel	Feb. 14, 1916
	Klauer Mfg. Co.	Corr. culverts	Feb. 28, 1916
	Ingvoldstad & Co.	Lumber	April 5, 1916
	Wheeler Br. Lbr. & Supply Co.	Lumber	April 5, 1916
	W. H. Klemme	Lumber	April 5, 1916
	Wheeler Br. Lbr. & Supply Co.	Lumber	April 5, 1916

Chapter VII—Road Department

December 1, 1915—December 1, 1916.

During the period covered by this report, engineers of the road department have checked and approved profiles for the improvement of 880 miles of road, involving the moving of 4,739,000 cubic yards of earth; revised the standard earth road specifications; prepared new standard specifications for gravel road construction; approved thirty-five contracts for road work, amounting to $260,554.00; investigated and undertook the adjustment of one hundred fifty-one road complaints; investigated and passed upon sixty-eight requests for changes in county roads; supervised State Road work involving the grading of seven and one-fourth miles, graveling one and one-half miles, laying 15,600 feet of tile, constructing fourteen culverts, and building one railroad crossing viaduct; assisted in the preparation of blanks for the annual county and township highway reports; assisted in the outlining of a tentative program governing the expenditure of the $2,200,000 Federal Aid which will be received during the next five years, and made brief investigations of highway work and expenditures in Illinois, Indiana and Minnesota.

District engineers representing the road department have made field examinations of 880 miles for which profiles were approved; attended fifty-one road lettings for work costing $511,000.00, involving the moving of 1,954,000 cubic yards of earth; made field examination of all the proposed changes in the county road systems concerning which there could be any question.

Twelve hundred eighty-six days have been spent in the field on road work; 723 days by engineers of the road department and 563 days by district engineers.

Organization of Road Department.

The approval of plans and profiles for road work, the investigation of complaints regarding road conditions, and the supervision of road work at the state institutions have made it necessary to divide the work of the road department into three main divisions;

Standard Box Culvert—This photograph shows a standard design 12'x12' reinforced concrete box culvert. It was constructed by day labor in Fayette county during 1916. The cost complete was $622.16. Careful attention to construction details produced in this culvert, a completed structure, that not only has the requisite strength, but that is pleasing in appearance. There were 4,800 culverts of this type constructed in Iowa during the season of 1915.

namely, the division of plans and profiles, the division of maintenance, and the division of State Road work. An engineer is in charge of each division.

The engineer in charge of road plans and profiles checks all such plans sent in by the county engineers, and modifies or corrects the same ready for official approval. The engineer of maintenance investigates complaints regarding road conditions in the various counties and townships. The engineer of State Roads has direct charge of the road work at all of the state institutions.

Road Profiles Approved.

Since the Commission was organized in 1913, profiles for 1,903 miles of road have been checked and approved. (Refer to Schedule No. Five.) These roads, if placed end to end, would reach from Ames to San Francisco over the Lincoln Highway; or from Ames to Chicago and from Chicago to Key West, Florida. The approved profiles provide for the improvement of about one-eighth of the present county road system.

The development of the road work is well illustrated in the increase of road profiles approved each year, as follows:

Year.	Profiles Approved.
1913	29 miles
1914	445 miles
1915	549 miles
1916	880 miles

A comparison of the maximum grades, rise and fall, and quantity of earthwork for the profiles approved in 1915 and 1916 follows:

	1915	1916
Average maximum grade before improvement	5.92%	5.77%
Average maximum grade after improvement	3.73%	3.61%
Reduction in average maximum grade	2.19%	2.16%
Average rise and fall per mile before improvement	52.9'	50.0'
Average rise and fall per mile after improvement	41.4'	40.1'
Reduction in average rise and fall	11.5'	9.9'
Earthwork required by profiles approved, cu. yds.	2,898,720	4,739,485
Av'ge quantity of earthwork per mile of road, cu. yds	5,280	5,655

The amount of earthwork required by the profiles approved in 1916, 4,739,485 cu. yds., is equivalent to excavating a hole one mile square and four and one-half feet deep. If the material were loaded into dump wagons carrying one and one-half cubic yards each, and spaced end to end, the resultant train would reach four times across the continent from San Francisco to New York.

Standard Specifications.

The standard earth road specifications issued in 1915 have been revised and brought up to date, ready to be issued for 1917 work. Standard specifications for single and for double-course gravel road construction have been repaired, ready to be issued for 1917 work.

Road Lettings Attended. (Refer to Schedule No. Six.)

Fifty-one lettings for the improvement of 468.37 miles of road have been attended. The total contract price of this work was $511,019.82. The earth excavation included in these lettings amounted to 1,954,159 cubic yards, which cost $419,754.07, or an average of 21.43 cents per cubic yard.

Road Contracts Approved.

The only road contracts which the law requires the counties to send to the Commission for approval are the contracts for more than one thousand dollars worth of grading work, let privately after bids have been received at a public letting and rejected. Many counties voluntarily sent in their contracts for the Commission to pass upon, even though they were not required to do so. (Refer to Schedule No. Seven.)

Thirty-five contracts for the improvement of 208.57 miles of road have been approved. The total amount of these contracts is $260,554.00, of which $221,389.00 is for earth excavation. These contracts provide for the moving of 1,001,335 cubic yards of earth at an average price of 22.109 cents per cubic yard.

Road Complaints.

During 1915 so many complaints regarding the condition of the roads were received, that it was deemed advisable, early in 1916, to assign an engineer to give such complaints special attention. Each complaint was given a number. A careful record was kept showing the progress of the work on each complaint, at any time (Refer to Schedule No. Eight.)

One hundred fifty-one complaints were received during 1916. One hundred twenty-seven of these were on the township roads. Twenty-four were on the county roads. The division of the complaints with reference to county and township roads is almost identical with the relative mileage of those systems. Sixteen complaints were based on poor work. The others were a result of neglect. The records show that eighty-five per cent (85%) of the roads concerning which complaints were made, have been repaired or improved satisfactorily.

Since April, 1913, there have been filed with the Commission five hundred sixteen road complaints, as follows:

Year.	No. of complaints.
1913	28
1914	83
1915	254
1916	151

The unusually large number filed in 1915 is due to the unusual wet weather of that year. The following brief statements show typical examples of road complaints:

(1) Boone County. During the summer a concrete box or catch basin was built at the upper end of a small circular concrete culvert between sections 7 and 8, Garden Township. This box was built by the property owner to fill up a ditch on his farm. The trustees, fearing that the road would be overflowed during high water, ordered the box removed. On October 11th the property owner appealed his case to the Commission. He was willing to do whatever in our judgment was right.

On October 12th the county engineer, together with our district engineer, made an examination of the structure. They found that the box had been built so high that the road was in danger of being flooded. They therefore recommended that the box be lowered in order to protect the road. On October 14th we wrote the property owner advising that the box be lowered. On October 18th we received a letter from him intimating that he would prefer to remove the box entirely than to lower it. On November 5th we were advised by the township clerk that the box had been removed.

(2) Fayette County. On May 29th we received a complaint regarding the county road in Section 1, Westfield Township. The complainant stated that the repair of this road had been delayed from time to time by the Board, and that the prospects were not bright. On June 10th we wrote the county supervisors asking that they give the matter their early attention, and wrote the complainant advising him of our letter to the supervisors.

On October 14th we again wrote the complainant, asking if the road had been repaired satisfactorily. He replied that the work had been attended to promptly and satisfactorily.

(3) Monroe County. On July 7th we received a complaint regarding the condition of the road in Section 32-73-19, which is located on Rural Route No. 4 out of Melrose. On July 11th we notified the trustees that this road had been reported in bad condition, and requested its improvement at an early date. We also wrote the complainant, advising him of our action and requesting that he notify us again if, after a reasonable length of time, nothing had been done.

On October 16th, having heard nothing further from the complainant, we wrote him inquiring about the road. He replied that the road "was repaired in very good order."

Inspection and Supervision of Road Work.

Fully ninety per cent of the road construction work is earth-work. The inspection and supervision of this work does not require much of the district engineers' time, only one hundred ten and one-half days being spent on such work.

Changes in County Road Systems.

The Commission has taken action on proposed additions or alterations in the county road systems in thirty-seven counties, involving sixty-eight separate requests by the boards of supervisors. Fifty-five of these requests were approved. Of the thirteen requests not approved by the Commission, seven were refused because of non-conformance with the legal requirements regarding such changes or additions. There are now pending ten requests from nine counties. (Refer to Schedule No. Nine.)

The fifty-five requests approved by the Commission involve the addition to the county road system, of 142.4 miles, and the removal of 18.5 miles from the county road system. The net increase in the county road systems was 123.9 miles. Most of these additions were on corporate lines. The thirteen requests not approved involve the addition of 83.25 miles and the removal of nineteen miles, or a net increase of 64.25 miles.

Special Assignments.

Engineers from the road department were assigned to do special work, as follows:

Dubuque Post Road	317 days
State Road Work	52 days
Special Survey, Jones County	31 days
Concrete Road, Atlantic	12 days
Miscellaneous	100 days
	512 days

The work on the Dubuque Post Road consisted of maintaining an engineer on this work to assist the engineer assigned by the Office of Public Roads to have charge of this contract. Due to the bad weather conditions in 1915, the contractor lost quite heavily so that he was apparently unable to put on the force in 1916, necessary to make due progress. The work is not yet finished. There remain three and two-tenths miles to be graded, eight miles to be graveled, double-course, and three and four-tenths miles of old macadam to be scarified, re-shaped, and graveled, single-course. The total length of the road is twenty miles.

The special assignments on State Road work consists of assignments on construction and surveys on institutional roads at Woodward and Council Bluffs, where an engineer from the road department gave detailed personal supervision to the work.

The special survey in Jones County consisted of making a detailed topographical survey of a portion of the Wapsipinicon River at Anamosa. At this point there is a water-power development which would be affected by the necessary road and bridge improvements.

The work on the concrete road at Atlantic consisted of making surveys and preparing detailed plans for one-half mile of concrete road.

The miscellaneous special assignments consist of attending seventeen Farmers' Institutes, trustees' meetings, and miscellaneous meetings, preparing and attending to three exhibits at three fairs, giving one sand-clay road demonstration, and accompanying the special road train.

State Road Work.

Surveys have been made for the improvement of sixteen and one-half miles of road at the state institutions at Woodward, Cherokee, Rockwell City, Council Bluffs, Ames, Glenwood and Clarinda. The plans have been prepared for seven and three-fourths miles.

At Woodward, Cherokee, Council Bluffs, Ames, Independence and Rockwell City, seven and one-fourth miles have been built to finished grade, 15,600 feet of tile have been laid, thirteen concrete culverts and one tile culvert have been built, one small concrete culvert and one large concrete culvert have been extended, one concrete railroad overhead crossing has been built, and one and one-half miles have been graveled. Graveling is now in progress at Ames and Woodward.

At Independence, Clive, Oakdale, Mt. Pleasant and Fort Madison, repair and maintenance work has been done. The roads at all other state institutions have been inspected.

An engineer from the road department has supervised all the surveys, preparation of plans, construction, and repair work on the state institution roads. This work has required one hundred and twenty-six days in the field, besides the necessary office work.

Annual Report Blanks.

In co-operation with the administrative department, the blanks for the township clerks', trustees', and road superintendents', and

for the road part of the county engineers' reports have been completely revised. Detailed instructions regarding the preparation of county and township reports have been issued to the county engineers and township officials. Approximately four thousand sets of such blanks have been sent out.

The revision of the township report blanks was a tedious and difficult task. Numerous old laws remain on the statute books, requiring obsolete reports, and resulting only in confusion for the township officials. A careful revision and repeal of these old laws would result in a much needed simplification of the township reports.

Federal Aid.

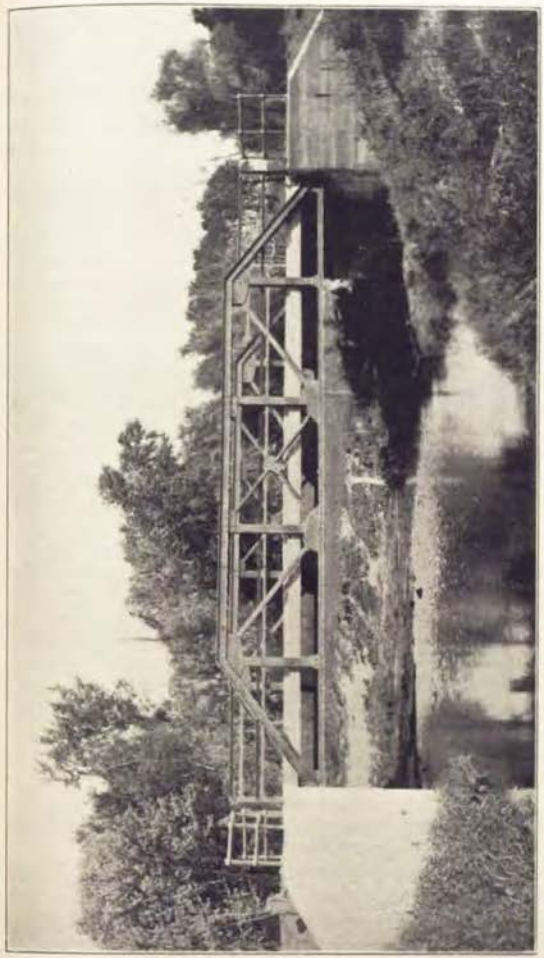
A representative of the road department attended the meeting of the state highway officials in Washington on August 15 and 16, called by the Secretary of Agriculture to consider the tentative rules and regulations governing the expenditure of the federal aid appropriated by the Sixty-fourth Congress. A tentative five-year program covering the expenditure of federal funds has been prepared on request of the Secretary of Agriculture. Under this tentative program, each county will be given a chance to secure a share of federal money.

Inspection of Highway Work in Other States.

Inspections have been made of highway work in portions of Minnesota, Illinois and Indiana. The one outstanding impression received from these inspections is that Iowa, although not constructing a large mileage of surfaced roads, is nevertheless laying a broad, substantial foundation for future road development on a more logical basis than the states visited.

Iowa is giving special attention to bridge and culvert construction, permanent grading, and drainage. These fundamentals the states mentioned appear to be overlooking. They have preferred to go from the old, poorly-built, poorly-drained earth road to a paved or otherwise hard-surfaced road at one bound, rather than through a gradual and logical development. The cost per mile for hard-surfacing is so great and the mileage is correspondingly so limited that these states have passed over some of the preparatory work in their effort to secure more mileage of surfacing with the money available.

Particular mention should be made of the bridge work. In 1915, Iowa spent $6,629,000 for bridge and culvert work, $4,000,000 of which went for permanent construction. In the same year, In-



Low Riveted Truss Span.—This structure was built in Chickasaw county in 1915. It is a typical 40' low riveted truss span on concrete abutments and carries a concrete floor. During 1915 there were 234 bridges of this type constructed on the Iowa highways. With a small maintenance cost for painting this type of bridge has a very long life.

diana spent $1,779,000 for bridge and culvert work. Considering the mileage of roads and relative area of the two states, Indiana should have spent more than twice as much to keep up with the pace set by Iowa.

The argument cannot be made that Indiana does not need the bridges. It is quite common in that state to find temporary bridges and culverts on a paved or hard-surfaced road. The same applies to Illinois.

In Iowa the first step in constructing a road is to build permanent bridges and culverts. In a two hundred-mile drive through the northwest portion of Iowa, from Des Moines to Spirit Lake, only eighteen wood or wood floor bridges were crossed, and six of these were on township roads. In Minnesota the same number of temporary bridges were crossed on a ninety-mile drive from Mankato to St. Paul on a state highway.

The broad, substantial roadways, easy grades, rounded corners, wide open side ditches, and deep tile drainage being secured on Iowa highways will compare favorably with such work in any of the states visited. Four hundred eighteen miles were permanently graded in 1914, 463 in 1915, and in 1916 it appears that about 700 miles will be so improved, making approximately 1,600 miles permanently graded and drained in the past three years. The counties are just getting organized to go at the work in earnest.

In addition to the above construction work, there has been a general betterment of all the highways. About eleven hundred miles have been built to temporary grades, 5,000 miles have been built to natural grades, and repairs and maintenance producing more than temporary results has been done on every mile of county road and on 90 per cent of the township roads. Nearly all of the county roads and a large percentage of the township roads have been placed and maintained in such a condition that they carry the traffic with comfort and safety. Contrasted to this situation, the states visited have neglected the maintenance and general betterment of the highways to such an extent that even the state highways are getting worse instead of better, except on the limited mileage that has been improved. The special observations made in the states visited follow:

Illinois. An inspection was made of brick roads around Paris, and of the brick and concrete roads near Danville. Of the brick roads inspected, it appears that the monolithic type in which the brick are laid directly on the fresh concrete base, is much superior

to the sand cushion type which was for many years a standard construction. In the monolithic type there is no rumbling or hollow sound under traffic. In the two years since the monolithic brick pavements have been built they have had none of the "blow-ups" common to the sand cushion pavement.

Numerous inspections were made of the edges of the monolithic pavement, and in no instance was there any apparent separation between the brick and concrete base.

No expansion joints are used in the brick pavements which are being built near Paris or Danville. At present the leaving out of the expansion joints appears to be an advantage. The pavement rides easier as there are no broken down expansion joints to cause jolting. It will be interesting to watch these pavements a few more years before passing final judgment on this change.

The portion of Illinois visited is noted for its brick industries, and it is here that we would expect to find the most durable type of brick roads constructed.

The oldest brick road inspected was said to be ten years old. It is of the grout filled, sand cushion type. The surface has deteriorated to such an extent that extensive repairs should be made. Other pavements six to eight years old will need attention soon. In view of the observations made, it would seem advisable to limit the life of bonds for even brick pavements to not to exceed twenty years, and preferably fifteen years. The life of bonds for less durable surfaces should be correspondingly reduced.

Indiana. An inspection was made of roads near South Bend and La Porte. The Lincoln Highway between these two towns is hard-surfaced partly with concrete and partly with limestone macadam. The concrete was laid in 1915. It shows the cracks typical of such roads. The macadam was laid in 1914 at a cost of approximately $5,000 per mile, and in 1916 was given a surface treatment of tar. The bonds issued to finance this work have eight years yet to run, but the road is rapidly going to pieces. This road must be given extensive repairs in the near future or the initial investment will be largely lost.

Once off of the hard-surfaced roads, traveling is inconvenient as the dirt roads have been neglected.

An investigation was made at the state house, of highway construction, bonds, and taxes. Indiana has 63,370 miles of road or about sixty-three per cent as much as Iowa. On January 1, 1916, 29,550 miles or 46.9 per cent of all the roads had been surfaced with

gravel, stone, or some kind of a pavement. On the same date Iowa had 2,500 miles, or 2.4 per cent of all the roads surfaced.

The reason for this vast difference in mileage of surfaced roads in the two states was easily located by comparing the total mileage of roads, expenditures, bonded indebtedness and tax rates. Iowa has 104,000 miles of road. Indiana has 63,370 miles. Iowa spent in 1915 for road work, bonds, and interest, exclusive of bridge and culvert expenditures, $6,898,000, or $66.00 per mile. In the same year Indiana spent for the same purpose $14,438,000, or $228.00 per mile.

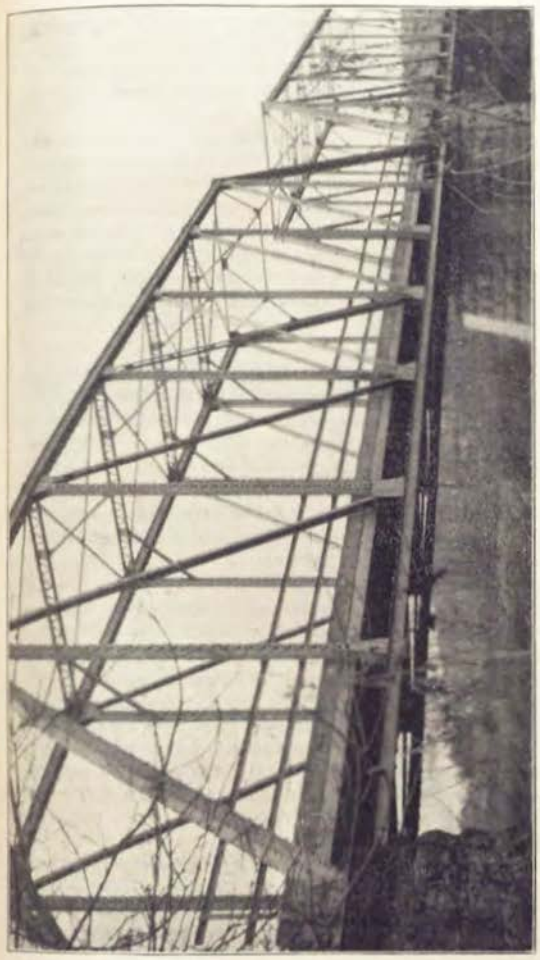
In Iowa the rate of tax for road purposes is 7.84 mills on farm property, 0.69 mills on town property, and 0.46 mills on property in cities of the first class. On the same basis the rate of tax in Indiana for road purposes is 33.58 mills on farm property, and 25.2 mills on town and city property.

On January 1, 1916, Iowa had outstanding road bonds amounting to $174,899. On the same date, Indiana's outstanding road bonds amounted to $37,497,600. Indiana began surfacing roads many years ago when many of the Iowa roads were nothing but swamps.

If Iowa would levy road taxes at the same rate that Indiana is levying, the annual road revenues, exclusive of the bridge fund, would amount to $31,500,000. After deducting at the present rate of repairs and maintenance, this fund would gravel the entire county road system in three years, or pave that system in eight years without the issuance of bonds.

Indiana has no state highway commission. All road and bridge work is handled by each county and township board independently of any other board. There are no standard plans and specifications and no uniformity in the construction secured. The bridge plans are, by law, furnished by the bridge contractor.

The roads are township roads until they are surfaced and accepted by the county commissioners. Then they become county roads and are maintained at the expense of the county. This has resulted in an aimless system of improved highways, overloaded with large mileages unnecessary to a primary system. In many instances portions of the county system connect with no towns and no other county roads. In Iowa a system of county or primary roads was first selected and then the construction of that system undertaken. Thus the counties have a definite object in view which



Through Truss Steel Bridge—This two-span riveted steel through truss bridge rests on an old masonry pier and abutments. It is located on the Turkey River in Clayton county. During the cloudburst flood of June 1, 1916, a large piece of floating debris passed over the floor of this bridge, tearing out one panel of the steel angle railing. Except for this slight damage this bridge withstood this exceptional flood without injury. It was designed by the Commission in 1911.

will result in a more efficient expenditure of the funds appropriated.

Minnesota. The inspection of Minnesota roads consisted of an automobile drive from Jackson to Worthington, Tracy, Mankato, St. Paul, Excelsior and Albert Lea.

The principal impression secured from this inspection is that Minnesota has many long, continuous stretches of gravel roads suitable for travel at all seasons of the year. From Tracy to Mankato, a distance of ninety miles, and from St. Paul to Albert Lea, one hundred miles, our cars were scarcely off a gravel road. Some portions of these roads were in splendid condition. Other portions were quite wavy. The one outstanding feature is that here were long, continuous stretches of road which could be used at all seasons.

The surface used was about the same as our Type "B," single-course gravel surfacing, ten feet wide, requiring 880 cubic yards of gravel per mile. The cost ran from $1,000 to $1,600 per mile. These roads will not last long under the heavy traffic which they carry unless they are constantly maintained in a most thorough manner. The Minnesota Highway Commission states that about 100 cubic yards of gravel per mile should be added each year to replace that worn away, and that in addition, about fifty dollars per mile per year should be spent for general maintenance, a total maintenance charge of about $150 per mile per year.

Near the cities of St. Paul and Minneapolis, short stretches of concrete pavement have been built, and old water-bound macadam roads have been surfaced with asphalt macadam. Such construction is, however, limited to the heavy traffic districts just outside of cities. The main surfacing used on the Minnesota roads is gravel. Even on a very heavily traveled road between Excelsior, a summer resort at the west end of Lake Minnetonka, and the Twin Cities, a gravel surface is in use. This road is oiled each year and kept in splendid condition. The maintenance costs about $400 per mile per year, but even this high annual cost is less than the interest on the money which would have to be invested if the road were paved.

Minnesota is doing so much more road surfacing work than Iowa that an inquiry was made to determine the reason. Minnesota has 93,000 miles of road. Iowa has 104,000 miles. Minnesota spent in 1915 for roads, bridges and culverts, $8,003,000, or an average of

$86.00 per mile. Iowa spent for the same purpose, $13,606,400, or an average of $131.00 per mile.

This would seem to indicate that Iowa is spending more money and getting less results than is Minnesota. That is, however, not the case. In the northern part of Minnesota there are vast, sparsely settled areas. The roads in these unsettled areas are included in the total mileage given but they carry little or no traffic and require no work. In Iowa every square mile is settled and every mile of road must be maintained. Minnesota is neglecting the bridge and culvert work. Iowa is spending half her funds on bridges and culverts.

Our county road system contains 15,766 miles. The Minnesota state road system, which is the one on which the surfacing work is being done, contains 12,300 miles. A comparison of the road expenditures on these systems is the only fair basis of comparing the penditures in these two states. In 1915 Minnesota spent on the state road system for road construction, repairs and maintenance, $3,328,000. There were 2,317 miles of unimproved state roads on which there were no expenditures. The money was spent on the remaining 9,983 miles, the average expenditure being $333.00 per mile. In the same year Iowa spent on the county road system for the same purpose, $3,400.00, or an average of $216.00 per mile. In other words Minnesota is spending fifty per cent more per mile per year on the state road system than Iowa is spending on the county road system. This difference in annual expenditure, coupled with a more available gravel supply, undoubtedly explains why Minnesota is so far ahead of Iowa in gravel roads.

Of the states visited, Minnesota more than either of the others, offers an example for Iowa to follow in road work. Minnesota is building good earth roads, although apparently not using tile drainage as liberally as Iowa. She is surfacing long stretches of road with gravel, thus providing a large number of communities with serviceable roads, rather than providing a few communities with limited mileages of high cost roads.

The low cost roads in many instances, probably, will cut through when the frost goes out in the spring. They will require considerable maintenance, and will need to be resurfaced in a few years. At best they are only temporary, but they meet the present traffic requirements; they can be used at all seasons of the year; they can be had within the means of the people who pay; and even if they do have to be replaced in a few years, they will have returned

to the people, in service, the full value of the money paid out; for the first cost is low.

Field Work of Road Department.

In general the field work of the road department in dealing with county and township officials, is carried on by the district engineers. During the past year, 563 days were spent by the district engineers on such work. In addition, engineers of the road department have spent 723 days in field on road work. The total amount of time

Crawford County Permanently Graded Road—Approximately 1,600 miles of such permanent grading work has been done in Iowa since the passage of the Highway Commission Road Law. Note the width and the attractive finished appearance of this particular piece of Crawford county grading.

spent in the field on road work was 1,286 days. A statement showing the distribution of the time spent by district engineers will be found in Part One, Chapter Eight. The time spent in the field by engineers of the road department follows:

Special assignments	512 days
Supervision of state road work	126 days
Investigation of complaints	26 days
Inspection of road profiles	14 days
Investigation and supervision road work	39 days
Unclassified	15 days
Total	723 days

SCHEDULE FIVE—ROAD PROFILES APPROVED

County	Profiles Approved	County	Profiles Approved	County	Profiles Approved
Adair	1	Franklin	..	Montgomery	1
Adams	..	Fremont	2	Muscatine	10
Allamakee	3	Greene	20	O'Brien	18
Appanoose	1	Grundy	1	Osceola	9
Audubon	..	Guthrie	..	Page	2
Benton	1	Hamilton	21	Palo Alto	46
Black Hawk	31	Hancock	20	Plymouth	..
Boone	12	Hardin	60	Pocahontas	40
Bremer	7	Harrison	3	Polk	3
Buchanan	..	Henry	..	Pottawattamie	..
Buena Vista	37	Howard	..	Poweshiek	..
Butler	6	Humboldt	20	Ringgold	..
Calhoun	25	Ida	..	Sac	39
Carroll	13	Iowa	14	Scott	14
Cass	3	Jackson	7	Shelby	..
Cerro Gordo	37	Jasper	10	Sioux	1
Cherokee	18	Jefferson	1	Story	51
Cedar	10	Johnson	2	Tama	26
Chickasaw	4	Jones	..	Taylor	1
Clarke	..	Keokuk	1	Union	..
Clay	61	Kossuth	10	Van Buren	..
Clayton	..	Lee	4	Wapello	12
Clinton	16	Linn	..	Warren	..
Crawford	23	Louisa	5	Washington	12
Dallas	10	Lucas	..	Wayne	1
Davis	..	Lyon	..	Webster	31
Decatur	..	Madison	1	Winnebago	1
Delaware	11	Mahaska	..	Winneshiek	..
Des Moines	4	Marion	5	Woodbury	2
Dickinson	28	Marshall	..	Worth	..
Dubuque	..	Mills	..	Wright	14
Emmet	42	Mitchell	..		
Fayette	..	Monona	4		988
Floyd	6	Monroe	..		

Some of the profiles were less than a mile in length. The 988 profiles represent only 880 miles of road.

SCHEDULE SIX—ROAD LETTINGS ATTENDED

County	No. of Lettings	Miles of Road	Earth Excav. Cu. Yds.	Kind of Work and Unit Prices	Approx. Total
Allamakee	1	1	4681	Earth, 28c; loose rock, 75c; rock $1.25 per cu. yd.	$ 4,716.35
Benton	1	1	5800	Earth, 29c cu. yd.	1,682.00
Black Hawk	1	5.17	.....	Gravel, 67.55c sq. yd.	24,610.00
Boone	3	2	.....	Gravel, 30c ton mile haul and place. Rejected.	968.00
Boone	..	2	10000	Earth, 22c cu. yd.	2,200.00
Boone	..	8	.....	Gravel, 75c cu. yd.	5,280.00
Bremer	1	4	8324	Earth, 11.4c cu. yd.	2,551.35
Buchanan	1	2	1000	No bids received	.....
Buena Vista	2	41	160000	Earth, 18.4c cu. yd.	29,440.00
Buena Vista	..	11½	43000	Earth, 23.95c cu. yd.	10,298.50
Calhoun	3	8	40632	Earth, 20½ cu. yd.	8,328.00
Calhoun	..	16	73167	Earth, 22½c cu. yd.	16,530.01
Carroll	1	12	50276	Earth, 23½c cu. yd.	13,833.51
Cass	1	2	14156	Earth, 26c cu. yd.	3,732.56
Cerro Gordo	2	10	40000	Earth, 24c cu. yd.	Rejected 9,600.00
Cerro Gordo	..	18½	83000	Earth, 22½c; loose rock, 45c; rock, 95c cu. yd.	Rejected 20,773.00

SCHEDULE SIX—ROAD LETTINGS ATTENDED—Continued

County	No. of Lettings	Miles of Road	Earth Excv. Cu. Yds.	Kind of Work and Unit Prices	Approx. Total
Cherokee	1	5	40130	Earth, 18c cu. yd.	7,223.40
Cedar	1	3-5	......	Macadam, 79.57 sq. yd.	5,011.00
Chickasaw	1	1	......	Earth and loose rock, 50c.	3,300.00 Rejected
Clinton	1	4½	23571	Earth, 22.4c; gravel, $1.3113 cu. yd. in place	13,168.03
Crawford	1	13.35	144372	Earth, 20.54c cu. yd.	29,654.23
Dallas	1	2.2	......	Hauling and placing gravel, 67c per cu. yd.	1,296.20
Delaware	1	4	19495*	No bids received	......
Dickinson	2	12	63221	Earth, .218c cu. yd.	13,782.18
Dickinson	..	11.13	43362	Earth, .219c cu. yd.	9,496.28
Emmett	2	12	44090	Earth, 22.45c cu. yd.	9,898.29
Emmett	..	3	6625	*Earth, 23c cu. yd.	1,523.75
Emmett	..	25	......	Gravel, 44½c cu. yd. hauling and placing	9,790.00
Hamilton	1	16⅔	102315	Earth, 19.7 cu. yd.	37,158.03
Hardin	2	31	130828	Earth, 19.45c cu. yd.	25,446.05
Hardin	..	15½	81985	*Earth, 18c cu. yd.	14,757.30
Harrison	1	3	19770	Earth, 19.14c cu. yd.	3,773.80
Humboldt	2	6	17229	Earth, 23.6c cu. yd.	4,066.63
Humboldt	..	4	16045	Earth, 25.3c cu. yd.	4,060.36
Kossuth	2	3	14516	Earth, 27.47 cu. yd.	3,987.05
Kossuth	..	1 2-3	17661	Earth, 23c cu. yd.	4,062.03
Louisa	1	4	33817	*Earth, 23.9c cu. yd.	8,082.26
Montgomery	1	1	24000	Earth, 26.56c cu. yd.	6,375.00
Muscatine	2	3	14675	Earth, 33.7c cu. yd.	4,945.48
Muscatine	..	1	6780	Earth, 28c; loose rock, 60c; rock $1.50 cu. yd.	4,348.40
O'Brien	1	16	74500	Earth, 20c cu. yd.	14,900.00
Osceola	1	7	51292	Earth, 22.95c cu. yd.	11,771.51
Palo Alto	2	16	63705	Earth, 20.59c cu. yd.	13,119.79
Palo Alto	..	6½	19411	Earth, 22c cu. yd.	4,270.42
Pocahontas	2	21	57767	Earth, 20.93c cu. yd.	12,092.52
Pocahontas	..	8	20244	Earth, 24c cu. yd.	5,858.48
Sac	1	11½	48000	Earth, 20c cu. yd.	9,600.00
Story	2	28½	72000	Earth, 24.6c cu. yd.	17,856.00
Story	..	12½	......	Gravel, 74.83c cu. yd.	8,165.50
Tama	2	8	71200	Earth, 20.35c cu. yd.	14,493.50
Tama	..	7	89100	Earth, 21.48c cu. yd.	19,138.68
Totals	51	468.37	1954159		$511,019.82

Note—Quantities marked thus (*) not included in total earthwork given.

Total cost earth excavation, $419,754.00.

Average contract price earth excavation, 21.43 cents per cu. yd.

SCHEDULE SEVEN—ROAD CONTRACTS APPROVED

County	Contractor	Date Approved	No. miles	Kind of Work	Unit Price	Quantity	Total Amount
Allamakee	P. T. Joyce	April 8, 1916	1.0	Earth excavating	$0.28 per cu. yd.	4,683 cu. yd.	$ 1,311.00
				Loose rock	0.75 per cu. yd.	290 cu. yd.	217.00
				Solid rock	1.25 per cu. yd.	2,550 cu. yd.	3,188.00
Allamakee	Richard Thompson	Aug. 16, 1916	1.0	Earth excavating	0.20 per cu. yd.	3,600 cu. yd.	720.00
				Loose rock	0.60 per cu. yd.	1,223 cu. yd.	734.00
				Solid rock	1.00 per cu. yd.	500 cu. yd.	500.00
Black Hawk	Geo. W. Condon	Sept. 4, 1916	5.17	Earth excavating	0.26 per cu. yd.	18,600 cu. yd.	4,836.00
				Loading gravel	0.19 per cu. yd.	10,500 cu. yd.	1,995.00
				Hauling gravel per mile	0.35 per cu. yd.	10,500 cu. yd.	12,861.00
				Construct. gravel surfacing	0.135 per sq. yd.	36,430 sq. yd.	4,918.00
				5-inch drain tile	0.10 per lin. ft.	4,900 lin. ft.	2,075.00
				Miscellaneous			490.00
Buena Vista	Conn Const. Co.	Oct. 9, 1916	1.5	Earth excavating	0.25 per cu. yd.	8,300 cu. yd.	79.00
Buena Vista	O'Hanlon & Reilly	Oct. 9, 1916	1.0	Earth excavating	0.25 per cu. yd.	4,500 cu. yd.	1,125.00
Calhoun	P. E. Shugart	April 8, 1916	8.0	Earth excavating	0.205 per cu. yd.	40,612 cu. yd.	8,330.00
Calhoun	P. E. Shugart	May 25, 1916	16.0	Earth excavating	0.225 per cu. yd.	73,467 cu. yd.	16,530.00
Cerro Gordo	Barnes Bros.	July 6, 1916	18.5	Earth excavating	0.225 per cu. yd.	83,000 cu. yd.	18,675.00
Cerro Gordo	Shugart & Munson	July 6, 1916	10.0	Earth excavating	0.24 per cu. yd.	40,000 cu. yd.	9,600.00
Clay	Russell Condon	Aug. 12, 1916	20.0	Earth excavating	0.242 per cu. yd.	66,829 cu. yd.	16,173.00
Clay	Russell Condon	Sept. 9, 1916	33.0	Earth excavating	0.223 per cu. yd.	105,000 cu. yd.	23,415.00
Crawford	Lana Const. Co.	Sept. 2, 1916	1.0	Earth excavating	0.20 per cu. yd.	18,821 cu. yd.	3,764.00
Crawford	W. R. Shipman	April 15, 1916	4.5	Earth excavating	0.1934 per cu. yd.	62,760 cu. yd.	12,142.00
Des Moines	John Grimm	May 25, 1916	1.7	Earth excavating	0.244 per cu. yd.	13,800 cu. yd.	3,367.00
Jackson	J. Anderson & Son	June 24, 1916	4.2	Earth excavating	0.265 per cu. yd.	31,262 cu. yd.	8,284.00
Jackson	Wm. Teters	July 29, 1916	......	Solid rock	0.90 per cu. yd.	2,388 cu. yd.	2,149.00
Jackson	Lewis Sade	July 29, 1916	......	Earth excavating	0.25 per cu. yd.	4,000 cu. yd.	1,000.00
Kossuth	Geo. W. Condon	Aug. 3, 1916	1.5	Earth excavating	0.23 per cu. yd.	17,661 cu. yd.	4,062.00
				Grubbing	2.00 per sq. yd.	10 squares	20.00
				Removing and replacing fence	1.60 per rod	250 rods	400.00
Montgomery	Wilson Conc. Co.	Nov. 11, 1916	0.8	Earth excavating	0.23 per cu. yd.	13,600 cu. yd.	3,128.00
O'Brien	Leach Bros.	May 23, 1916	16.0	Earth excavating	0.20 per cu. yd.	74,500 cu. yd.	14,900.00
Osceola	Geo. W. Condon	July 25, 1916	9.0	Earth excavating	0.2295 per cu. yd.	52,000 cu. yd.	11,934.00
Palo Alto	John Dooley	May 24, 1916	6.0	Earth excavating	0.1825 per cu. yd.	23,828 cu. yd.	4,348.00
Palo Alto	W. J. Anglum	June 20, 1916	2.0	Earth excavating	0.19 per cu. yd.	7,592 cu. yd.	1,442.00
Sac	Lamoreaux Bros.	March 8, 1916	19.0	Earth excavating	0.198 per cu. yd.	73,000 cu. yd.	14,454.00
Sac	F. W. Beaman	June 9, 1916	11.5	Earth excavating	0.20 per cu. yd.	48,000 cu. yd.	9,600.00

SCHEDULE SEVEN—ROAD CONTRACTS APPROVED—Continued

County	Contractor	Date Approved	No. miles	Kind of Work	Unit Price	Quantity	Total Amount
Scott	August Korneman	May 6, 1916	1.6	Earth excavating	0.25 per cu. yd.	4,500 cu. yd.	1,035.00
				Hauling and placing crushed stone	1.60 per cu. yd.	1,366 cu. yd.	2,185.00
				Hauling and placing gravel	1.55 per cu. yd.	3,796 cu. yd.	5,884.00
				Hauling and placing culv. pipe	0.25 per ft.	200 lin. ft.	50.00
Scott	John Fey	May 6, 1916	1.7	Earth excavating	0.30 per cu. yd.	4,900 cu. yd.	1,470.00
				Loose rock	0.75 per cu. yd.	1,000 cu. yd.	750.00
				Hauling and placing culv. pipe	0.25 per ft.	144 lin. ft.	36.00
Scott	John Fey	May 6, 1916	0.4	Earth excavating	0.32 per cu. yd.	1,780 cu. yd.	570.00
				Hauling and placing crushed stone	1.50 per cu. yd.	780 cu. yd.	1,170.00
				Hauling and placing stone dust	1.10 per cu. yd.	300 cu. yd.	330.00
				Hauling and placing culv. pipe	0.25 per ft.	144 lin. ft.	36.00
Scott	Littig Const. Co.	July 1, 1916	3.0	Earth excavating	0.275 per cu. yd.	11,000 cu. yd.	3,025.00
				Hauling and placing culv. pipe	0.25 per lin. ft.	350 lin. ft.	88.00
				Tile drains	0.15 per lin. ft.	1,000 lin. ft.	150.00
Scott	Ia. Wood Fiber Co.	June 26, 1916	0.2	Asphalt surfacing	0.60 per sq. yd.	1,555 sq. yd.	933.00
Sioux	Driscoll & Harkin	Oct. 14, 1916	0.7	Earth excavating	0.35 per cu. yd.	4,700 cu. yd.	1,645.00
Tama	Blythe Bros.	April 28, 1916	1.0	Earth excavating	0.18 per cu. yd.	4,100 cu. yd.	738.00
Tama	Cameron-Joyce	May 12, 1916	6.0	Earth excavating	0.205 per cu. yd.	67,100 cu. yd.	13,755.00
Wapello	J. F. Jackson	Nov. 23, 1916	0.6	Earth excavating	0.33 per cu. yd.	6,000 cu. yd.	1,980.00
Winnebago	Morrison Const. Co.	Sept. 16, 1916	1.0	Earth excavating	0.25 per cu. yd.	7,820 cu. yd.	1,955.00
Total			208.57				$260,554.00

Total number of contracts approved, 35.
Total earth excavation in contracts approved, 1,001,335 cu. yd.
Total cost of earth excavation in contracts approved, $221,389.00.
Average unit cost of earth excavation, $0.22109 per cu. yd.

SCHEDULE EIGHT—ROAD COMPLAINTS

County	Complaints Filed with Commission	County	Complaints Filed with Commission
Adair	3	Jefferson	1
Adams		Johnson	1
Allamakee		Jones	1
Appanoose	3	Keokuk	1
Audubon	3	Kossuth	1
Benton	2	Lee	2
Black Hawk	1	Linn	2
Boone	5	Louisa	2
Bremer		Lucas	2
Buchanan	1	Lyon	1
Buena Vista	2	Madison	2
Butler	1	Marion	2
Calhoun		Marshall	2
Carroll	2	Mills	1
Cass	2	Mitchell	1
Cass, Garde	2	Monona	1
Cherokee	1	Monroe	1
Cedar	1	Montgomery	1
Chickasaw	1	Muscatine	1
Clarke	1	O'Brien	1
Clay	1	Osceola	1
Clayton	1	Page	1
Clinton	1	Palo Alto	1
Crawford	1	Plymouth	1
Dallas	1	Pocahontas	1
Davis	1	Polk	1
Decatur	1	Pottawattamie	1
Delaware	1	Poweshiek	1
Des Moines	1	Ringgold	1
Dickinson	1	Sac	1
Dubuque	1	Scott	1
Emmet	1	Shelby	1
Fayette	1	Sioux	1
Floyd	1	Story	1
Franklin	1	Tama	1
Fremont	1	Taylor	1
Greene	1	Union	1
Grundy	1	Van Buren	1
Guthrie	1	Wapello	1
Hamilton	1	Warren	1
Hancock	1	Washington	1
Hardin	1	Wayne	1
Harrison	1	Webster	1
Henry	1	Winnebago	1
Howard	1	Winneshiek	1
Humboldt	1	Woodbury	1
Ida	1	Worth	1
Iowa	1	Wright	1
Jackson	1		
Jasper	1		
Total	151		

SCHEDULE NINE—COUNTY ROAD CHANGES UPON WHICH OFFICIAL ACTION HAS BEEN TAKEN

County	Date Filed with Commission	Date of Action by Commission	Was Board's Action Approved?	Mi. to be Added Co. System	Mi. to be Deducted Co. System
Adams	May 25, 1916	June 6, 1916	Yes	9½	
Adams	Jan. 25, 1915	June 14, 1916	Yes	½	
Appanoose	Jan. 1916	April 19, 1916	Yes	1½	¼
Appanoose	March 23, 1916	April 3, 1916	Yes	7	1½
Audubon	1914		Yes	3	
Audubon	July 18, 1916	Oct. 12, 1916	No	2	
Boone		Sept. 25, 1916	Yes		¼
Buchanan	July 14, 1915	July 21, 1915	Yes	½	½
Buchanan	Feb. 21, 1916	March 6, 1916	Yes	5½	¼
Buena Vista	Nov. 24, 1915	Jan. 22, 1916	Yes	3¼	
Butler	Dec. 6, 1915	Jan. 22, 1916	Yes	½	2¼
Butler	Sept. 16, 1916	Sept. 25, 1916	Yes	½	
Calhoun	March 31, 1916	April 19, 1916	Yes	6½	½
Cass	July 7, 1916	July 24, 1916	Yes	½	
Cerro Gordo	July 29, 1916	Sept. 21, 1916	Yes	¼	
Cerro Gordo	Oct. 31, 1916	Nov. 23, 1916	Yes	½	
Cherokee	April 10, 1916	Oct. 12, 1916	No	3½	4½
Cedar	June 26, 1916		No	9	
Clarke		March 6, 1916	Yes	½	½
Crawford	Oct. 14, 1915	Nov. 18, 1915	Yes	3	3½
Crawford	March 31, 1916	June 19, 1915	Yes	½	¼
Dallas	Dec. 27, 1915	Sept. 25, 1916	Yes	½	
Delaware	April 30, 1916	May 12, 1916	Yes	3½	
Dickinson	Jan. 1, 1916	Feb. 9, 1916	Yes	2½	½
Dickinson	Feb. 16, 1916	Aug. 3, 1916	No	10	11
Franklin	Dec. 6, 1915	April 3, 1916	Yes	3	
Franklin	July 10, 1916	Sept. 25, 1916	Yes	3½	
Grundy	Dec. 13, 1915	Jan. 22, 1916	Yes	4	2
Grundy	March 9, 1916	April 3, 1916	Yes	1½	1½
Grundy	June 16, 1916	July 6, 1916	Yes	2	
Hamilton	Jan. 4, 1916	Jan. 22, 1916	Yes	6	
Hancock	Nov. 20, 1915	Jan. 22, 1916	Yes	12¼	
Hancock	May 11, 1916		No	8½	
Hancock	Oct. 6, 1916	Oct. 12, 1916	Yes	1	
Henry		May 12, 1916	Yes	4	
Henry	Feb. 7, 1916	Oct. 12, 1916	Yes	6	
Humboldt	Oct. 25, 1915	Nov. 18, 1915	Yes	1	
Humboldt	Oct. 23, 1916	Oct. 27, 1916	Yes	2	
Kossuth	March 16, 1916	April 3, 1916	Yes	14¼	
Mitchell	Nov. 16, 1915	April 3, 1916	Yes	3¼	
Monroe	Dec. 30, 1915	Dec. 2, 1915	No	5	
Monroe	April 24, 1916	Oct. 27, 1916	Yes	3½	
Monroe	June 4, 1916	May 12, 1916	No	7	
Monroe	June 4, 1916	Oct. 27, 1916	No	12	
Monroe	Oct. 4, 1916	Oct. 27, 1916	No	5¼	
Monroe	Oct. 4, 1916	Oct. 27, 1916	No	9	
Montgomery	Aug. 30, 1916	Oct. 27, 1916	Yes	1½	
O'Brien	April 18, 1916	Sept. 21, 1916	Yes	6½	
Palo Alto		May 23, 1916	Yes	1	
Palo Alto	April 20, 1916	April 3, 1916	Yes	½	
Palo Alto		May 12, 1916	Yes	¾	
Palo Alto		Sept. 25, 1916	Yes	¼	
Pocahontas	Aug. 25, 1916	Sept. 25, 1916	Yes	½	
Polk	March 17, 1916	Oct. 27, 1916	Yes	1	1
Polk		April 3, 1916	Yes	1	1¼
Sac	Oct. 15, 1915	Sept. 25, 1916	Yes	¼	
Sac	May 25, 1916	Nov. 18, 1916	Yes	1-20	
Sac	June 26, 1916	Aug. 3, 1916	Yes	½	
Shelby	July 17, 1916	July 6, 1916	Yes	¾	
Union	Dec. 13, 1915	July 24, 1916	Yes	½	½
Union	March 9, 1916	March 6, 1916	Yes	3½	
Union	July 30, 1916	April 3, 1916	No	3	¾

SCHEDULE NINE—Continued

County	Date Filed with Commission	Date of Action by Commission	Was Board's Action Approved	Mi. to be Added Co. System	Miles to be Deducted Co. System
Union	July 20, 1916	July 24, 1916	Yes	1	1¼
Wapello	March 7, 1916	May 12, 1916	Yes	½	
Webster	June 13, 1916	Sept. 25, 1916	Yes	3 7-8	
Webster	June 13, 1916	Sept. 25, 1916	No	4	1½
Winnebago	July 25, 1916	Aug. 3, 1916	In part	3¼	1¼
Total miles accepted				142.43	18.50
Total miles rejected				81.25	19.00
Total requests by board of supervisors				223.68	37.50

SCHEDULE TEN—SHOWING DAYS SPENT IN EACH COUNTY BY DISTRICT ENGINEERS

County	Days	County	Days
Adair	9	Jefferson	13
Adams	9	Johnson	17
Allamakee	14	Jones	7
Appanoose	11	Keokuk	8
Audubon	15	Kossuth	12
Benton	7	Lee	10
Black Hawk	9	Linn	10
Boone	24	Louisa	9
Bremer	9	Lucas	7
Buchanan	13	Lyon	11
Buena Vista	14	Madison	4
Butler	16	Mahaska	20
Calhoun	11	Marion	8
Carroll	18	Marshall	8
Cass	35	Mills	17
Cerro Gordo	13	Mitchell	9
Cherokee	15	Monona	9
Cedar	9	Monroe	13
Chickasaw	20	Montgomery	12
Clarke	8	Muscatine	13
Clay	8	O'Brien	9
Clayton	15	Osceola	5
Clinton	12	Page	7
Crawford	8	Palo Alto	11
Dallas	14	Plymouth	6
Davis	8	Pocahontas	21
Decatur	4	Polk	19
Delaware	9	Pottawattamie	20
Des Moines	16	Poweshiek	6
Dickinson	22	Ringgold	6
Dubuque	9	Sac	9
Emmet	11	Scott	12
Fayette	14	Shelby	10
Floyd	13	Sioux	8
Franklin	14	Story	7
Fremont	19	Tama	14
Greene	14	Taylor	6
Grundy	5	Union	10
Guthrie	16	Van Buren	12
Hamilton	12	Wapello	15
Hancock	11	Warren	16
		Washington	8

SCHEDULE TEN—Continued

County	Days	County	Days
Hardin	16	Wayne	11
Harrison	23	Webster	9
Henry	14	Winnebago	9
Howard	11	Winneshiek	12
Humboldt	13	Woodbury	9
Ida	8	Worth	5
Iowa	7	Wright	15
Jackson	16		
Jasper	12	Total	1,177

Chapter VIII Work of the District Engineers

The five district engineers have spent 1,177 days in the various counties, assisting in the county and township highway work. They have attended fifty-one lettings for the improvement of 468.37 miles of road costing $511,019.82; one hundred thirty-nine lettings for the construction of 2,301 bridges costing $2,322,411, and eighty-seven lettings for bridge and road material. The profiles for 880 miles of road have been examined in the field to determine the reasonableness of the improvement contemplated. Eighty-nine complaints regarding the condition of the highways have been investigated, and a number of meetings have been held in each district for the purpose of explaining the annual report blanks to the county engineers.

The number of days spent in the field are classified as follows:

	1915	1916
Examination of bridge sites	146 days	84 days
Attending bridge lettings	155 days	138 days
Attending material lettings	67 days	79 days
Inspection and supervision of bridge work	341 days	163 days
Examination of emergency work	33 days	12 days
Special assignments	226 days	3 days
Attending road lettings	23 days	44 days
Approval of grade lines	130 days	166 days
Inspection and supervision of road work	256 days	99 days
Inspecting proposed changes of county roads	15 days	37 days
Investigation of complaints	120 days	77 days
Explanation of yearly report blanks	43 days	93 days
Unclassified	86 days	182 days
Total	1,641 days	1,177 days
Deduct time of engineers of road department	304 days	
	1,337 days	1,177 days

(Refer to Schedule Number Ten.)

The classification given for 1915 includes not only the field work of the five district engineers, but also the field work of the engineers of the road department. The classification given for 1916 includes only the work of the district engineers. The number of days reported for 1915 (1337) includes thirteen months time. The average per month was 102.85 days. The number of days reported for 1916 includes twelve months. The average per month was 98.09 days.

In the thirteen months included in the 1915 report, the five district engineers traveled by rail 108,344 miles, or 8,334 miles per month. In the twelve months included in the 1916 report they traveled 100,374 miles, or 8,365 miles per month. The average travel for each day spent in the field was eighty-one miles in 1915, and eighty-five miles in 1916.

It should be noted that the annual distance traveled by the five district engineers is less than the mileage of public highways in the state.

Summary of Field Work of Each District Engineer.

First District. Engineer C. Coykendall has attended eighteen material lettings, thirty-two bridge lettings for 784 structures costing $679,795; sixteen road lettings for 164.5 miles of road costing $210,110.02; investigated nineteen complaints; spent twenty-one days in taking field measurements for bridges, thirty-one days on field examination of road profiles, and thirty-nine days in the supervision and inspection of bridge and road work. A total of 240 days has been spent in the field requiring traveling amounting to 22,480 miles.

Second District. Engineer W. H. Root has attended twenty-eight material lettings, thirty-seven bridge lettings for 489 structures costing $580,349.30; eight road lettings for 43.67 miles of road costing $65,552.70; investigated eleven complaints; spent thirty-nine days taking field measurements for bridges, twenty-seven days on field examination of road profiles, and fifty-four days in the supervision and inspection of bridge and road work. A total of 240 days has been spent in the field, requiring travel amounting to 20,225 miles.

Third District. Engineer W. F. Beard has attended nine material lettings, twenty-four bridge lettings for 396 structures costing $471,601.29, and twenty-one road lettings for 246.3 miles of road costing $204,099.10; investigated five complaints; spent three days taking field measurements for bridges, sixty-seven days in field examination of road profiles, and forty days in the inspection and

supervision of bridge and road work. A total of 221 days has been spent in the field, requiring travel amounting to 21,630 miles.

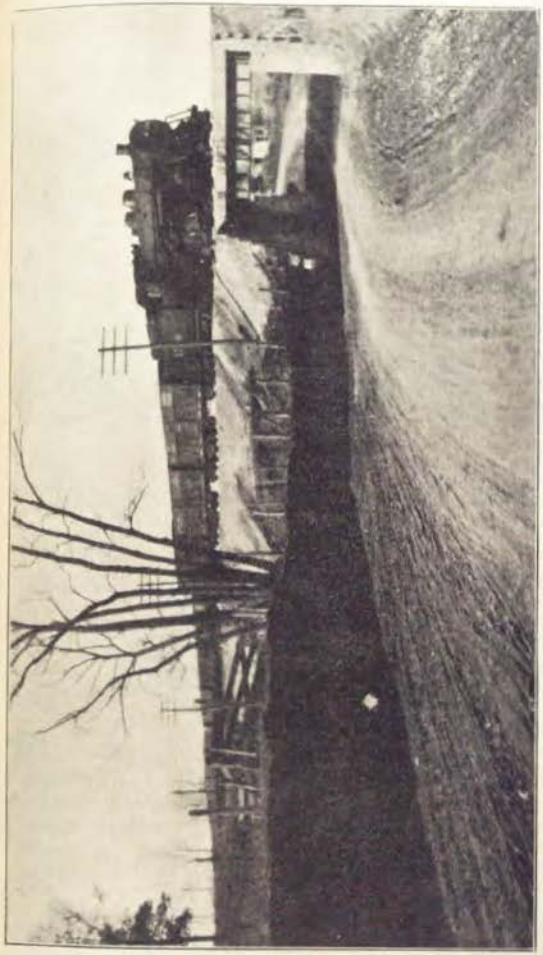
Fourth District, Engineer L. M. Martin has attended eighteen material lettings, twenty-four bridge lettings for 214 structures costing $270,554; three road lettings for six miles of road, costing $13,881.36; investigated twenty-five complaints; spent fifteen days taking field measurements for bridges, nine days on field inspection of road profiles, and sixty-two days in the supervision and inspection of bridge and road work. A total of 244 days has been spent in the field, requiring travel amounting to 19,700 miles.

Fifth District, Engineer J. S. Morrison has attended fourteen material lettings, twenty-two bridge lettings for 418 structures costing $320,111.42; three road lettings for eight miles costing $17,376.14; investigated twenty-nine complaints; spent six days in taking field measurements for bridges, thirty-two days in field examination of road profiles, and sixty-six days in the supervision and inspection of road and bridge work. A total of 232 days has been spent in the field, requiring travel amounting to 16,339 miles.

Chapter IX—Railroad Crossing Improvement

January 1, 1916, to January 1, 1917.

Since May, 1914, the Commission has undertaken an active campaign for the elimination and improvement of the most dangerous railroad crossings in the State. The increasing number of deaths and serious accidents resulting from a marked increase in the amount of travel on the highways, together with the urgent demand for greater protection to the traveling public has given this phase of highway improvement great importance. The incomplete records received only from the newspaper clippings, show a total death list from crossing accidents for 1916 of 38 lives. Below is given, in tabulated form, the summary and comparative results accomplished on railroad crossing improvements during the years 1915 and 1916.



Grade Separation on the Dubuque Post Road—This view shows the grade separation on the Dubuque-Dyersville Post road one mile west of Epworth. The Illinois Central Railroad track is carried above the highway on a concrete structure, as shown in the picture. The possibility for making a permanent under grade crossing at this point was secured through a slight relocation of the highway which gave sufficient vertical clearance. The cost of this improvement was $6,300.

COMPARATIVE STATEMENT OF WORK ACCOMPLISHED—RAILROAD CROSSING IMPROVEMENTS TO JANUARY 1, 1917

	1915	1916	Total to Jan. 1, 1917
Total crossing projects listed	112	43	237
Total railroad crossings involved on projects listed	121	80	302
Projects surveyed	45	25	121
Projects for which plans and estimates were prepared during year	46	32	104
Number of conferences held during the year	37	28	65
Total projects satisfactorily adjusted	41	23	64
Projects completed during the year	27	22	49
Number of crossing projects listed which have been appealed to Railroad Commission	9	5	14
Projects adjusted by Railroad Commission	2	4	6
Crossings eliminated	7	12	19
Grade crossings eliminated by grade separation	10	7	17
Crossings improved	55	24	79
Crossing projects temporarily abandoned	20	34	54
Estimated cost of crossings satisfactorily adjusted	$107,324.00	$110,259.00	$217,583.00
Total estimated cost of crossing improvements on Commission plan	211,400.00	350,087.00	561,487.00
Total amount appropriated by railroads for crossing projects	69,122.00	68,341.00	137,463.00
Total amount appropriated by public funds for crossing projects	38,202.00	41,918.00	80,120.00

There are 8,700 railroad crossings on the 104,000 miles of public highways in Iowa, which is approximately one crossing for every 12 miles of highway. Of the above number, 1,533 or 18 per cent are located on the County Road System and 7,143 or 82 per cent are on the township Road System. It is, therefore, apparent that since the County Road System carries a large per cent of the entire traffic, that the most dangerous crossings on the County Road System should receive first consideration. 128 or 54 per cent of the 237 crossing projects listed for improvements, are located on the County Road System. Eighty-four or 35 per cent are on the Township Road System and 25 or 11 per cent are inside of corporation limits.

Method of Handling Crossing Complaints.

Each crossing project presents a specific problem which requires a special study before a satisfactory plan for elimination or improvement can be worked out. In many cases, it is necessary to prepare detailed plans and estimates of cost showing the existing condition and the method of improvement recommended. In general a similar procedure is followed on all projects called to the attention of the Commission.

Upon the request of the proper county, township or city official, the crossing is assigned a project number and listed for inspection.

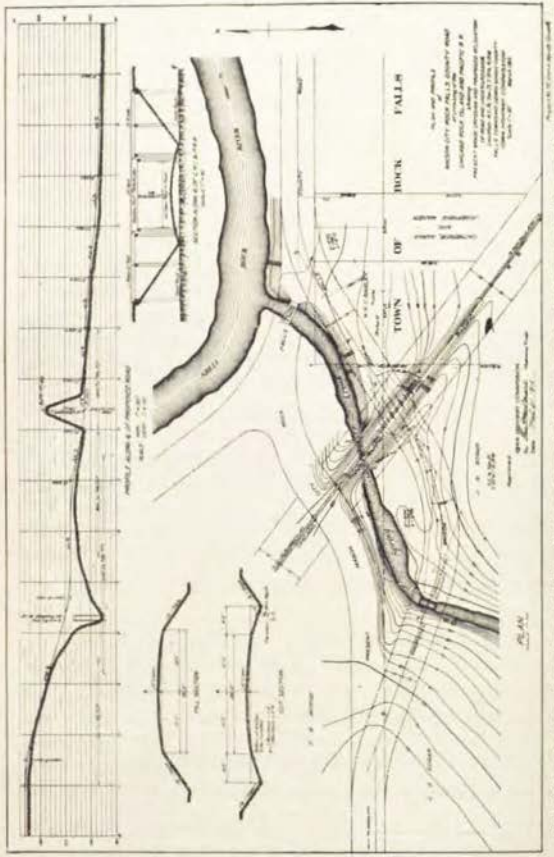
An engineer of the Commission, familiar with work of this character, is assigned to make a detailed study of the existing crossing and recommendations for improvement. In many cases, it is necessary to make a complete topographical survey of the territory adjacent to the crossing in order to secure the necessary information for working out the plans for the improvement of the crossing. (See page 110.) After the plans and estimates of cost have been prepared and forwarded to the interested parties, a conference is arranged, usually at the site of the crossing. This conference is held for the purpose of considering the proposed plans for improvement and the distribution of cost between the railroad company and county, township or city authorities interested. On account of the dissimilarity of crossing projects and the local conditions affecting each improvement, it is impractical to recommend a fixed method for the distribution of cost which would be applicable to all projects under consideration. It has also been found inequitable to follow a general policy of distributing the cost of the improvement between the railroad company and public funds on the basis of the proportions of cost expended on the railroad and highway right of ways. Such a distribution of cost has only been found equitable in a very limited number of the crossing projects which have been satisfactorily adjusted. Since there is a joint responsibility existing between the railroad and the public at highway crossings, the distribution of cost of each improvement should be a subject for careful consideration and should be based as nearly as possible on the actual benefits received by each of the interested parties.

Appeal to Railroad Commission.

If a satisfactory agreement cannot be reached, an appeal is made to the Board of Railroad Commissioners, who are given final authority by statute for distributing the costs of such improvements. On the projects adjusted to date, a total of 14 or approximately 15 per cent of the total number completed, have been appealed. Six projects or 6.2 per cent of the total adjustments have been upon formal orders of the Board of Railroad Commissioners.

Types and Distribution of Dangerous Crossings.

Of the three types of crossings: grade, overhead and undergrade, by far the most dangerous from the standpoint of the users of the highway, is the grade crossing. While no accurate figures are available at this time, it is estimated that over 90 per cent of the cross-



Rock Falls Crossing, Cerro Gordo County—This is a typical plan prepared by the Commission for a railroad crossing improvement. In this case a dangerous grade crossing was eliminated by a slight relocation of the county road and the construction of an under grade crossing. A mother and her daughter were killed on the old crossing which is now abandoned by the new improvement. The bridge was constructed of concrete and steel.

ings on the highways of the state are at grade. The tabulated statement below, shows the number and percentage of the various types

Julien Crossing on Dubuque Post Road—This view shows the old road and the site of the present 180' wooden viaduct which carries the Dubuque Post road over the Illinois Central railroad tracks near Julien. At the point where the creek crosses the highway in the foreground a 4'x4' box culvert, 140' in length has been constructed. The fill at this point is 35' high.

Wooden Overhead Crossing—This photograph shows the wooden structure which carries the Dubuque Post road, which is also a portion of the Hawkeye Highway, over the Illinois Central R. R. tracks near Julien in Dubuque county. This overhead bridge eliminates by grade separation a very dangerous double track crossing on this important highway. It also materially reduces the amount of rise and fall on the mile of road on which it is located.

of crossings which have been listed for improvement or improved to date:

DISTRIBUTION AND PERCENTAGE OF CROSSINGS LISTED FOR IMPROVEMENT OR IMPROVED TO JANUARY 1, 1917

	Distribution of Original Crossings as Listed by the Commission	
	Number	Percentage
Grade	243	80
Overhead	21	7
Undergrade	33	11
New Crossings	5	2
Total	302	100

	Distribution of Crossing Improvements According to Plans or Recommendations of the Commission						
	Eliminated		Improved		Grade Separation		Total Number
	No.	%	No.	%	No.	%	
Grade	90	37	81	47	47	26	161
Overhead	2	12	14	88	..	..	16
Undergrade	5	20	20	80	..	..	25
New Crossings	..	..	..	..	..	..	..
Total	97	28	118	53	47	21	222

	Distribution of Crossing Improvements Satisfactorily Adjusted to Date						
	Eliminated		Improved		Grade Separation		Total Number
	No.	%	No.	%	No.	%	
Grade	16	16	53	62	17	20	86
Overhead	1	9	10	91	..	..	11
Undergrade	2	11	16	89	..	..	18
New Crossings	..	..	..	..	..	..	..
Total	19	16	79	69	17	15	115

Methods of Improvement.

It is apparent that the greatest number of improvements listed, are on grade crossings. Three general methods of improvement to grade crossings have been successfully employed: Elimination, grade separation or improvement to obtain better approach grades or views.

Elimination is usually accomplished by relocation of the highway which is the method used whenever practicable. Grade separation necessitates the construction of overhead or undergrade crossing structures and is the method recommended whenever relocation is impracticable or topographical or traffic conditions will justify a heavy expenditure for such a method of improvement.

If elimination or grade separation is not a feasible method of improvement, it is often possible to greatly improve the original crossing by a careful study of the local conditions which make the crossing dangerous. Bevelling the banks, grading up to approaches, removal of obstructions to the view of approaching trains or vehicles, and slight relocations are all common methods employed in greatly benefitting grade crossings.

The overhead crossing complaints generally arise from a failure on the part of the railroads to appreciate the safety or convenience of the users of the highway. Steep approach grades, narrow roadways, right angle approaches, or unsafe structures are all causes of complaints commonly filed with the Commission. The time is at hand when proper provision for the safety and convenience of the traveling public should be of first importance in the design and construction of overhead bridges, and in order to obtain these inherent rights for the public, it will be necessary to repair, renew or relocate a large number of the existing structures of this character.

The complaints on undergrade crossings have been numerous but not as general as those on the two types of crossings just mentioned. Most of the complaints filed, refer to inadequate drainage, insufficient horizontal or vertical clearance, or obstructed view to vehicles approaching the crossing. The remedy these conditions, necessitates a careful study of local conditions affecting the improvement and in some cases, requires the preparation of detailed plans for the specific improvement.

Recommendations for Improved Crossings.

The Commission has formulated some general recommendations governing the construction of the three types of crossings just men-

tioned. These minimum requirements are given below in detailed form.

Grade Crossings:

Undergrade Crossings:

Overhead Crossings:

Grade Crossings:
- Location of crossing signs 300' from crossing, maximum approach grade to crossing 6%
- Level approach grade on each side of track ..... 25'
- Width of planking measured at right angles to the highway (County Road System) ..... 24'
- Width of planking measured at right angles to the highway (Township Road System) ..... 20'
- Clear view which allows a person in a vehicle 200' from the crossing to observe an approaching train an equal distance from the crossing.

Undergrade Crossing:
- Vertical clearance ..... 13'
- Horizontal clearance—temporary construction ..... 18'
- Horizontal clearance—permanent construction, County Road System ..... 24'
- Horizontal clearance—permanent construction, Township Road System ..... 20'
- Clear view of approaching vehicles not less than 200' at any point as measured on center line of the highway.

Overhead Crossings:
- Vertical distance top of rail to low steel ..... 22'
- Width of roadway—temporary construction ..... 20'
- Width of roadway—permanent construction, County Road System ..... 24'
- Width of roadway—permanent construction, Township Road System ..... 20'

The Nevada Crossing Project—This photograph shows a general view of the Lincoln Highway crossing over the Rock Island R. R. tracks, east of Nevada. The highway is carried over the track on a poorly constructed combination of wood and steel viaduct. The floor of the viaduct is at a very steep incline. A short distance beyond the point shown in the extreme right of the photograph, the highway is carried again at a steep grade over the North-Western tracks on a grade crossing. Plans have been prepared for the replacing of the viaduct over the Rock Island and the construction of an undergrade crossing under the North-Western tracks. Negotiations are pending at the present time with the Rock Island, but have been completed with the North-Western. The estimated cost of the entire improvement is $50,000.

Distribution of Crossing Improvements.

The distribution of crossing improvements according to the number of crossings on the county and township road system, and the mileage of track owned by the principal railroad systems in the state, is given in the tabulation below. While no attempt has been made to distribute these crossings in direct ratio to the mileage of track owned by each railroad, yet the actual distribution of the crossings is practically in this ratio.

DISTRIBUTION OF CROSSINGS AND PROJECTS LISTED

Name of Railroad	Number of crossings on county road system	Number of crossings on Township road system	Total number of crossings	No. of projects listed by commission for improvement	Total mileage of track in state
C., R. I. & P.	348	1526	1874	44	2959
C., M. & St. P.	251	1277	1528	35	2663
C., B. & Q. R. R.	272	915	1187	58	2020
C. & N. W.	208	1183	1391	32	2539
C. & G. W.	123	633	756	20	1066
M. & St. L.	111	582	693	14	1053
Illinois Central	95	442	537	12	928
Wabash R. R.	41	142	183	10	237
Great Northern	9	56	65	4	103
C., St. P., M. & O.	11	60	71	3	139
Miscellaneous—R. R. & Interurban	63	327	390	15	481
Total	1533	7143	8676	247	14188

Important Crossing Adjustments.

Several important crossing projects have been adjusted during the year. Notable among these is the elimination of one dangerous grade crossing on the main line of the Chicago and Northwestern Railroad and the improvement by reconstruction of an overhead bridge over the track of the Chicago, Rock Island and Pacific Railroad. These two crossings are involved in the same project, the plans for which were prepared by the Commission. The improvement consists of the construction of a subway under the Chicago and Northwestern tracks at an estimated cost of $28,000 and the replacing by permanent construction of a temporary combination wood and steel viaduct over the Chicago, Rock Island and Pacific track at an estimated cost of $22,000. The estimated cost of the entire improvement is $50,000, of which the Chicago and North Western Railroad Company is to pay approximately $25,000, the Chicago, Rock Island and Pacific Railroad $12,000 and Story

County $13,000. An agreement has been reached with the Chicago and North Western Railroad which insures the construction of its portion of the improvement during 1917 and an adjustment is pending with the Chicago, Rock Island and Pacific Railroad at the present time. Views of the crossings to be improved, are shown on pages 114 and 117.

Two very dangerous grade crossings in Polk County will be improved by grade separation next year. A grade crossing located on the Beaver Avenue Road near the north city limits of Des Moines on the Des Moines-Perry Interurban will be replaced by an overhead bridge during 1917. An agreement was entered into on November 27, 1916, between the Interurban Railroad Company and Polk County for the improvement of this crossing under plans as prepared by the Commission. The estimated cost of this improvement is $6,700. The county will pay 45 per cent and the Interurban Railway Company will pay 55 per cent of the cost on this project. Another very dangerous grade crossing on the Des Moines-Carlisle County Road at its intersection with the Chicago Rock Island and Pacific tracks between Sections 28 and 29, Allen township, will be replaced by an overhead bridge with earth approach grades. An agreement was reached between Polk County and the Chicago, Rock Island and Pacific Railroad for the improvement of this crossing in accordance with the plans of the Commission. The estimated cost of this improvement is $8,700, which cost will be distributed on the basis of the Railroad Company paying 60 per cent and the county 40 per cent.

Many other important crossing projects were adjusted during the year 1916 and a detailed statement of each crossing listed appears under Schedule 10. The total estimated cost of crossing improvements adjusted on plans prepared by the Commission during 1916 is $110,259.00 of which the railroad will pay $68,341.00, or approximately 62.0 per cent.

Plans for Future Work.

Surveys for a number of important projects have been made and the plans are now in the course of preparation. A number of these projects will be completed in time to allow conferences to be held before the construction season opens and the actual construction work undertaken in 1917. In addition to the regular plan for improvement of the most dangerous crossings as outlined above, the Commission expects to send out blanks to the county engineers to secure general information on all highway crossings in the State.

Such information when compiled, should prove invaluable in a study of the future crossing problems in the State.

SCHEDULE ELEVEN.

DETAILED STATEMENT OF WORK ACCOMPLISHED AND PROGRESS REPORT ON EACH CROSSING PROJECT LISTED.

NO. 9—LINN COUNTY.

Section 33, Monroe Township; Illinois Central Railroad and Waterloo, Cedar Falls and Northern Railroad.

Revisions of the plan for this crossing were made in 1916. The recommendation of the Commission calls for a grade separation of these two grade crossings by the construction of an overhead crossing. A petition was filed by eighty-six interested citizens for a grade crossing improvement. Plans for a grade separation and for a grade crossing have been prepared by the Commission, but no agreement reached as to method of improvement or distribution of cost to date.

NO. 10—POLK COUNTY.

Section 18, Webster Township, ¼ mile north of Des Moines; Des Moines Inter-Urban Railroad.

At a conference held in Des Moines on November 27th an agreement was reached between the county and Railroad Company. The county pays 45% and the Railroad

Steep Incline at Grade Crossing—This type of grade crossing in which the approach to the tracks is up a steep incline, with a very short level section of the road where it passes over the railroad tracks, is about as dangerous as where both tracks and highway are located in cuts. This is the North-Western crossing between Nevada and Colo and is especially dangerous not only because of the steepness of the incline but by reason of the fact that the approach on both sides of the track is on sharp curves. The Lincoln Highway parallels the North-Western tracks for some distance on either side of the crossing. The highway will pass under the tracks, the improvement, costing $28,000.00.

Company 55% of the cost of an overhead crossing estimated at $6,700. Work will be done in 1917 on plans as prepared by the Commission.

NO. 18—PAGE COUNTY.

Sections 29 and 30, Lincoln Township, near Coin; Wabash Railroad.

Conference held at crossing November 28, 1916. Plans as prepared by Commission accepted. No agreement as to distribution of cost reached. Will be taken up by correspondence.

NO. 23—CLARKE COUNTY.

Section 31, Green Bay Township, 2 miles south of Osceola; Chicago, Burlington & Quincy Railroad.

Proposition ready for conference. Will be taken up in 1917.

NO. 24—CLARKE COUNTY.

In Singlers Addition, town of Woodburn; Chicago, Burlington & Quincy Railroad. Proposition appealed to Railroad Commission December 20, 1915.

NO. 26—POLK COUNTY.

Between Sections 28-29, Allen Township; Chicago, Rock Island & Pacific Railroad. At a conference held on November 27, 1916, an agreement was reached between the railroad and county which insures the elimination of this dangerous grade crossing. The county pays 40% and the railroad 60% of the entire cost of the improvement, based on the plans as prepared by the Commission. Work will be done in 1917.

No. 41—ADAMS-TAYLOR COUNTIES.

Section 33, Grant Township, Adams County; Chicago, Burlington & Quincy Railroad. Temporarily abandoned at request of Board of Supervisors.

NO. 44—HAMILTON COUNTY.

Section 17, Cass Township, 4 miles north of Webster City; Chicago & North-Western Railroad.

No survey made. Proposition temporarily abandoned.

NO. 45—HAMILTON COUNTY.

Section 8, Cass Township, 5 miles north of Webster City; Chicago & North-Western Railroad.

No survey made. Proposition temporarily abandoned.

NO. 47—DICKINSON COUNTY.

Sections 28 and 33, Diamond Lake Township; Chicago, Rock Island & Pacific Railroad.

Adjusted at conference held July 11, 1916. County builds culvert and pays 50% of grading cost; Railroad Company pays remainder of cost.

NO. 50—CLARKE COUNTY.

Sections 15 and 22, Osceola Township, 2 miles east of Osceola.

Proposition temporarily abandoned. May be taken up in 1917.

NO. 51—WASHINGTON COUNTY.

Section 10, Iowa Township, in Iowa Junction; Chicago, Rock Island & Pacific Railroad.

Conference will be arranged upon request of Board of Supervisors. Plan and estimates prepared by Commission.

NO. 53—CRAWFORD COUNTY.

Sections 24 and 25, Boyer Township, 5 miles southwest of Dows City; Chicago & North-Western Railroad.

Proposition now under adjustment between county and railroad company. No agreement reported to date.

NO. 55—LOUISA COUNTY.

Section 25, Wapello Township, 1½ miles west of Elrick Station; Minneapolis & St. Louis Railroad.

A conference was held on this project at which time the county submitted a proposition to the Railroad Company, agreeing to pay $600 towards the improvement of this crossing by the construction of an undergrade crossing. Acceptance of the proposition has not been made by the Railroad Company to date.

NO. 56—LOUISA COUNTY.

Section 31, Morning Sun Township, 2 miles southeast of Morning Sun; Chicago, Rock Island & Pacific Railroad.

Plans and estimates completed and forwarded to railroad company and county. Conference will be arranged upon request of board of supervisors.

NO. 59—MARION COUNTY.

Section 35, Liberty Township, near Hamilton; Chicago, Burlington & Quincy and Wabash Railroads.

Railroad companies have installed signal bell and proposition has been temporarily abandoned.

NO. 61—DALLAS COUNTY.

Sections 32 and 33, Union Township; Chicago, Rock Island & Pacific Railroad.

Proposition now completed. Railroad Company and county each paid 50% of the cost of the improvement estimated at $650.

NO. 65—MONROE COUNTY.

Section 1, Troy Township, 3¼ miles east of Albia; Minneapolis & St. Louis Railroad.

Plans and estimates now complete and project will be taken up at conference to be held early in 1917.

NO. 67—MARION COUNTY.

Section 10, Knoxville Township, 2 miles east of Knoxville; Chicago, Burlington & Quincy Railroad.

Work practically completed on this crossing improvement. The existing undergrade crossing was widened and improved at entire expense of Railroad Company.

NO. 68—MARION COUNTY.

Sections 19 and 20, Swan Township, in town of Swan; Chicago, Burlington & Quincy Railroad.

Satisfactorily adjusted. (See 1915 Report.)

NO. 69—WOODBURY COUNTY.

Sections 28 and 33, Banner Township, near Lawton; Chicago & North-Western Railroad.

Plans and estimates of cost forwarded to Railroad Company and county. Conference will be arranged upon request of board of supervisors.

NO. 72—WOODBURY COUNTY.

Section 36, Little Sioux and Section 31, Oto Township; Chicago, Milwaukee & St. Paul Railroad.

Appealed to Railroad Commission who ordered improvement in accordance with Commission's plans. The county to do the grading work and the Railroad Company to pay not to exceed $300. Work completed in 1916.

NO. 73—JEFFERSON COUNTY.

Section 36, Lockridge Township, east of Lockridge; Chicago, Burlington & Quincy Railroad.

This improvement was adjusted at a conference held in 1915, but on account of a later improvement to the county highway the project was abandoned. Now included under No. 212. See report on this project.

NO. 74—LEE COUNTY.

Sections 3 and 4, West Point Township, near West Point; Chicago, Burlington & Quincy Railroad.

A conference for the consideration of the improvement of this project is set for January 4, 1917. Plans and estimates of cost are complete, which contemplate the elimination of four crossings and the improvement of two crossings.

NO. 79—CERRO GORDO COUNTY.

Sections 13 and 18, Pleasant Valley Township, 1 mile south of Swaledale; Chicago, Great Western Railroad.

Plans completed and furnished to county and Railroad Company. Project will be taken up in 1917.

NO. 80—LUCAS COUNTY.

Sections 1 and 2, Benton Township, 1 mile west of Russell; Chicago, Burlington & Quincy Railroad.

Plans and estimates of cost prepared for this project. Conference for a discussion of this improvement will be arranged upon request of board of supervisors.

NO. 81—LUCAS COUNTY.

In Section 19, Union Township; Chicago, Burlington & Quincy Railroad.

Plans and estimates of cost prepared for this improvement. Conference for the consideration of the methods of improvement and distribution of cost will be held upon request of board of supervisors.

NO. 82—PALO ALTO COUNTY.

Sections 13 and 14, Highland Township, 7 miles west of Emmetsburg; Chicago, Milwaukee & St. Paul Railroad.

Improvement finally made on basis of improvement to grade crossing. County and railroad each paid about 30% of the cost of improving crossing in this manner.

NO. 86—SIOUX COUNTY.

Sections 6 and 7, and 7 and 8, Lincoln Township; Great Northern Railroad.

Plans are being revised for this improvement and will be submitted to Railroad Company and county at early date. A conference was held on this project July 27, 1916, and the various methods of improvement discussed. No agreement was reached at that time.

NO. 87—SIOUX COUNTY.

Sections 20 and 21, West Branch Township; Great Northern Railroad.

Surveys for the improvement of this crossing have recently been completed and plans for the improvement will be made at an early date.

NO. 88—LYON COUNTY.

Section 30, Larchwood, and Section 25, Sioux Township; Chicago, Rock Island & Pacific Railroad.

Plans have been completed for this improvement and a conference will be arranged upon request of board of supervisors.

NO. 89—LYON COUNTY.

Sections 35 and 36, Doon Township, 1 mile south of Doon; Great Northern Railroad.

Survey recently made and plans now in course of preparation. Will be taken up in 1917.

NO. 91—DAVIS COUNTY.

Section 3, West Grove Township; Wabash Railroad.

Temporarily abandoned. (See 1913 Report.)

NO. 93—MONROE COUNTY.

Sections 21 and 22, Urbana Township; Chicago, Milwaukee & St. Paul Railroad.

Temporarily abandoned. (See 1915 Report.)

NO. 94—WRIGHT COUNTY.

N. W. corner Section 27, Blaine Township; Chicago, Rock Island & Pacific Railroad.

Surveys will be made at an early date for the improvement of this crossing.

NO. 95—TAYLOR COUNTY.

Lennox Crossing; Chicago, Burlington & Quincy Railroad.

Will be surveyed upon request of board of supervisors.

NO. 96—MUSCATINE COUNTY.

Section 24, Bloomington Township; Des Moines Inter-Urban Railroad.

Plan for improvement as prepared by Commission contemplated an improvement of the present grade crossing by the bevelling of the banks to obtain a better view of the crossing. At a conference held last August the Board of Supervisors and Railroad Company agreed upon the temporary improvement of the crossing by the installation of an electric signal bell.

NO. 97—DALLAS COUNTY.

South corporation limits town of Woodward; Des Moines-Perry Inter-Urban Railroad.

(See 1915 Report.) Appealed to Railroad Commission in 1916 and adjusted upon formal order of Railroad Commission requiring Railroad Company to construct under-

Dangerous Type of Grade Crossing—The type of grade crossing on which both the railroad crossing and the highway, are both in cuts, is in general, the most dangerous of grade crossings. This view shows a crossing on the Great Northern R. R., five miles north of Perkins in Sioux county. It is No. 86 in the list of crossings scheduled by the Highway Commission for improvement. Present day traffic demands the elimination of the dangerous railroad crossing of this kind.

grade crossing in accordance with plans as prepared by Highway Commission. County and Railroad Company to each pay 30% of the cost of the improvement.

No. 98—BUTLER COUNTY.

Sections 28 and 33, Albion Township, 2½ miles south of Parkersburg; Chicago & North-Western Railroad.

Surveys made but plans have not been prepared. Temporarily abandoned.

NO. 99—FLOYD COUNTY.

Section 14, Rockford Township; Chicago, Rock Island & Pacific Railroad.

The plans on this project are being revised and the project will be taken up early in 1917.

NO. 100—MARION COUNTY.

Section 29, Swan Township, 1 mile south of Swan; Chicago, Burlington & Quincy Railroad.
Temporarily abandoned.

NO. 101—MUSCATINE COUNTY.

Section 16, Goshen Township, 2½ miles east of West Liberty; Chicago, Rock Island & Pacific Railroad.
Crossing improved as per plans of Commission. Settlement with Railroad Company now pending. Satisfactory adjustment in 1915.

NO. 104—DUBUQUE COUNTY.

Section 27, Dubuque Township, Center Grove; Illinois Central Railroad.
Construction work completed on this project. (See 1915 Report.)

NO. 105—DUBUQUE COUNTY.

Section 36, Center Township, Julian Viaduct; Illinois Central Railroad.
Construction work completed on this viaduct. (See 1915 Report.)

NO. 106—DUBUQUE COUNTY.

Section 10, Taylor Township, 1 mile west of Epworth; Illinois Central Railroad.
Construction work completed in 1916. (See 1915 Report.)

NO. 107—FAYETTE COUNTY.

In city of Oelwein; Chicago Great Western Railroad.
Temporarily abandoned. (See 1915 Report.)

NO. 108—WAYNE COUNTY.

Sections 15 and 16, Jackson Township, in town of Harvard; Chicago, Rock Island & Pacific Railroad.
Conference held at site of crossing September 1, 1916. No agreement reached between Railroad Company and county. Adjustment now being carried on by correspondence.

NO. 112—IOWA COUNTY.

Near North English; Chicago, Milwaukee & St. Paul Railroad.
Temporarily abandoned. (See 1915 Report.)

NO. 115—BOONE COUNTY.

Sections 29 and 32, Garden Township, 1 mile east of Madrid; Chicago, Milwaukee & St. Paul Railroad.
Temporarily abandoned until further requests for improvement are filed.

NO. 117—DALLAS COUNTY.

Section 20, Van Meter Township.
Temporarily abandoned until further requests for assistance in securing improvement are made.

NO. 118—LUCAS COUNTY.

Court Street crossing in Chariton; Chicago, Burlington & Quincy Railroad.
Appealed to Railroad Commission in 1915. No decision announced to date. (See 1915 Report.)

NO. 119—LUCAS COUNTY.

Sixteenth Street crossing in Chariton; Chicago, Burlington & Quincy Railroad.
Appealed to Railroad Commission in 1915. No decision announced to date. (See 1915 Report.)

NO. 124—GREENE COUNTY.

Section 31, Kendrick Township, in town of Ralstron; Chicago & North-Western Railroad.
Temporarily abandoned. (See 1915 Report.)

NO. 125—STORY COUNTY.

Sections 3 and 10, Nevada Township, between Colo and Nevada; Chicago & North-Western Railroad, and Chicago, Rock Island & Pacific Railroad.

Two conferences were held in 1916 to consider the improvement of the overhead crossing over the Chicago, Rock Island & Pacific Railroad Company's tracks and the elimination of the grade crossing on the main line tracks of the Chicago & North-Western. At the conference held on July 7th, the Rock Island officials agreed to submit a proposition to their management contemplating the acceptance of the Commission's plan for improvement, which provides for the substitution of an earth approach grade for the wooden trestle on the west end of the present viaduct, and the complete reconstruction of the viaduct over the tracks and approaching the tracks from the east. The division of cost was tentatively agreed upon which places the construction and maintenance costs of the west approach and construction over the tracks upon the Chicago, Rock Island & Pacific Railroad. The county to assume the cost of construction and maintenance for the east approach in accordance with the Commission's plans. The costs under this agreement would be divided approximately as follows: Chicago, Rock Island & Pacific Railroad, $12,000; county, $9,000. A final acceptance is being awaited from the management of the Railroad Company.

On August 8th an agreement was reached with the Chicago & North-Western Railroad Company which insures the construction of a subway crossing under the main line tracks of the railroad in accordance with the plans as prepared by the Commission. The total estimated cost of this part of the improvement is $21,800. The Railroad Company will construct the subway under the tracks at an estimated cost of $25,000. The county will construct the highway north of the tracks and pay $3,000 towards the construction of the subway which makes an estimated expenditure for the county of $4,000.

Under the agreements practically assured, the dangerous grade crossings on the Chicago & North-Western tracks will be eliminated and the viaduct over the Chicago, Rock Island & Pacific tracks greatly improved.

Approximate distribution of expense:

Chicago & North-Western Railroad	$25,000
Chicago, Rock Island & Pacific Railroad	12,000
Story county	13,000
	$50,000

NO. 126—SCOTT COUNTY.

Section 35, Princeton Township; Davenport, Rock Island & North-Western Railroad.
Plans and estimates of cost were completed by the Commission in 1915. The proposition was finally appealed to the Railroad Commission and a formal hearing held at Princeton on June 23, 1916. No decision has been announced by the Railroad Commission to date. (See 1915 Report.)

NO. 127—GREENE COUNTY.

Sections 9 and 16, Jackson Township; Chicago & North-Western Railroad.
At a conference held in Jefferson on December 19, 1916, the county submitted a proposition to the railroad officials on the basis of the county paying 40% and the Railroad Company paying 60% of the entire cost of the improvement in accordance with the Commission's plans.

NO. 128—GREENE COUNTY.

Sections 3 and 4, Scranton Township, 1 mile west of Scranton; Chicago & North-Western Railroad.
At a conference held in Jefferson on December 19, 1916, a proposition was submitted by the county to the Railroad Company on this project. The plans as prepared by the Commission were adopted. The county and Railroad Company are each to pay 50% of the cost of the improvement. One grade crossing will be eliminated and one improved.

NO. 141—KEOKUK COUNTY.

Section 26, Richland Township, 1½ miles south of Richland; Chicago, Milwaukee & St. Paul Railroad.
Temporarily abandoned upon request of board of supervisors.

NO. 142—ADAIR COUNTY.

Sections 8 and 9, Summit Township; Chicago, Rock Island & Pacific Railroad.
Temporarily abandoned until further request from board of supervisors.

NO. 143—MAHASKA COUNTY.

South line Section 36, Prairie Township; Minneapolis & St. Louis Railroad.
No surveys or plans prepared. Will be taken up early in 1917.

NO. 144—ADAIR COUNTY.

Section 14, Somerset Township, near N. ¼ corner; Chicago, Burlington & Quincy Railroad.
No surveys made for this improvement. Will be taken up in 1917.

NO. 145—SHELBY COUNTY.

Section 31, Lincoln Township, 1 mile north of Tennant; Chicago Great Western Railroad.
At a conference held April 20, 1916, the Chicago Great Western Railroad Company agreed to contribute $1,000 towards improvement of this crossing in accordance with plans as prepared by the Commission. Satisfactorily adjusted. Estimated cost of improvement which eliminates two crossings and improves one at grade is $1,815.

NO. 146—PLYMOUTH COUNTY.

Section 6, Freedonia Township; Chicago, St. Paul, Minneapolis & Omaha Railroad.
Conference held on this crossing and No. 147 at LeMars on July 25, 1916. No agreement reached at this conference. Adjustment is now being undertaken by correspondence.

NO. 147—SIOUX COUNTY.

Sections 31 and 32, Nassau Township; Chicago, St. Paul, Minneapolis & Omaha Railroad.
See report on No. 146 above. These two projects are dependent upon each other.

NO. 149—DUBUQUE COUNTY.

Section 31, Washington, and Section 36, Prairie Creek Township; Chicago, Milwaukee & St. Paul Railroad.
Proposition temporarily abandoned.

NO. 150—HARDIN COUNTY.

Section 24, Harding Township, south corporation line Iowa Falls; Illinois Central and Chicago, Rock Island & Pacific Railroads.
Listed for survey in 1917.

NO. 151—FAYETTE COUNTY.

Second Street, East Oelwein; Chicago, Rock Island & Pacific Railroad.
Satisfactorily adjusted in 1915. (See 1915 Report.)

NO. 152—FAYETTE COUNTY.

Center Section 22, Union Township; Chicago, Rock Island & Pacific Railroad.
Condition of overhead bridge improved by Railroad Company without necessity of making survey or plan. Satisfactorily adjusted.

NO. 153—FAYETTE COUNTY.

Corner Sections 33 and 34, Westfield Township; Chicago, Milwaukee & St. Paul Railroad.
Proposition satisfactorily adjusted at conference held in Fayette on February 10, 1916. Railroad Company construct at their expense the undergrade crossing. The county purchase the right of way and do the necessary grading. Estimated cost $1,80. Railroad Company pays approximately $1,080 and county and township $900.

NO. 154—WARREN COUNTY.

Section 7, Richland Township, between Clarkson and Ford; Chicago, Burlington & Quincy Railroad.
Board of supervisors purchased the necessary right of way and relocation now completed. Satisfactorily adjusted.

NO. 155—WARREN COUNTY.

Between Sections 16 and 17, Jefferson Township, 1½ miles south of Churchill; Chicago Great Western Railroad.
Listed for survey in 1917.

NO. 156—FRANKLIN COUNTY.

Between Section 31, Mott Township, and Section 36, Marion Township; Chicago Great Western Railroad.
Complaint regarding the condition of the crossing will be investigated during 1917.

NO. 158—APPANOOSE COUNTY.

3½ miles north of Centerville, 2 miles east of Mystic; Chicago, Milwaukee & St. Paul Railroad.
Listed for survey in 1917.

NO. 159—KEOKUK COUNTY.

N. W. ¼ Section 28, Township 74 North, Range 10 West; Chicago, Milwaukee & St. Paul Railroad.
Temporary repairs have been made by the Railroad Company which adjusts the complaint.

NO. 161—BOONE COUNTY.

S. E. corner Section 23, Des Moines Township; Fort Dodge, Des Moines & Southern Railroad.
Temporarily abandoned.

NO. 163—POLK COUNTY.

Sections 31 and 32, Jefferson Township; Chicago, Milwaukee & St. Paul Railroad.
Temporarily abandoned.

NO. 164—KEOKUK COUNTY.

Section 23, Richland Township, 1½ mile northeast of Richland; Chicago, Milwaukee & St. Paul Railroad.
Plans will be prepared during 1917.

NO. 165—KEOKUK COUNTY.

Section 32, West Lancaster Township, 1 mile S. W. Hayesville; Chicago, Milwaukee & St. Paul Railroad.
Surveys to be made in 1917.

NO. 166—ADAIR COUNTY.

In town of Adair; Chicago, Rock Island & Pacific Railroad.
Plans for improvement of overhead bridge were prepared by the Commission and submitted to the county board of supervisors. The board later decided to abandon the improvement of the crossing at present and now contemplate the reconstruction of the bridge some time in the near future.

NO. 168—APPANOOSE COUNTY.

West city limits of Centerville; Centerville-Albia and Southern Inter-Urban.
No report on settlement of this project. Plans for improvement as prepared by Commission provide for improved undergrade crossing.

NO. 169—LINN COUNTY.

Main street in town of Coggon; Illinois Central Railroad.

Adjustment of conditions complained of not satisfactorily adjusted to date.

NO. 172—CLAYTON COUNTY.

Section 25, Cass Township; 2 miles east of Strawberry Point; Chicago, Milwaukee & St. Paul Railroad.

Conference held on September 26, 1916, on this project. Change in plan suggested which will be made in 1917.

NO. 173—HENRY COUNTY.

Section 10, Center Township, east corporation line Mount Pleasant; Chicago, Burlington & Quincy Railroad.

Plans for this improvement were prepared but no conference held. Temporarily abandoned.

NO. 175—CALHOUN COUNTY.

Sections 27 and 28, Greenfield Township; Chicago, Rock Island & Pacific Railway.

Plans are complete for this project and a conference will be arranged at an early date.

NO. 176—CALHOUN COUNTY.

Sections 23 and 24, Center Township; Illinois Central Railroad.

At a conference held on May 17, 1916, the Railroad Company agreed to buy all necessary right of way and pay 75% of grading and right of way cost. The county to pay 25% of grading cost and install small culvert. Distribution of expense in accordance with Commission's plans. Satisfactorily adjusted.

NO. 177—CALHOUN COUNTY.

Between Sections 17 and 20, Butler Township; Chicago, Milwaukee & St. Paul Railroad.

At a conference on July 24th this project was satisfactorily adjusted by agreement between the county and Railroad Company, each pays approximately 50% of the cost estimated at $924. The plans were prepared by the Commission.

NO. 179—HARDIN COUNTY.

Section 7, Hardin Township, near north corporation line of Iowa Falls; Chicago, Rock Island & Pacific Railroad.

Temporarily abandoned on account of excessive cost.

NO. 180—WEBSTER COUNTY.

North line Sections 11 and 14, Dayton Township; Minneapolis & St. Louis Railroad.

Preliminary estimates and plan in course of preparation.

NO. 181—WEBSTER COUNTY.

North line Section 1, Fulton Township; Minneapolis & St. Louis Railroad.

Plans and estimates completed and forwarded to board of supervisors and Railroad Company. Project ready for final conference.

NO. 182—WEBSTER COUNTY.

Section 33, Cooper Township, S. E. corner Fort Dodge; Fort Dodge, Des Moines & Southern Railroad.

Plans and estimates completed and project ready for final conference.

NO. 183—BOONE COUNTY.

Sections 35 and 36, Jackson Township; Chicago & North Western Railroad.

At a conference held at the site of the crossing on July 26th an agreement was reached between the township trustees and the Railroad Company for the improvement of this crossing. Satisfactorily adjusted.

NO. 184—POLK AND DALLAS COUNTIES.

Section 31, Webster Township, Polk County; Section 36, Walnut Township, Dallas County; Chicago, Milwaukee & St. Paul Railroad.

Temporarily abandoned.

NO. 185—DALLAS COUNTY.

Section 13, Des Moines Township; Chicago, Milwaukee & St. Paul Railroad.

Satisfactorily adjusted by correspondence. Repairs to crossing completed.

NO. 186—JONES COUNTY.

Section 13, Greenfield, and Section 18, Rome Township; Chicago, Milwaukee & St. Paul Railroad.

Satisfactory adjusted. (See 1915 Report.)

NO. 187—JONES COUNTY.

Sections 11 and 12, Greenfield, 1 mile west of Morley; Chicago, Milwaukee & St. Paul Railroad.

Project not satisfactorily adjusted. Efforts are being made to adjust the matter by correspondence.

NO. 188—JONES COUNTY.

Sections 5 and 8, Greenfield Township, 1 mile east of Martelle; Chicago, Milwaukee & St. Paul Railroad.

No survey made of the crossing. Will be ready for conference in 1917.

NO. 189—JONES COUNTY.

Section 8, Greenfield Township, 2 miles S. E. of Martelle; Chicago, Milwaukee & St. Paul Railroad.

No survey made. Will probably be taken up in 1917.

NO. 190—DECATUR COUNTY.

Sections 14 and 23, Long Creek Township; Chicago, Burlington & Quincy Railroad.

Satisfactorily adjusted by the improvement of the present grade crossing. Estimated cost of improvement according to plans as prepared by Commission $1,013. Work will be done in 1917. Railroad Company to pay approximately 50% of entire cost of improvement.

NO. 191—WAPELLO COUNTY.

Section 25, Green Township; Wabash Railroad.

Listed for survey in 1917.

NO. 192—RINGGOLD COUNTY.

Sections 34 and 35, Lincoln Township, 3 miles west of Diagonal; Chicago, Burlington & Quincy Railroad.

Agreement reached with Railroad Company on May 31 for improvement of the crossing in accordance with the Commission's plans. The underdrainage of the present subway crossing is to be improved. Railroad Company to furnish cast iron pipe and township trustees install it and do necessary grading. Cost about equally divided.

NO. 193—POLK COUNTY.

Sections 13 and 14, Saylor Township; Chicago Great Western Railroad.
No survey made. Temporarily abandoned.

NO. 194—POLK COUNTY.

Sections 13 and 24, Saylor Township; Fort Dodge, Des Moines & Southern Railroad.
Complaint satisfactorily adjusted by correspondence. Crossing graded by Railroad Company in accordance with Commission's suggestions.

NO. 195—POLK COUNTY.

Sections 13 and 14, Saylor Township; Chicago & North-Western Railroad.
Temporarily abandoned.

NO. 196—HOWARD COUNTY.

Section 7, Township 97 North, Range 13, West; Chicago Great Western Railroad.
No report as to repairs on this structure by the Railroad Company. Temporarily abandoned.

NO. 197—WARREN COUNTY.

Section 12, Linn Township; Chicago, Burlington & Quincy Railroad.
Temporarily abandoned until board of supervisors desire to take matter up further.

NO. 198—DECATUR COUNTY.

Section 30, Township 69 North, Range 25 West; Chicago, Burlington & Quincy Railroad.
Plans have been prepared for this project and conference will be arranged upon further request of board of supervisors.

NO. 199—WASHINGTON COUNTY.

In city limits of Washington, west end of Seventh Street; Chicago, Rock Island & Pacific Railroad and Chicago, Milwaukee & St. Paul Railroad.
Plans have been prepared by the Commission for the elimination of two crossings by the relocation of the present highway in the city limits of Washington. No conference has been held on this project and further action will be withheld for the present.

NO. 200—WAYNE COUNTY.

North side Section 3, Howard Township; Chicago, Milwaukee & St. Paul Railroad.
Satisfactorily adjusted by correspondence. Overhead bridge will be graded and bridge widened in 1917.

NO. 201—WAYNE COUNTY.

Sections 8 and 17, Howard Township; Chicago, Milwaukee & St. Paul Railroad.
Taken up recently with Railroad Company by correspondence. Under adjustment at present time.

NO. 202—MARION COUNTY.

Section 36, Township 77 North, Range 20 West, 1½ miles west of Cordova; Wabash Railroad.
Proposition satisfactorily adjusted. Plans approved by Commission. Grade crossing eliminated by construction of overhead crossing at company's expense.

NO. 203—WRIGHT COUNTY.

Section 32, Liberty Township; Chicago, Rock Island & Pacific Railroad.
Plans for elimination of one grade crossing and one undergrade crossing have been prepared by the Commission. Project is now in course of adjustment. Right of way not secured.

NO. 204—WAPELLO COUNTY.

Section 19, Keokuk Township; Wabash Railroad.
Plans and estimates of cost for this improvement have been forwarded to county and Railroad Company. Conference will be arranged upon request of board of supervisors.

NO. 205—BREMER COUNTY.

Sections 6 and 7, Polk Township; Illinois Central Railroad.
Plans are being prepared for this improvement. Conference for adjustment of cost will probably be held early in 1917.

NO. 206—ADAIR COUNTY.

Section 6, Walnut Township and Section 1, Summit Township; Chicago, Rock Island & Pacific Railroad.
Plans incomplete. Conference for improvement will probably be held early in 1917.

NO. 207—MAHASKA COUNTY.

Section 18, Adams Township; Minneapolis & St. Louis Railroad.
Plans prepared by Commission for improvement of grade crossing by grade separation. No conference arranged. Temporarily abandoned upon request of county engineer.

NO. 208—MAHASKA COUNTY.

Section 19, Adams Township; Minneapolis & St. Louis Railroad.
Plans prepared by Commission for improvement of grade crossing by grade separation. Project temporarily abandoned until further advised by county authorities.

NO. 209—CERRO GORDO COUNTY.

West Fifth Street in Mason City; Chicago & North-Western Railroad.
Plans prepared by City Engineer and submitted for approval. Conference held by Railroad Commission and formal order for improvement issued. Improvement now completed.

NO. 210—SAC COUNTY.

Sections 15 and 16, Township 86 North, Range 36 West; Chicago & North-Western Railroad.
Satisfactorily adjusted by correspondence. Railroad Company installed cast iron pipe culvert at their expense. County does grading work at approaches.

NO. 211—HARRISON COUNTY.

Section 28, Boyer Township; Illinois Central Railroad.
Plans for improvement of undergrade crossing submitted to Commission for approval. Project finally approved upon modified plans by Commission. Railroad Company to pay entire cost of new construction.

NO. 212—JEFFERSON COUNTY.

Blue Grass Road, east of Fairfield; Chicago, Burlington & Quincy Railroad.
Plans for the relocation of 3 miles of county road east of Fairfield were prepared by the County Engineer and checked and approved by the Commission. A conference was held on this project on October 24 and a tentative agreement reached. No final decision on this project has been received from the Railroad Company to date. Estimated cost of improvement $15,000.

NO. 211—TAYLOR COUNTY.

Section 2; Township 69 N., Range 34 West; Chicago, Burlington & Quincy Railroad.
Appealed to Railroad Commission by citizens of Taylor County. No decision announced to date.

NO. 214—BUTLER COUNTY.

N. W. of Dumont; Chicago & North-Western Railroad.
An inspection of this crossing will be made in 1917 preparatory to making surveys.

NO. 215—MUSCATINE COUNTY.

Section 21, Bloomington Township; Chicago, Rock Island & Pacific Railroad.
Plans have been prepared by the Commission for the improvement of this crossing by bevelling the banks. A conference was held at the site of the crossing September, 1916, after which the county submitted a definite proposition to the Railroad Company. This matter is now in course of adjustment by correspondence.

NO. 216—MUSCATINE COUNTY.

Sections 21-27-33, Mt. Pelier Township; Chicago, Rock Island & Pacific Railroad.
Plans have recently been completed by the Commission for the relocation of 2½ miles of county road through Mount Pelier Township. This relocation will improve the county road and eliminate three grade crossings. Options for right of way have been secured and a conference for the further consideration of the plans and distribution of cost for the improvement will be held in 1917. Estimated cost $13,500.

NO. 217—UNION COUNTY.

S. W. ¼ Section 4, Jones Township; Chicago Great Western Railroad.
Notes recently received for improvement of crossing as secured by former County Engineer are incomplete and arrangements are under way for securing complete notes at an early date.

NO. 218—WARREN COUNTY.

Section 17, Jefferson Township—East line Section 17—1 mile south of Churchville; Chicago Great Western Railroad.
Listed for surveys in 1917.

NO. 219—BREMER COUNTY.

Section 28, Lafayette Township; Illinois Central Railroad.
At a conference held in Waverly on October 18, 1916, the board of supervisors submitted a proposition to the railroad company for consideration. Proposition contemplates the county paying one-third and Railroad Company two-thirds of entire cost. Plans and estimates of cost prepared by Commission. Estimated cost $1,825. No reply from Railroad Company to date.

NO. 220—SAC COUNTY.

Sections 11 and 10, Boyer Valley Township; Chicago & North-Western Railroad.
County Engineer has prepared plans for a subway crossing at this location, the estimated cost of which is $6,447. A conference to consider the improvement is being arranged by the Commission for a date early in 1917.

NO. 221—JACKSON COUNTY.

Sections 19 and 30, Bellevue Township; Chicago, Milwaukee & St. Paul Railroad.
Project surveyed but held up awaiting the receipt of right of way maps from Railroad Company. Will be completed at an early date. Two grade crossings eliminated by this contemplated improvement.

NO. 222—MUSCATINE COUNTY.

In Wilton Junction; Chicago, Rock Island & Pacific Railroad.
Listed for survey in 1917.

NO. 223—POTTAWATTAMIE COUNTY.

Project temporarily abandoned until further requests from board of supervisors for improvement.

NO. 224—WAYNE COUNTY.

Section 14, Jackson Township; Chicago, Rock Island & Pacific Railroad.
Plans in course of preparation on this improvement. Will be completed at an early date.

NO. 225—WAYNE COUNTY.

N. E. Corner Section 25, Corydon Township; Chicago, Burlington & Quincy Railroad.
Listed for survey in 1917.

NO. 226—DECATUR COUNTY.

Section 26, Long Creek Township; Chicago, Burlington & Quincy Railroad.
Notes taken by County Engineer. Plans now in course of preparation.

NO. 227—O'BRIEN COUNTY.

Sections 2 and 11, Liberty Township; Chicago & North-Western Railroad.
Listed for survey in 1917.

NO. 228—DUBUQUE COUNTY.

On Military Road; Chicago, Milwaukee & St. Paul Railroad.
Plans now in course of preparation.

NO. 229—JASPER COUNTY.

Section 8, Palo Alto Township—3 miles west of Newton; Chicago, Rock Island & Pacific Railroad.
Surveys completed for improvement and plans now being completed.

NO. 230—MADISON COUNTY.

Section 35, Crawford Township Chicago, Rock Island and Pacific Railroad.
Surveys made and plans now in course of preparation.

NO. 231—MADISON COUNTY.

Sections 9 and 10, Ohio Township; Chicago, Burlington & Quincy Railroad.
Surveys completed and plans now in course of preparation.

NO. 232—MADISON COUNTY.

Section 4, Madison Township; Chicago, Rock Island & Pacific Railroad.
Surveys completed and plans now in course of preparation.

NO. 233—MADISON COUNTY.

Section 2, Township 77 N., Range 28 W. 1 mile west of Earlham; Chicago, Rock Island & Pacific Railroad.
Surveys completed and plans being prepared.

NO. 234—LYON COUNTY.

Sections 17 and 20, Richland Township; Chicago, Milwaukee & St. Paul Railroad.
Surveys completed and plans now being prepared.

NO. 235—KEOKUK COUNTY.

Section 36, Jackson Township; Chicago, Milwaukee & St. Paul Railroad.
Taken up by correspondence and under adjustment at this time.

NO. 236—FRANKLIN COUNTY.

Sections 9 and 16, Mott Township—3 miles north of Hampton; Minneapolis & St. Louis Railroad.
Under adjustment at present time by correspondence. Repairs to overhead bridge.

Oiled and Unoiled Earth Road—This view affords an excellent comparison. It was taken on the River-to-River road east of Grinnell a few hours following a heavy rain storm. There had been heavy traffic, even during and following the rain storm, over the oiled section, but but little traffic, not more than two or three vehicles over the unoiled road.

NO. 237—FRANKLIN COUNTY.

Sections 2 and 3, Reeve Township; Minneapolis & St. Louis Railroad. Satisfactory adjustment. Complaint withdrawn.

NOTE—All railroad crossing projects are listed as received and given consecutive numbers. The projects which are found in the following list are reported in previous reports of the Commission. No report is included of the crossing projects, which, though still unsettled, remain in the same status as previously reported.

Nos. 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 25, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 43, 46, 48, 49, 52, 54, 57, 58, 60, 62, 63, 64, 66, 70, 71, 75, 76, 77, 78, 83, 84, 85, 90, 92, 101, 102, 109, 110, 111, 113, 114, 116, 120, 121, 122, 123, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 148, 157, 160, 162, 167, 170, 171, 174, 178.

Chapter 10—Experiments, Tests and Technical Investigations

The testing work for the Highway Commission is done in the laboratories of Iowa State College, largely by members of the Engineering Experiment Station Staff. No charge is made by the Experiment Station for this work. Samples of materials for use on county road or bridge work, sent to the Commission for examination, are tested free of charge and a report made as to the compliance with Commission specifications, and the requirements of standard practice. Field projects are carried on in co-operation with engineers of the Good Roads Section of the Engineering Experiment Station.

Several new experiments were started during the past year, and observations were made on previous projects.

Gravel Roads.

One new gravel road experiment was started this year. One-half mile on the Lincoln Highway in the vicinity of the Lincoln Memorial bridge east of Jefferson in Greene County, was surfaced with the Commission standard section for two course, single track gravel road. This section requires 1,660 cubic yards of gravel per mile. A steam roller and operator was furnished by the State and the work was done under the supervision of a Commission engineer, co-operating with the county engineer. The trench method of construction was used; the material being placed in two courses. Each course was compacted by use of the steam roller.

In addition to the Greene County road, the Spirit Lake-Arnold's Park road in Dickinson County, was completed making a total of 1½ miles in this county. The Dickinson County work this year cost at the rate of approximately $3,000.00 per mile. The haul

averaged 2¾ miles. On a mile haul, the cost would have been reduced to about $2,000.00 per mile. Gravel was taken from a county pit.

During the past year, a considerable mileage of gravel has been constructed in the vicinity of Eagle Grove through the efforts of the Eagle Grove Good Roads Committee. Engineers from the Highway Commission assisted the local officials in organizing their work, advised them regarding proper methods of construction, and helped establish a patrol system of maintenance. Faulty construction in previous years had resulted in some very wavy, rough and unsatisfactory gravel roads. These sections were scarified and reshaped.

Oiled Earth Road—This view shows a portion of the 8-mile section of the River-to-River road east of Grinnell, which was oiled during the season of 1916. This road was properly prepared before the oil was applied. The roadway being properly crowned the oiled surface easily sheds the water into the side ditches. During rainy weather weather the road was never in bad condition for travel.

Eagle Grove now has a system of gravel roads leading out from town, which are gradually improving under the maintenance system adopted.

Gravel Census of State.

With the assistance of the county engineers, a gravel census has been conducted during the year, covering the entire state. Blank forms were furnished the county engineers, on which a complete report was made of the important gravel pits in the county. Many of the engineers made the desired tests on representative samples and included this data in their report. Others sent samples to the Commission. About two hundred such samples were received. These samples are being studied in the Experiment Station laboratories. The results of this census will be published later.

Bituminous Carpet Coats on Gravel and Cinder Roads.

The two experimental gravel roads, one on the Hawkeye Highway, leading out of Ft. Dodge, and the other leading out of Rockwell City, built last year, were given bituminous carpet coats this year. The Ft. Dodge road came through the winter in good condition for the treatment. The one at Rockwell City was completed in the winter and became very uneven and wavy. This road was scarified, reshaped, and rolled before being treated.

In carrying out the work, the road surface was swept with a horse drawn sweeper to remove the dust. The liquid asphalt was then applied cold at the rate of ½ gallon per square yard in two applications of ¼ gallons each, by means of a pressure distributor. Following the second application, coarse sand was spread over and broomed on the surface. Patrolmen were kept on the road for several days, adding additional sand where needed and brooming it over the surface. The oil asphalt used had the following analysis:

Specific Gravity, at 77°F.	.9597
Specific viscosity, 100 c.c.50°C (Engler)	31.0
Loss on heating 5 hrs. 163°C.	18.65%
Character of Residue	Thick, Sticky.
Total Bitumen	99.89
Bitumen insoluble in 86° Be. Naphtha	5.49
Fixed Carbon	6.12
Ash	.21
Flash Point, (Open cup)	144°F.
Burning Point, (Open cup)	165°F.

This same type of oil asphalt was used on four miles of the Des Moines-Ankeny cinder road. The application methods were the same as those used at Ft. Dodge. This work was done in co-operation with the Des Moines-Ankeny Good Roads Association.

Two miles of this same road were treated with a different grade of oil; one which had proven very satisfactory on earth roads of medium traffic.

The results thus far are not conclusive in the case of the gravelled roads. A recent inspection showed the Ft. Dodge road to be in very good condition with only a very few places needing repairs. The Rockwell City road though was in rather poor condition. The deterioration of the carpet coat on the Rockwell City road was started by the passage of heavy tractors. The wheel lugs cut

through the mat and loosened the gravel surface. Traffic ravelled the gravel somewhat and wore away the thin mat, causing shallow pot holes in many places. These places will be repaired and further observation carried on next year.

The Des Moines-Ankeny experiment demonstrated that a bituminous carpet will not hold up on a cinder surface under heavy traffic. At first the road was in excellent condition. Soon, however, the mat wore away in spots, due to the crumbling of the cinder roadbed underneath. These places later developed to an extent that rendered the road unpleasant for travel. The portion on which the ordinary road oil was used also became uneven, but not to the same extent. The condition of the road finally became so bad that it was scarified and reshaped.

Bituminous Carpet Coats on Concrete Roads.

In 1915 an experiment was started to determine the relative value of different materials for bituminous carpet coat work. A concrete road at Mason City was treated with a number of materials as follows:

	Section.	Length.	Nature of Treatment.
1.	West end	620 feet	½ gallon tar in one coat.
2.		130 feet	Binder coat of tar followed by ¼ gallon soft natural asphalt.
3.		90 feet	Binder coat of tar followed by ¼ gallon soft oil asphalt.
4.		525 feet	½ gallon per sq. yd. of mixture of 80% oil asphalt and 20% natural asphalt
5.		80 feet	½ gallon per sq. yd. of oil asphalt.
6.		225 feet	½ gallon per sq. yd. of a mixture of 80% natural asphalt and 20% oil asphalt.
7.		60 feet	Binder coat of natural asphalt cut back with naphtha followed by ½ gallon of natural asphalt.
8.		100 feet	One-half gallon per sq. yd. of natural asphalt.

The surface was dressed with trap rock chips of a size that will pass a ½-inch screen.

Inspection of this road has been made from time to time and the behavior of the surface was quite significant. On several sections the surface began to peel off along the wheel track and this continued and extended until little of the bituminous material was left. Generally speaking, the sections upon which oil asphalt was used, deteriorated most rapidly, the tars next and the fluxed natural asphalt has held up very well. The naphtha-fluxed binder coat was a help.

The experiment is of value in showing that only a very few materials can be used for carpet coats on concrete and that they must be applied with extreme care or they will peel off the surface. This line of experimentation should be continued so as to determine the exact procedure necessary to secure success under the climatic conditions encountered in Iowa.

In September, 1916, the concrete roadways on the college campus at Ames were given a bituminous carpet coat. The same type of liquid asphalt as was used on the experimental gravel roads was used. The work was also carried on in practically the same manner except that the liquid asphalt was heated to about 150°F. before application. The concrete roadways had been treated previously in October, 1913. The coat had worn away so that re-treatment was advisable. It was only necessary to use 1-3 gallon per square yard. This application restored the roadway to good condition.

Earth Road Oiling.

A greater amount of earth road oiling has been carried on this year than in any previous year. The results have been very satisfactory. A better quality of oil has been used and more care taken in the preliminary preparation of the road for the treatment. Oils vary greatly and it is essential that a suitable one be used. The Commission will have tests made of samples submitted and advise as to the quality of the material.

The following is the analysis of an oil which has been used with success:

Specific gravity at 25°C	1.0073
Specific viscosity, 100 c.c. 50°C (Engler)	30.1
Loss on heating 163°C-5 hrs.	2.14%
Character of Residue	Sticky.
Total Bitumen	99.93
Bitumen Insoluble in 86° Be. Naptha	8.46
Fixed carbon	7.13
Ash	Nil.
Flash Point (Open cup)	396°F.
Burning Point, (Open cup)	460°F.

The Engineering Experiment Station secured the use of a pressure distributor with a heater attachment for several of the coun-

ties and furnished an engineer to advise regarding the application of the oil. Our observations thus far have led to the following conclusions regarding oiled roads:

1. The treatment can only be considered as an efficient method of maintenance and will need to be repeated yearly.
2. The preparation of the road surface preliminary to oiling is of prime importance.
3. Better results can be obtained by heating the oil.
4. It is advisable to use a good quality of oil even at a slightly increased cost.

Ankeny-Des Moines Oiled Cinder Road—This view shows the condition of this important road about two weeks after oil was applied. It shows that section on which ordinary road oil was used; other types of oil being used on other sections. The entire road later became so uneven and rough that it was scarified and reshaped.

Road and Pavement Investigation.

During the year, Technical Report No. 1, entitled: "An Investigation of Concrete Roadways," was published for general distribution. This report was based on a comprehensive study of present day specifications and construction methods, inspection of a number of concrete roadways, together with a detailed laboratory examination of a number of samples taken from concrete pavements now in service in the City of Des Moines.

The concrete paving samples were taken along with samples from a number of bituminous pavements from the streets of Des Moines through a co-operative arrangement with the City Council. The laboratory work has been completed on the bituminous paving samples and a report will be published soon.

Service Tests on Bridge Paints.

In order to make a close study of various bridge paints on the market, one hundred and sixteen test panels were painted in 1914 with different combinations of commercial paints. This number was increased to one hundred and thirty-eight in 1915. These panels have all been exposed to the weather. A careful inspection during the past year resulted in the following tentative conclusions:

First: Of all paints used, the coal tar paints have proven to be the poorest. In no case has a coal tar paint continued to completely protect the panel from corrosion for more than eighteen months. All of the paints of this class have failed. In order to remedy a condition of this kind in the field, one of two methods can be used.

1. Complete removal of all paint by burning and scraping, and repainting with a good oil paint; or,
2. Frequent repainting with the same paint, being very careful to brush the paint out well.

Second: The asphaltic paints are, as a class, cracking and checking considerably, but no evidences of rusting are apparent. The advisability of including this class of paints in our specifications is questionable.

Third: The red leads in general are fading badly and in some cases are checking, chalking and cracking. It would be advisable to use these paints only in connection with a covering of a more stable paint.

Fourth: The sublimed white leads are checking some and showing a tendency to rust in the cracks. Structures painted with this class of paint should be watched closely to prevent this early rusting from progressing too far before re-painting.

Fifth: The sublimed blue leads are checking some, but to a less degree than the sublimed white leads.

Sixth: The best grades of iron oxide paints are standing up very well. The iron oxide paints, however, which contain calcium sulphate or calcium carbonate, are showing signs of dissolution, leaving pit holes in the paint film.

Seventh: Where the graphite and carbon paints are placed next to the iron there are evidences of rusting. When used as a second coat, over a prime coat of first quality, iron oxide or lead, these paints appear to be very serviceable.

Eighth: The paints containing zinc chromate or lead chromate are showing up exceptionally well.

In addition to the study of the behavior of the paints on the test panels, field inspections have been made on a number of bridges.

Applying Road Oil on Gravelled Road—This view shows a pressure distributor applying oil asphalt on the mile of experimental gravelled road at Ft. Dodge. The oil asphalt was put on in two applications of ¼ gallon each.

The results of all of these inspections substantiates the requirements of the Commission's specifications for paints.

Service Tests on Corrugated Metal Culverts.

In the last report of the Commission mention was made of the tests in progress on samples of culvert metal. These tests are being carried out on fifty small, 2 inches square, samples and on ten sections of commercial culverts. Observations have been continued during the past year, but the data collected thus far will not permit the formation of definite conclusions. The study of these samples will be continued next year.

Tests of Materials.

The following materials were tested by the Engineering Experiment Station for the Highway Commission, from December 1, 1915, to November 30, 1916:

Paints	42
Steel reinforcing, (Physical tests)	40
Steel reinforcing, (Chemical tests)	3
Cement, (Physical tests)	13
Road oils	10
Culvert metals	8
Stone	10
Gravels	16
Sands	6
Concrete paving	1
Asphalt cements	5
Tars	2
Creosote oil	1

Inspection of Bridge and Pavement Construction, Capitol Extension, Des Moines, Iowa.

At the request of the Executive Council, an engineer was furnished by the Commission to inspect the work on the bridge over Court Street in the Capitol Extension. Engineers were also furnished to inspect the paving work on E. Grand Avenue, Court, Kasson and Dey Streets through the capitol grounds.

Repair of Concrete Pavements.

During the past year the Commission, in co-operation with the Good Roads Section of the Engineering Experiment Station, furnished an engineer to advise and assist in the repair of a concrete pavement at Osage, Iowa, and concrete roadways in Louisa and Des Moines Counties.

The Osage pavement was in a very badly worn condition at the joints. The worn joints and larger cracks were filled with a mastic, composed of asphalt, Portland cement and sand. This was finished with a seal coat of asphalt which was sprinkled with sand. The smaller cracks were filled with hot Tarvia "A" and sanded.

The concrete roadways in Louisa and Des Moines Counties were repaired by filling the cracks and worn joints with hot tar and sand-

ing. Neither of these roads were badly in need of repair. The work was done in time to check the rapid wear which takes place along unprotected cracks. A systematic plan of maintenance takes care of small defects before they become conspicuously noticeable.

Preparation of Evidence in Litigation Involving Bridge Patents.

An act of the Thirty-fifth General Assembly makes it the duty of the Attorney General, when directed by the Governor to do so, to appear for and on behalf of any county, city, town or other municipality, or for or on behalf of an officer thereof or con-

Sanding the Freshly Oiled Gravel Road—This view shows the spreading and brooming of the thin layer of coarse sand which was applied to the freshly distributed oil asphalt on the mile of experimental gravelled road at Ft. Dodge.

tractor, in any action brought against the aforesaid which involves the validity of an alleged patent for any device used in bridge or road construction.

Engineers of the Commission have assisted the Department of Justice in the collection of data for the defense of several bridge patent infringement suits. In connection with this work during the past year a number of models were made of old bridges, which showed priority of idea in forms of construction claimed to be covered in the patent.

In the suit of Thacher vs. Polk County, in which Thacher alleged infringement of the Thacher patents in bridges designed by the Commission for Polk County, a decision was handed down by Judge Wade in favor of Polk County. The suit of Luten vs. Marsh Engineering Company is still pending.

Chapter 11—Roads At the State Institutions

Use of Convicts for Road Work.

The Commission includes this chapter to serve a dual purpose: the first, that of a progress report on the improvement of the roads through and adjacent to state lands at the several institutions; the second, a description of the work on which convict labor has been used.

In co-operation with the Board of Control of State Institutions, the Commission had direction of the work for three years of the road camps made up of prisoners from the state penitentiary at Fort Madison and the state reformatory at Anamosa.

Much thought and study is now being given to define the relationship which the state shall bear to the man who is convicted by the courts and committed to the care of the state. If correctly sensed, public sentiment seems to be strongly tending to the thought that the state shall do all in its power to develop the man so committed into a responsible citizen.

The publicity which has been given to the use of convicts on road work in other states has directed public attention to the possibility of the general use of convicts on road work. In fact, the use of such labor has been more or less seriously urged as one of the means for solving the ever-present road problem.

While the Commission does not consider the experience of the past three years conclusive, it does consider the results as indicative of the economic use that may be made of convict labor in the state of Iowa on road work.

Iowa Statutes Regarding Convict Labor.

Under an act passed by the Thirty-fourth General Assembly and amended by the Thirty-fifth General Assembly, the Board of Control of State Institutions was placed in charge of all the roads through and adjacent to state lands at all of the state institutions. There are approximately fifty miles of such roads. The act provided that the roads at each of the institutions should constitute a separate road district; that the cost of improving and maintain-

ing these roads, except county bridges, should be paid from the general fund. The supervision of the roads is under a supervisor appointed by the Board of Control. Acting under this statute, the Board of Control appointed the Chief Engineer of the State Highway Commission as Supervisor of State Roads.

Under an act passed by the Thirty-sixth General Assembly the Commission was required to make the surveys and plans for the improvement of these roads, as was requested by the Board of Control.

Paint Service Tests—This view shows the method of testing paints under actual service conditions as conducted by the Engineering Experiment Station at Ames, under the direction of the State Highway Commission. The panels shown on the long rack are each painted with a well known brand of paint, and a complete record of the results of the tests on each panel is kept.

Under an act passed by the Thirty-fifth General Assembly the Board of Control was authorized to use prisoners at the two state institutions on road work, under the supervision of the State Highway Commission at any point in the state where such work can be used. The prisoners in all such cases remained under the charge of the warden of the institution from which they were sent.

During the past three years prisoners have been used on road work at the Iowa State College, the State Epileptic Colony at Woodward, the State Farm at Clive, the State Hospital at Cherokee and the Woman's Reformatory at Rockwell City.

During the first two years, in beginning the work, it was not to be expected that the same efficiency would result from the work of the prisoners as would be possible after an organization was perfected, and after experience had shown the profitable ways in which this labor could be used. The Commission considers that the results of this year's work make a very good showing for the convict labor.

Road Work at Epileptic Colony at Woodward.

The contract for the grading work was let to William Dutton of Boone, at twenty-one cents per yard, for 14,124 cubic yards. 8,230 feet of tile underdrains, using six-inch tile were placed at a total cost of $908.28, as follows:

Cost of tile and hauling	$335.96
Convict labor	432.68
Foreman	139.74

This is an average cost of eleven cents per foot for tile laid an average depth of five feet. All the labor was performed by prisoners working under an experienced tiler as foreman.

Five circular culverts, using clay tile for forms, cost $602.67. These culverts required forty-one cubic yards of concrete at an average cost placed, of $14.69. One 2 ft. by 2 ft. box culvert required twelve and one-half cubic yards, at an average cost of $10.80 per cubic yard, total $126.01. An extension on an 11-ft. bridge required 133 cubic yards of concrete at a total cost of $1,537.50, unit cost, 11.70 per cubic yard.

This work was built entirely by convict labor, with the exception of carpenter work, amounting to $71.00. Only a small mixer was available, which increased the time required to place the concrete.

The convicts on this work were honor men from Ft. Madison. They were reliable and showed fine interest in the work which they were doing. They had no foreman other than the engineer in charge, and worked faithfully.

Road Work at the State Hospital at Cherokee.

Eight thousand cubic yards of earth were moved by convict labor, using small steel Koppel cars and track. The cost of this work was as follows:

Convict labor	$1,663.20
Teams	434.50
Hardware and blacksmith	49.80
Supervision	155.07
Total	$2,302.57

The average cost per cubic yard was twenty-eight cents.

This work was started on an excavation which had been opened in 1915 with steam shovel equipment, and the cost of trimming and sloping the banks is included in the unit cost. On this part of the work the unit price ran as high as thirty-two cents per yard. During the latter part of the work the cost was reduced to twenty-two cents.

The material used was very hard and necessitated extra teams for plowing. The earth was loaded in small cars with shovels by the men, and on some days the men shoveled as high as twenty yards per day per man.

Concrete Pile Trestle Viaduct—The construction of the viaduct shown above was made necessary by the building of a switch track across the State farm to the institution buildings at the State Hospital at Cherokee. The viaduct carries the Hawkeye Highway over the railroad tracks. Prison labor was used throughout and the workmanship is first class.

A reinforced concrete viaduct over a railway spur was built on this road at the following costs:

Convict labor	$1,134.23
Carpenter and teams	568.25
Pile and pile driving	630.04
Cement	970.27
Steel	2,140.00
Gravel	605.55
Lumber	411.90
Miscellaneous tools and supplies	215.13
Superintendence	700.00
Total	$7,375.37

With the exception of one carpenter, the superintendent in charge and teams used in hauling, the entire structure was built by convict labor at a total cost of $125.00 less than the estimated cost.

This road camp turned out a quantity of work far beyond the expectations of the Commission. The men were not skilled workmen, but were willing to work hard and apparently were anxious to make good on their work. It is doubtful if it is possible to get together

an equal number of free laborers who would perform the same quantity of manual labor as was performed by this camp. After the work was concluded at Cherokee, this crew was divided, part being taken to Rockwell City and part to the Lyon County quarry.

Road Work at the Iowa School for the Deaf, Council Bluffs.

Eleven thousand cubic yards of earth work was contracted to Tim Ryan at Council Bluffs, at 24 cents; ninety-two cubic yards of concrete were contracted to the Lana Construction Company of Council Bluffs at fifteen dollars per cubic yard and one thousand feet of ten-inch tile was laid by contract at $1.25 per rod.

The only equipment which the state has for moving dirt was in use at Cherokee, and the other work on which prison labor could be used was so small that it was not considered economical to establish a camp at this point. The grading work was practically all of a character requiring the use of the teams.

Road Work at the Iowa State College.

About 7,000 yards of excavation under two separate contracts were contracted to William Dutton at twenty-five cents per cubic yard. One and six-tenths miles of road were gravelled at a cost, including the cost of gravel, at ninety-five cents per cubic yard. The average haul for the gravel was two miles. The contract price for hauling, seventy cents per cubic yard, a cost of twenty-two cents per ton mile.

Road Work at Woman's Reformatory, Rockwell City.

Grading was done by day labor, using teams in conjunction with the blade grader and traction engine. Approximately 4,000 cubic feet of earth were moved at a cost of $2,002.00, a unit cost of twenty-five cents per cubic yard. 2,146 cubic yards of gravel were placed as follows:

Hauling	$1,073.12
Cost of gravel	357.75
Superintendence, stripping pits and rolling gravel	416.05
Total	$1,846.92

The cost per yard of gravel rolled in place was eighty-six cents. 7,900 feet of six-inch tile were laid at a total cost of $522.00, cost per foot, seven and eight-tenths cents.

Convict labor was used on little of this work, as the prisoners who were in camp were employed on other work.

Comparison of Prison Labor and Contract Labor.

From the above it will be noted that the cost of road work let by contract at Woodward was twenty-one cents, at the Iowa State College twenty-five cents, at Rockwell City twenty-five cents, and at Council Bluffs twenty-four cents. The cost of earth work, using prison labor, at Cherokee was twenty-eight cents. It should be noted also in this connection that the crew which was used on the Cherokee work did more work than could be expected from the average prison crew. The cost of the earth work at Cherokee during 1915 with a different crew was approximately thirty-eight cents per cubic yard. The average cost at the Iowa State College in 1915 on part contract and part prison labor for road work was thirty and one-tenth cents per cubic yard.

No comparative costs on road gravelling are available for 1916. The cost of gravel on the Rockwell City road was eighty-six cents per cubic yard and on the roads at the Iowa State College, where gravel was hauled an average of two miles, was approximately ninety-five cents.

The cost of tiling by prison labor at Woodward was eleven cents per foot and by contract at Rockwell City, approximately seven and eight-tenths cents per foot. On the same depth of cut, the cost by contract would have been almost exactly equal to the cost of prison labor.

The cost of concrete used for encasing tile, placed by prison labor at Woodward, was $14.69 per cubic yard; the cost of concrete in box culvert construction was $10.80, and in the bridge extension, the cost was $11.70. The cost of concrete work by contract at Council Bluffs was $15.00 per cubic yard.

From the above comparison, it will be noted that on road work on which teams and earth moving machinery can be used, convict labor cannot compete with contract prices. It would not be practicable to attempt to outfit crews of prisoners with teams and machinery for use on this character of work. The only places where convict labor can be used with economy on earth work would be where there are large yardages of dirt to be moved within comparatively narrow limits, where equipment similar to the Koppel cars and track can be used to advantage. In such isolated instances the cost of convict work can be kept near the cost of contract work if picked crews are used. It is quite practicable to use convicts in laying tile for road drainage or other purposes, for this requires hand labor without requiring special equipment. This is also true in building concrete culverts and small bridges.

The unit prices obtained on the work at the various institutions this year show the same general results as the unit prices on the work during the preceding two years.

Use of Convicts on General Road Work.

The experience of the past three years has demonstrated to the Commission that it is not practical to attempt to use convict labor on general road work over the state. A great percentage of the permanent road work which is now being done is of a character that can be better and more economically done by contractors equipped with the necessary teams or other power and the necessary machinery. Prisoners can be used at points where there are considerable amounts of tile drains to be laid, but this in general is not true on road work.

Although prison labor can be used successfully on concrete culverts and bridges, it is not practical to use men on this work who must be placed under guards, and only a limited number of men can be sent out from the institutions as honor men.

The Commission is of the opinion that so far as the use of convicts on general road work in the state is concerned, that it is not practicable and that no economy would result to the counties or the state in attempting to use prisoners in this way.

Use of Convicts at State Institutions.

Without any question, the State Board of Control is pursuing the proper policy in using as many prisoners as possible to perform the necessary work at the various institutions where labor is not available from the inmates of the institutions. The labor on the roads around the farms and on the buildings, which prisoners can perform satisfactorily, is undoubtedly the proper place to use this labor. The problems of food supplies and shelter for the men can be satisfactorily handled where the men are employed at such institutions and there is a sufficient amount of work to be performed to require practically all of the men who can be sent from the two institutions without armed guards for some time to come.

Preparation of Road Materials.

The Commission is of the opinion that the only sphere in which prison labor can be used profitably as in the preparation of road materials or in the loading of such materials for distribution to the counties. In the preparation of crushed rock, for instance, a con-

siderable amount of hand labor is used. The Board of Control has purchased in Lyon County a quarry site on which there is an outcrop of Sioux Falls quartzite, the only deposit of this material in the state. There are certain classes of road surfacings which must be built from material of this quality. The concrete roads and pavements which have been built in Sioux City and a number of other points in the State, are proving satisfactory largely because material of this character has been used as aggregate. The cities and towns of Iowa which are laying asphaltic concrete; bitulithic or concrete pavements, are shipping material into the state from South Dakota, Minnesota and Wisconsin. The development of a supply of suitable stone within the state is possible through the use of convict labor, and the development of this supply of material will prove a benefit to the counties and municipalities of the state. From this source the state will have an outlet for a large amount of prison labor which cannot be used economically for other road work. There are many points in the state where large gravel pits are available and where by the installation of proper machinery, gravel can be loaded on cars for shipment to points where gravel is not available, at a very reasonable cost. In the shipment of this gravel, the co-operation of the railroads will be needed in transporting the material at the lowest possible freight rates.

The utilization of prison labor in this manner, outside of the use that the state can make of prisoners for road improvement and other similar work at the state institutions, the Commission believes to be the only practical use connected with highway improvement that can be made of prison labor in the state. There are exceptions to this rule. If some county or district desires to lay a considerable stretch of concrete or similar surfacing, a prison crew can be organized for this purpose, and the work can be handled at about the same cost as for contract labor.

The Ultimate Object of Using Prison Labor.

It should be borne in mind that prison labor, however used, offers no solution of the road problem of the state. The best service for which prison labor can be used in road improvement is the preparation of materials for road building, but the ultimate object of the employment of convict labor is the development of the prisoner himself. The men who have constituted the road camps and who have come under the observation of the Commission have apparently benefited both physically and mentally from their employment on this work. These men have all been paid at a rate varying from twenty cents to twenty-five cents per hour, the rate for 1916 being twenty-two and one-half cents. Many of them have saved some money and have been able to assist those dependent upon them. The state has benefited from the employment of these men as their entire living cost, including the expenses of guards and transportation, have been paid from their earnings.

The state of Iowa does not have road building of the character that has been quite successfully handled by some states with convict labor where a large amount of manual labor was necessarily employed, nor does it have the same character of prisoners as do some of the southern states. These differences must be recognized in the methods adopted to utilize such labor.

The Commission is thoroughly in sympathy with the methods which are employed by the Board of Control to use prison labor and recommends to the General Assembly the further use of all available prison labor in the preparation of road materials for distribution to the counties of the state at the lowest cost consistent with the cost of production.

Chapter 12—Financial Report

Fiscal year July 1, 1915, to June 30, 1916.

Under an act of the Thirty-sixth General Assembly all bills for salaries and expenses of the State Highway Commission are audited by the State Board of Audit. All bills are approved by the Commission before they are forwarded to the Board of Audit. All funds credited to the State Highway Commission are disbursed by the State Treasurer on warrants drawn by the State Auditor.

Under the instructions of the State Document Editor, only a summary of the Commission's expenditures is given here as a full detailed and itemized account appears in the published report of the Executive Council for the biennial period, July 1, 1914, to June 30, 1916.

The summary of expenditures, Schedule No. 12, shows the total expenditures from the appropriation of the State Highway Commission, to have been $90,821.34 for the fiscal year ended June

30th, 1916, as compared with $80,935.16 for the fiscal year ended June 30th, 1915. An examination of Schedule No. 25 shows that the increase for 1915-1916 over the previous year, has been due to additional duties which were added by the Thirty-sixth General Assembly. In addition to the lake bed investigation, the defense of suits on account of bridge patents, the supervision of roads at the various state institutions, the making of surveys and plans for railroad crossing improvements, all of which were added by the Thirty-sixth General Assembly, it was found advisable to make a careful investigation of the wearing qualities and economic features of various types of surfacing. These additional duties have required expenditures totaling $17,947.

In addition to the work previously undertaken, the Administrative Department, which includes the Accounting Department, had to be extended to cover all of these new activities. The better organization which has been worked out since 1914-15, has enabled the Commission to handle the same line of work at a much lower cost than was done in 1914-15. It is safe to say that the activities of the Commission in 1915-16 increased over those of 1914-1915 at least 50% while the increased cost of the department was only a little more than 11%. The report on the lakes and lake beds contains a full statement of the cost of that work.

Practically all supplies used by the Commission are obtained through the purchasing department of the Iowa State College, the Commission getting the advantage of prices secured by the college on its contracts for supplies. On all printing of any consequence, bids are taken from a number of firms in the state. Office rooms, heat, light and janitor service are furnished free by the Iowa State College.

SALARIES AND EXPENSES,
JULY 1, 1915, TO JUNE 30, 1916.

SCHEDULE NO. 12.
SUMMARY OF EXPENDITURES.

	Salary or Per Diem	Expenses	Total
Commissioners	$ 1,650.00	$ 943.22	$ 2,593.22
Administrative Department	11,381.59	756.39	12,137.98
Road Department	9,687.38	1,498.97	11,186.35
Bridge Department	7,333.35	610.98	7,944.33
Drafting Department	10,279.86	29.34	10,309.20
First District Engineer	1,899.96	773.71	2,673.67
Second District Engineer	1,899.96	778.66	2,678.62
Third District Engineer	1,849.98	972.10	2,822.08
Fourth District Engineer	1,999.92	975.77	2,975.69
Fifth District Engineer	1,849.98	711.05	2,561.03
Tests and experimental work	4,755.30	544.67	5,300.07
Bridge patent litigation	1,773.65	82.25	1,855.90
State institution roads	2,772.15	454.39	3,226.54
Railroad crossing surveys and plans	1,800.00	231.30	2,031.30
Drainage and lake bed surveys	5,519.98	15.02	5,535.00
Equipment and supplies, all departments	.....	.....	14,990.36
Totals	$66,452.96	$ 9,378.02	$90,821.34

SCHEDULE NO. 13.
COMMISSIONERS.

Name	Character of Employment	Salary	Expense	Total
J. W. Holden, Chrmn.	Commissioner	$ 650.00	$ 260.55	$ 910.55
A. Marston	Commissioner	.....	193.39	193.39
H. C. Beard	Commissioner	1,000.00	489.28	1,489.28
Total		$1,650.00	$ 943.22	$2,593.22

SCHEDULE NO. 14.
ADMINISTRATIVE DEPARTMENT.

Thos. H. MacDonald	Highway Engineer	$3,600.00	$ 531.67	$4,131.67
J. E. Kirkham	Consulting Bridge Engineer	499.92	.....	499.92
L. A. Wilkinson, Sr.	Accountant	1,999.92	6.84	2,006.76
J. W. Eichinger	Bulletin Editor	1,899.96	204.67	2,104.63
Annie Laurie Bowen	Clerk	900.00	.....	900.00
Janet Jacobsen	Stenographer	616.00	11.03	627.03
Thora Tallman	Stenographer	720.00	1.98	721.98
Maud Spence	Stenographer	519.96	.....	519.96
Anna S. Holden	Stenographer	217.35	.....	217.35
May Vanderlinden	Stenographer	94.00	.....	94.00
Extra help	Stenographic	60.81	.....	60.81
Extra help	Bulletin Mailing Room	253.67	.....	253.67
Total		$11,381.59	$ 756.39	$12,137.98

SCHEDULE NO. 15.

ROAD DEPARTMENT.

Name	Character of Employment	Salary	Expense	Total
F. R. White	Road Engineer	$2,700.00	$ 363.67	$3,063.67
J. S. Dodds	Assistant Engineer	1,999.92	468.12	2,468.04
W. E. Jones	Assistant Engineer	1,899.96	162.48	2,062.44
O. W. Crowley	Assistant Engineer	1,127.50	523.49	1,650.99
L. S. Gates	Assistant Engineer	400.00	.....	400.00
W. M. MacGibbon	Assistant Engineer	400.00	181.21	581.21
Anne Vanderlinden	Stenographer	960.00	.....	960.00
Total		$9,687.38	$1,498.97	$11,186.35

SCHEDULE NO. 16.

BRIDGE DEPARTMENT.

J. H. Ames	Bridge Engineer	$2,299.92	$ 398.29	$2,698.21
E. F. Kelley	Asst. Bridge Engineer	2,199.96	128.66	2,328.62
E. W. Blumenschein	Structural Engineer	1,999.92	84.03	2,083.95
Mrs. J. A. Paulsen	Stenographer	833.55	.....	833.55
Total		$7,333.35	$ 610.98	$7,944.33

SCHEDULE NO. 17.

DRAFTING DEPARTMENT.

J. A. Paulsen	Chief Draftsman	$1,800.00	$ 27.69	$1,827.69
L. H. Doughty	Designer	1,599.96	.....	1,599.96
W. N. Adams	Draftsman	1,380.00	1.65	1,381.65
W. A. Reeves	Draftsman	1,200.00	.....	1,200.00
Theo. Ohmann	Draftsman	1,380.00	.....	1,380.00
V. Enslow	Draftsman	952.00	.....	952.00
T. C. Nichols	Draftsman	431.04	.....	431.04
M. G. Spangler	Draftsman	209.61	.....	209.61
G. W. Garland	Draftsman	100.00	.....	100.00
Hans Hanson	Clerk	1,040.00	.....	1,040.00
Extra help		187.25	.....	187.25
Total		$10,279.86	$ 29.34	$10,309.20

SCHEDULE NO. 18.

DISTRICT ENGINEERS.

C. Corkendall	First District	$1,899.96	$ 773.71	$2,673.67
W. H. Root	Second District	1,899.96	778.66	2,678.62
W. F. Beard	Third District	1,849.98	972.10	2,822.08
L. M. Martin	Fourth District	1,999.92	975.77	2,975.69
J. S. Morrison	Fifth District	1,849.98	711.05	2,561.03
Total		$9,499.80	$4,211.29	$13,711.09

SCHEDULE NO. 19.

TESTS AND EXPERIMENTAL WORK.

C. B. McCullough	Asst. Highway Engineer	$1,200.00	$ 126.42	$1,326.42
C. D. Curtiss	Assistant Engineer	1,249.98	72.96	1,322.94
Velda Rowland	Stenographer	624.00	.....	624.00
Extra help		1,681.22	345.49	2,026.71
Total		$4,755.20	$ 544.87	$5,300.07

SCHEDULE NO. 20.

BRIDGE PATENT LITIGATION.

Name	Character of Employment	Salary	Expense	Total
C. B. McCullough	Asst. Highway Engineer	$1,300.00	$ 82.25	$1,382.25
A. S. Miller	Assistant Engineer	373.65	.....	373.65
Total		$1,773.65	$ 82.25	$1,855.90

SCHEDULE NO. 21.

STATE INSTITUTION ROADS.

F. H. Mann	Engineer	$1,470.62	$ 35.07	$1,505.69
L. S. Gates	Assistant Engineer	654.03	176.22	830.25
O. W. Crowley	Assistant Engineer	147.53	61.05	208.58
W. M. McGibbon	Assistant Engineer	500.00	181.22	681.22
Total		$2,772.15	$ 454.39	$3,226.54

SCHEDULE NO. 22.

RAILROAD CROSSING SURVEYS AND PLANS.

E. Williams	Assistant Engineer	$1,800.00	$ 231.30	$2,031.30
Total		$1,800.00	$ 231.30	$2,031.30

SCHEDULE NO. 23.

DRAINAGE INVESTIGATION AND LAKE BED SURVEYS.

R. W. Clyde	Drainage Engineer	$1,800.00	$ 15.02	$1,815.02
H. S. Leicht	Assistant Engineer	1,028.40	.....	1,028.40
S. A. Schackle	Assistant Engineer	619.35	.....	619.35
W. M. MacGibbon	Assistant Engineer	300.00	.....	300.00
M. A. Bakken	Assistant Engineer	65.00	.....	65.00
Richard Chellander	Assistant Engineer	52.00	.....	52.00
P. J. Beams	Rodman	130.00	.....	130.00
Lyle Turner	Rodman	264.00	.....	264.00
Chris Sorensen	Rodman	22.00	.....	22.00
Ernest Nelson	Rodman	298.00	.....	298.00
R. Swain	Rodman	70.00	.....	70.00
Everett Long	Rodman	203.33	.....	203.33
R. S. Barston	Rodman	56.45	.....	56.45
Wm. Long	Rodman	232.00	.....	232.00
F. E. Eatherton	Rodman	56.45	.....	56.45
A. H. Frost	Rodman	236.00	.....	236.00
Wm. Kelley	Rodman	28.00	.....	28.00
Holland Haysworth	Rodman	65.00	.....	65.00
C. H. Dunn	Rodman	4.00	.....	4.00
Total		$5,519.98	$ 15.02	$5,535.00

SCHEDULE NO. 24.

EQUIPMENT AND SUPPLIES, ALL DEPARTMENTS.

Freight, drayage and express	$ 360.00
Telephone and telegraph	803.67
Postage on service bulletin	1,300.00
Postage, general	1,035.70
Stationery and office supplies	1,154.17
Bridge supplies	579.39
Road supplies	298.39
Photos, lantern slides, etc.	447.35
Printing	4,463.82
Furniture, filing cabinets	652.20
Miscellaneous	3,895.25
Total	$14,990.36

SCHEDULE NO. 25.

COMPARISON OF EXPENDITURES FOR 1914-15 AND 1915-16.

	1914-15	1915-16
Commissioners	$ 3,467.65	$ 2,593.22
Administrative (and office)	14,834.87	12,157.91
Road department	10,308.53	11,186.75
Bridge department	16,064.47	7,944.32
Drafting	.....	10,308.20
District engineers	13,053.59	13,711.09
Equipment and supplies	18,643.65	14,990.36
Remodeling and repairing offices and designing depart...	4,622.42	.....
Tests and experimental work	.....	5,300.07
Bridge patent litigation	.....	1,855.90
State institution roads	.....	7,226.54
Railroad crossing surveys and plans	.....	2,031.30
Drainage and lake bed surveys	.....	5,535.00
Total	$80,935.16	$90,821.34

SCHEDULE NO. 26.

DETAILED DISTRIBUTION OF SALARIES PAID BRIDGE AND DRAFTING DEPARTMENTS.

Administration and field work	$ 3,541.72
Designs for counties	5,641.26
Approval of county designs	564.86
Approval of shop drawings	385.63
Checking road profiles	356.91
Preparing standard plans	1,144.80
Plans for railroad crossing improvements	957.55
Bridge patent litigation	489.34
Bridge investigations	641.63
Tests and research	5.66
State institution roads	33.84
Short course exhibits	26.69
Blue printing	677.49
Clerical work	537.93
Annual report	150.33
Lake maps	889.32
General	1,153.32
Miscellaneous drafting	214.74
Total	$17,613.21

PART II

Summary of Annual Reports of County Engineers

PART TWO

Summary of Annual Reports of County Engineers

This summary is prepared from the annual reports of the county engineers of the ninety-nine counties of Iowa and is prepared and submitted in accordance with the provisions of Section 1527-s2, SS 1915.

The county engineers' reports include detailed statements of all county expenditures for road and bridge work. Efforts were made through the county engineers to secure detailed reports of township expenditures. Out of 1,646 townships, reports were secured from 1,360 up to the date when this report was tabulated.

Statements of expenditures are based on warrants issued by the county auditors for the period covered by this report. The county engineers are dependent upon the following sources for information contained in their reports:

(a) Total expenditures from county bridge, county motor vehicle road and county road cash funds; county auditor's warrant register. Detailed classification of these expenditures must be made by the county engineer.

(b) Financial statement of the receipts and disbursements in above named funds, county treasurer's cash book.

(c) Statement of county's indebtedness, records of county auditor and county treasurer combined.

(d) Statement of classified expenditures from all township funds, and financial statement of receipts and disbursements in said funds, annual reports of township clerks.

This report includes a general summary of the activities of the ninety-nine counties, paragraph summaries of the road and bridge expenditures of the individual counties and twenty-three summary tables showing in detail the expenditures for road and bridge work from all funds and the present financial condition of the several counties.

SUMMARY OF FINANCIAL STATEMENT FOR ENTIRE STATE.

January 1, 1916, to January 1, 1917.

From January 1, 1916, to January 1, 1917, the counties and townships spent $14,337,056.00 for road and bridge work on the 104,000 miles of road constituting the county and township road systems. This is an average expenditure of $137.70 per mile, which includes both road and bridge work. The expenditures are classified as follows:

Spent for bridge work on both county and township roads	$ 7,172,346.00
Spent for township road work	3,888,784.00
Spent for county road work	3,276,036.00
Total	$14,337,056.00

On January 1, 1917, there were cash balances on hand in the county and township road and bridge funds amounting to $868,502.55 as follows:

County bridge fund	$ 18,971.00
County road cash fund	43,418.36
County motor vehicle road fund	236,943.64
Total county balance	$ 299,333.00
Township road, drag and drainage funds	569,170.00
Total	$ 868,503.00

There were outstanding bonds amounting to $4,327,274.30 as follows:

Bridge bonds outstanding	$ 3,872,817.27
Road bonds outstanding	454,457.03
Total	$ 4,327,264.30

It should be noted that only 10.4% of the outstanding bonds are for road work. The remaining 89.6% are bonds for bridge work.

The total indebtedness of the counties, which includes outstanding bills, warrants and bonds was $8,034,968.00. This indebtedness is classified as follows:

COUNTY BRIDGE FUND.

Outstanding bills	$ 216,253.00	
Outstanding warrants	2,556,460.00	
Outstanding bonds	3,872,817.00	
Total bridge indebtedness		$6,645,530.00

COUNTY ROAD FUNDS.

Outstanding bills	$ 125,475.00	
Outstanding warrants	809,506.00	
Outstanding bonds	454,457.00	
Total road indebtedness		$1,389,438.00
Total indebtedness		$8,034,968.00

Seventeen per cent of the total indebtedness is for road work. The remaining eighty-three per cent is for bridge work. In addition to the large percentage of outstanding indebtedness which is for bridge work and the correspondingly small percentage of indebtedness which is for road work, it should be stated that the road funds are annually depleted in making payments for bridge and culvert work. The law provides that permanent culverts may be paid for from the county motor vehicle road fund, and that filling bridges and culverts, making stream changes, etc., can be paid for from the county road cash fund. During 1915, $670,000.00 was thus diverted from the road funds for bridge and culvert work, and in 1916, $972,338.00 was so diverted. Of the road funds used for bridge and culvert work in 1916, $550,166.00 came from the motor vehicle road fund, and $422,172.00 came from the county road cash fund.

Tables Nos. 1, 19, 20, 21, 22 and 23 show the expenditures and financial statements for each county.

SUMMARY OF ROAD WORK AND EXPENDITURES FOR ENTIRE STATE.

January 1, 1916, to January 1, 1917.

County Road Expenditures.

During the period covered by this report the total expenditure for road work on the county system was $3,276,026.00. This sum includes all expenditures for construction, maintenance, repairs, and miscellaneous work on the county system, all expenditures for road equipment and unused material, new right of way, gravel pits, railway crossing improvements, drainage assessments, and all other expenditures by the counties for road purposes. It does not include the expenditures from the county motor vehicle road fund for permanent culverts amounting to $550,166.57, nor the expenditures from the county road cash fund for filling bridges and culverts amounting to $422,171.83. These expenditures are listed under the bridge work.

Of the above county road expenditure of $3,276,026.00, $1,309,884.00, or 40%, was spent for permanent work; $541,605.00, or 16.5%, was spent for temporary work; $542,478.00, or 16.6%, was spent for repairs; $389,664.00, or 11.9%, was spent for maintenance; $242,962.00, or 7.4%, was spent for equipment and unused material and $249,435.00, or 7.6%, was spent for miscellaneous work.

A comparison of the road expenditures for 1916 with the expenditures for 1914 and 1915 follows:

TOTALS.

	1914	1915	1916
Permanent work	$ 895,000.00	$1,139,764.00	$1,309,884.00
Repairs and maintenance	560,000.00	1,140,382.00	932,142.00
Temporary work—			
(a) tractor grading	101,000.00	239,205.00	313,600.00
(b) oiling roads	.....	.....	28,005.00
Filling bridges and culverts	.....	249,016.00	.....
Machinery and unused material	182,000.00	227,920.00	242,962.00
Miscellaneous	1,292,000.00	257,078.00	249,435.00
Total	$3,403,000.00	$3,396,365.00	$3,276,126.00

PERCENTAGES.

	1914	1915	1916
Permanent work	25.3%	34.1%	40.0%
Repairs and maintenance	28.6%	33.7%	28.5%
Temporary work—	2.9%	10.6%	13.7%
(a) tractor grading	.....	.....	0.8%
(b) oiling roads	.....	7.3%	.....
Machinery and unused material	5.3%	6.7%	7.4%
Miscellaneous	37.9%	7.6%	7.6%

"Permanent Work" includes constructing roads to the permanent grade lines established by the county engineer and to standard sec-

tions; constructing roads to temporary grade lines and standard sections, that is widening cuts and fills to standard width and working toward a permanent grade line; tile drainage; and surfacing roads with gravel, macadam, sand-clay or some form of paving.

It should be noted that the percentage of county road expenditure which went for permanent work in 1916 increased 5.9% over that of 1915. Likewise the repairs and maintenance decreased 5.2%. The percentage of county road expenditures for repairs and maintenance in 1916 is almost identical with 1914. The long continued wet weather of 1915 is indicated clearly in the increased cost of repair and maintenance work.

During 1916, repairs and maintenance cost $59.75 per mile, against $74.00 per mile for this work in 1915.

"Temporary Work" includes "oiling roads," and "tractor grading." No tractor grading is included in this classification unless the cost was in excess of sixty dollars per mile. Such work costing less than sixty dollars per mile is classified as repair work.

"Filling Bridges and Culverts" which was classified with the road work in 1915 has been classified under bridge work in the 1916 reports.

During 1916 there were 625.2 miles of road built to permanent grades at a cost of $782,221.73 or an average of $1,251.13 per mile. $133,413.15 was spent for building roads to temporary grades. For $33,455.67 of this expenditure the mileage was not reported. For the remaining $99,957.48, 107.83 miles were put to temporary grade or at an average cost of $926.99 per mile. Three thousand six hundred eight-one miles of roads were constructed to natural grade at a cost of $513,600.00 or an average cost of $139.53 per mile. Two hundred seventy-seven miles were hard surfaced at a cost of $223,183.73 or an average cost of $805.72 per mile. Nearly all of this surfacing work is single course gravel conforming to the class "B" standard cross section which requires 880 cubic yards of gravel per mile. 14,927 miles of the county road system were regularly dragged at an average total cost of $24.09 per mile. The average number of times dragged was 28.3. The average cost per mile for dragging one round trip was $0.74. The total county road expenditure in 1916 averaged $207.80 per mile. In 1915 the total expenditures averaged $215.40 per mile.

A comparison of the construction work accomplished during 1916 with that accomplished during 1914 and 1915 follows:

	1914	1915	1916
Built to permanent grade	418 mi.	462.7 mi.	625.2 mi.
Built to temporary grade	416 mi.	355.9 mi.	107.8 mi.
Tractor grading	1,210 mi.	2,358.8 mi.	3,680.9 mi.
Surfaced	75.6 mi.	182.0 mi.	277.0 mi.

Since April, 1913, surveys have been made on 4,898 miles or about thirty-one per cent of the county road system; 7,530 miles or about

fifty per cent of the county system has been built to natural grades; 1,506 miles have been built to permanent grade, and 535 miles have been surfaced.

Detailed comparisons of the road work and expenditures on the various county road systems are shown in Table Nos. 7 to 10 inclusive. Table No. 17 shows the number and value of gravel pits owned by the counties.

Township Road Expenditures.

Reports from 1,300 of the 1,646 townships were received in time to be included in this report. This is 254 or about 25% more than reported in time to be included in the 1915 report.

The 1,300 townships reporting show a total road expenditure of $3,072,023.00 from which the total expenditures for the 1,645 townships have been estimated at $3,888,784.00. These expenditures are distributed as follows:

TOTALS.

Permanent work	$ 264,437.00
Temporary work	715,536.00
Repairs	1,100,527.00
Maintenance	715,536.00
Equipment and unused material	233,327.00
Filling bridges and culverts and placing temporary culverts	342,213.00
Miscellaneous	517,208.00
Total	$3,888,784.00

PERCENTAGES.

Permanent work	6.8%
Temporary work	18.4%
Repairs	28.3%
Maintenance	18.4%
Equipment and unused material	6.0%
Filling bridges and culverts and placing temporary culverts	8.8%
Miscellaneous	13.3%

The above percentages show that 78.4% of the township money went for repairs, maintenance, temporary and miscellaneous work. This is as it should be. It is surprising to note that any of the township money went for permanent work. There are approximately 88,200 miles of township road, so that the average expenditure per mile is less than $44.00, which is only about two-thirds of the average county road expenditure for repairs and maintenance alone.

The township expenditures are shown more in detail in Tables Nos. 11, 12, 13 and 14.

SUMMARY OF BRIDGE WORK AND EXPENDITURE FOR ENTIRE STATE.

January 1, 1916, to January 1, 1917.

A summary of the county engineers' annual reports for 1916 shows a total expenditure for bridge work in the state of $7,172,000.00. A com-

parison of the classified expenditures for 1914, 1915 and 1916 are given in the table below:

	1914	1915	1916
Bridge and culvert construction	$3,100,000.00	$5,170,000.00	$5,348,000.00
Repair work	1,160,000.00	1,212,000.00	1,027,000.00
Bridge equipment and material	310,000.00	247,000.00	318,000.00
Filling bridges and culverts			287,000.00
Miscellaneous right of way, etc.	357,000.00	.....	192,000.00
Total	$5,027,000.00	$6,629,000.00	$7,172,000.00

In making a comparison of the total expenditures for 1915 and 1916 it should be noted that the item of filling bridges and culverts is not included in the total for 1915. During 1916, a total of $287,000.00 was spent on filling bridges and culverts, which deducted from the total given above leaves the amount of $6,785,000.00 as the total expenditure for bridges and culverts during 1916. This amount indicates an increased expenditure of $156,000.00 or 2.5% over 1916. The increased cost of construction due to the advance in the price of construction materials would readily account for this increased expenditure.

In the table given below, a summary and comparative statement is given on the classified expenditures for the past three years.

Classification	1914		
	No.	Amount	%
Permanent bridges and culverts	6,587	$2,655,000.00	53.0
Temporary bridges and culverts	4,858	418,000.00	8.3
Repair work	.....	1,160,000.00	23.1
Miscellaneous	.....	794,000.00	15.6
Total bridge work proper	11,445	5,027,000.00	100.00
Filling bridges and culverts	.....	.....	.....
Total	.....	$5,027,000.00	.....

Classification	1915		
	No.	Amount	%
Permanent bridges and culverts	7,131	$4,079,000.00	61.5
Temporary bridges and culverts	34,233	1,091,000.00	16.5
Repair work	.....	1,212,000.00	18.3
Miscellaneous	.....	247,000.00	3.6
Total bridge work proper	41,364	6,629,000.00	100.0
Filling bridges and culverts	.....	249,000.00	.....
Total	.....	$6,878,000.00	.....

Classification	1916		
	No.	Amount	%
Permanent bridges and culverts	11,116	$4,058,000.00	59.3
Temporary bridges and culverts	33,500	1,221,000.00	18.1
Repair work	.....	1,027,000.00	15.1
Miscellaneous	.....	510,000.00	7.5
Total bridge work proper	44,616	6,785,000.00	100.00
Filling bridges and culverts	.....	287,000.00	.....
Total	.....	$7,172,000.00	.....

The amounts given above were spent on work classified as shown. Permanent bridges and culverts include only structures composed entirely of masonry or steel construction. If a part of the work is of a temporary nature, the structure is classified under the heading of temporary construction. Temporary bridges and culverts include all structures not mentioned above. Pipe culverts not provided with masonry bulkheads are classified as temporary construction. The item of filling bridges and culverts is not included in the totals for the years 1914 and 1915.

During 1916 there was a slight decrease in the amount spent and percentage of permanent bridges and culverts constructed as compared with 1915. The total expenditure for permanent construction decreased $52,000.00.

The expenditure for temporary bridges and culverts increased in amount $131,000.00 in 1916. Practically the same percentage of the total expenditure for bridge work was expended for temporary work in 1916 as in 1915.

It is interesting to note the steady decrease in the amount spent for repair work as shown in the table above. During 1916 this item was reduced 3.2% or an amount of $95,000.00 over the amount reported for 1915. The miscellaneous item which includes an amount of $318,100.00 for equipment and material purchased has been slightly increased during 1916.

A detailed statement of the amount spent for the various types of construction for 1915 and 1916 are given in the table below.

No.	Type	1915 No.	1915 Cost	1916 No.	1916 Cost
1	Concrete box culvert	4,886	$1,675,889.00	3,136	$1,883,066.00
2	Circular concrete culverts	708	68,155.00	880	105,754.00
3	Concrete arch culverts	123	23,309.00	147	16,239.00
4	Concrete pipe culverts	2,531	129,835.00	2,768	89,614.00
5	Corrugated pipe culverts	27,768	537,464.00	30,486	721,335.00
6	Masonry arch culverts	3	803.00	56	7,007.00
7	Boiler pipe culverts	1,899	98,018.00	1,566	77,925.00
8	Cast iron pipe culverts	255	21,085.00	478	41,089.00
9	Masonry box culverts	23	5,421.00	30	5,563.00
10	Head walls on culverts	594	62,384.00	1,085	82,250.00
11	Concrete slab bridges	138	173,034.00	128	165,556.00
12	Concrete arch bridges	15	199,354.00	42	73,908.00
13	Concrete abutments	68	60,904.00	90	91,888.00
14	Concrete through girders	16	35,668.00	23	45,143.00
15	Concrete deck girders	55	167,273.00	79	187,567.00
16	Retaining walls	41	14,085.00	24	12,839.00
17	Masonry abutments	6	2,940.00	4	3,434.00
18	I-beam spans in piling abutments	110	53,533.00	129	65,171.00
19	I-beam spans on concrete abutments	404	44,479.00	411	619,114.00
20	Steel girders on concrete abutments	7	21,300.00	4	13,447.00
21	Pony truss on piling—wood floor	39	46,002.00	68	86,340.00
22	Pony truss with concrete abutments	214	566,449.00	185	545,556.00
23	High steel trusses—concrete abutments	23	82,309.00	23	133,982.00
24	Deck trusses—concrete abutments	....	....	1	4,422.00
25	Wood pile bridges	834	210,305.00	773	180,462.00
26	Miscellaneous bridges and culverts	644	186,788.00	.....	54,834.00
	Total	41,364	$4,886,888.00	44,616	$5,248,332.00

SUMMARY OF ROAD AND BRIDGE EXPENDITURES.

BY COUNTIES.

January 1, 1916, to January 1, 1917.

ADAIR COUNTY.

Roads:

The total county road expenditure was $14,900.78 of which $146.00 or 1.0% was spent for permanent work, $6,333.67 or 42.5% was spent for temporary work, $1,989.06 or 13.4% was spent for repairs, $3,816.82 or 25.6% was spent for maintenance, $1,985.23 or 13.3% was spent for equipment and unused material, $630.00 or 4.2% was spent for miscellaneous work.

There were no roads built to permanent or temporary grades and no roads surfaced. $2,291.89 was spent for constructing roads to natural grades but the mileage was not reported.

The county road system was dragged an average of 27.5 times, the average cost of dragging being $0.70 per mile one round trip. The average cost of repairs and maintenance was $33.70 per mile of county road. The total average expenditure per mile of county road was $86.60.

No report was received of township road expenditures.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $76,673.06 of which $41,697.98 or 54.4% was spent on permanent bridges and culverts, $218.86 or 0.3% was spent on temporary bridges and culverts, $6,478.21 or 8.4% was spent on repair work, $15,162.40 or 19.8% was spent on equipment and materials, $13,115.61 or 17.1% was spent on filling bridges and culverts.

Of the total amount $41,916.84 spent for new bridges and culverts, $41,697.98 or 99.5% was spent for permanent work, $218.86 or 0.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

22 concrete box culverts costing $11,791.27; 176 concrete pipe culverts costing $12,368.29; 9 corrugated pipe culverts costing $218.86; 176 headwalls on culverts costing $12,797.27; 1 I-beam span on concrete abutments costing $741.15; 1 pony truss with concrete abutments and floor costing $4,000.

ADAMS COUNTY.

Roads:

The total county road expenditure was $13,817.44, of which $1,261.29 or 9.2% was spent for permanent work; $6,731.85 or 48.6% was spent for temporary work; $1,550.53 or 11.2% was spent for repairs; $3,258.76

or 22.6% was spent was maintenance; $795.10 or 5.7% was spent for equipment and unused material; $219.91 or 1.7% was spent for miscellaneous work.

There were no roads built to permanent grade. 1 mile was built to a temporary grade at a cost of $1,261.29. There was no surfacing work done. 60.5 miles were built to natural grade at a cost of $6,731.85.

The county road system was dragged an average of 37.2 times, the average cost of dragging being $0.70 per mile one round trip. The average cost of repairs and maintenance was $41.10 per mile of county road. The total average expenditure per mile of county road was $109.55.

The total township road expenditure as shown by reports from all of the 12 townships was $24,251.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $40,390.39, of which $17,839.83 or 44.2% was spent on permanent bridges and culverts; $13,002.26 or 31.4% was spent on temporary bridges and culverts; $6,150.07 or 15.2% was spent on repair work; $16.65 or 0.4% was spent on equipment and materials; $3,361.68 or 8.3% was spent on filling bridges and culverts and $20.00 or 0.5% was spent on miscellaneous items.

Of the total amount $20,842.09 was spent for new bridges and culverts; $17,839.83 or 57.7% was spent for permanent work; $13,002.26 or 42.3% was spent for temporary work. The amounts above referred to were spent on the following construction:

7 concrete box culverts costing $4,070.20; 170 concrete pipe culverts costing $8,114.27; 170 corrugated pipe culverts costing $5,917.46; 2 boiler pipe culverts costing $349.72; 8 cast iron pipe culverts costing $763.97; 76 headwalls on culverts costing $5,655.36; 1 I-beam span on piling abutments costing $837.50 and 68 wood pile bridges costing $5,132.61.

ALLAMAKEE COUNTY.

Roads:

The total county road expenditure was $23,804.55, of which $6,542.84 or 27.5% was spent for permanent work; $13,969.95 or 58.7% was spent for repairs; $1,551.11 or 6.5% was spent for maintenance; $671.51 or 2.8% was spent for equipment and unused material; $1,069.14 or 4.5% was spent for miscellaneous work.

2.14 miles were built to permanent grade at a cost of $6,542.84. No roads were built to temporary grade and no surfacing work done. There were no roads built to natural grade.

The county road system was dragged an average of 12.9 times, the average cost of dragging $1.00 per mile one round trip. The average cost of repairs and maintenance was $133.80 per mile of county road. The total average expenditure per mile of county road was $265.20.

The total township road expenditure as indicated by reports from 14 of the 18 townships was $30,294.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $74,588.87, of which $33,542.27 or 45.0% was spent on permanent bridges and culverts; $3,069.31 or 4.1% was spent on temporary bridges and culverts; $36,402.32 or 48.8% was spent on repair work; $167.39 or 0.2% was spent on equipment and materials; $481.66 or 0.7% was spent on filling bridges and culverts and $924.92 or 1.2% was spent on miscellaneous items.

Of the total amount $36,612.58 spent for new bridges and culverts, $33,543.27 or 91.6% was spent for permanent work; $3,069.31 or 8.4% was spent for temporary work. The amounts above referred to were spent on the following construction:

10 concrete box culverts costing $2,038.01; 3 circular concrete culverts costing $280.80; 19 corrugated pipe culverts costing $3,069.31; 4 masonry box culverts costing $1,014.73; 3 I-beam spans on concrete abutments costing $2,330.84; 3 pony truss spans with concrete abutments and floor costing $13,610.31; 3 high steel trusses, concrete abutments and floor costing $14,268.48.

APPANOOSE COUNTY.

Roads:

The total county road expenditure was $14,000.73, of which $333.88 or 2.4% was spent for temporary work; $7,183.13 or 51.3% was spent for repairs; $4,001.89 or 28.6% was spent for maintenance; $765.56 or 5.5% was spent for equipment and unused material; $1,716.27 or 12.2% was spent for miscellaneous work.

There was no permanent grading work and no surfacing. 4 miles were built to natural grade at a cost of $333.88.

The county road system was dragged an average of 20 times, the average cost of dragging being $0.60 per mile one round trip. The average cost or repairs and maintenance was $71.24 per mile of county road. The total average expenditure per mile of county road was $89.10.

The total township road expenditure as shown by reports from all of the 18 townships was $27,423.15.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $61,670.36, of which $27,002.16 or 43.8% was spent on permanent bridges and culverts; $15,097.61 or 24.5% was spent on temporary bridges and culverts; $10,947.30 or 17.8% was spent on repair work; $8,421.29 or 13.6% was spent on filling bridges and culverts and $202.00 or 0.3% was spent on miscellaneous items.

Of the total amount $42,099.77 spent for new bridges and culverts, $27,002.16 or 64.4% was spent for permanent work; $15,097.61 or 35.6% was spent for temporary work. The amounts above referred to were spent on the following construction:

12 concrete box culverts costing $6,778.76; 178 corrugated pipe culverts costing $3,150.68; 159 boiler pipe culverts costing $9,211.76; 1 cast iron

pipe culvert costing $51.00; 1 masonry box culvert costing $213.95; 8 headwalls on culverts costing $1,307.25; 2 concrete abutments costing $1,735.63; 5 I-beam spans on concrete abutments costing $8,661.60; 3 pony truss spans on concrete abutments and floor costing $8,904.97 and 91 miscellaneous bridges and culverts costing $2,684.17.

AUDUBON COUNTY.

Roads:

The total county road expenditure was $15,966.79, of which $968.10 or 6.1% was spent for permanent work; $2,567.09 or 16.1% was spent for temporary work; $6,503.36 or 40.8% was spent for repairs; $3,026.54 or 19.0% was spent for maintenance; $2,431.70 or 15.1% was spent for equipment and unused material; $470 or 2.9% was spent for miscellaneous work.

There was no permanent grading and no surfacing work done. 20.7 miles were built to natural grade at a cost of $2,567.09.

The county road system was dragged an average of 30 times, the average cost of dragging being $0.70 per mile one round trip. The average cost of repairs and maintenance $69.56 per mile of county road. The total average expenditure per mile of county road was $116.50.

The total township road expenditure as shown by reports from all of the 12 townships was $26,025.75.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $52,066.07, of which $5,376.59 or 10.3% was spent on permanent bridges and culverts; $29,787.91 or 57.3% was spent on temporary bridges and culverts; $5,116.74 or 9.8% was spent on repair work; $6,070.20 or 11.6% was spent on equipment and materials; $4,773.06 or 9.2% was spent on filling bridges and culverts and $941.57 or 1.8% was spent on miscellaneous items.

Of the total amount $35,164.50 spent for new bridges and culverts, $5,376.59 or 15.3% was spent for permanent work; $29,787.91 or 84.7% was spent for temporary work. The amounts above referred to were spent on the following construction:

8 concrete box culverts costing $5,367.76; 512 corrugated pipe culverts costing $15,775.17; 1 cast iron pipe culvert costing $1,377.74; 1 headwall on culvert costing $8.83; 25 wood pile bridges costing $12,635.

BENTON COUNTY.

Roads:

The total county road expenditure was $25,153.02, of which $8,271.25 or 32.9% was spent for permanent work; $9,089.82 or 36.2% was spent for temporary work; $2,335.79 or 9.4% was spent for repairs; $4,184.11 or 16.6% was spent for maintenance; $1,060.80 or 4.1% was spent for equipment and unused material; $211.25 or 0.8% was spent for miscellaneous work.

One-half mile was built to permanent grade at a cost of $3,726.68. The miles built to temporary grade were not reported, but $2,783.66 was spent on this work. There was no surfacing laid. The mileage of natural grade work was not reported, but $9,089.82 was spent for this work.

The county road system was dragged an average of 13.5 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $30.90 per mile of county road. The total average expenditure per mile of county road was $119.20.

The total township road expenditure as shown by reports from all of the 20 townships was $59,752.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $100,511.72, of which $70,642.63 or 70.6% was spent on permanent bridges and culverts; $4,433.63 or 4.4% was spent on temporary bridge and culverts; $11,753.33 or 11.8% was spent on repair work; $155.70 or 0.1% was spent on equipment and materials; $11,789.57 or 11.8% was spent on filling bridges and culverts, and $1,737.49 or 1.7% was spent on miscellaneous items.

Of the total amount $75,076.26 spent for new bridges and culverts, $70,642.63 or 94.1% was spent for permanent work; $4,433.63 or 5.9% was spent for temporary work. The amounts above referred to were spent on the following construction:

103 concrete box culverts costing $36,766.59; 23 circular concrete culverts costing $2,233.33; 49 concrete pipe culverts costing $359.42; 230 corrugated pipe culverts costing $3,479.13; 19 cast iron pipe culverts costing $553.66; 8 concrete slab bridges costing $11,507.43; 6 concrete thru girders costing $8,598.83; 4 pony truss spans with concrete abutments and floor costing $11,536.45; miscellaneous bridges and culverts costing $41.48.

BLACK HAWK COUNTY.

Roads:

The total county road expenditure was $27,787.44, of which $6,293.54 or 22.5% was spent for permanent work; $5,785.98 or 20.8% was spent for temporary work; $6,186.93 or 22.3% was spent for repairs; $4,049.25 or 14.6% was spent for maintenance; $1,513.25 or 5.4% was spent for equipment and unused material; $3,958.49 or 14.4% was spent for miscellaneous work.

2.27 miles were built to permanent grade, at a cost of $2,034.80; 2.1 miles were surfaced with gravel at a cost of $2,471.82. 28 miles were built to natural grade at a cost of $5,785.98.

The county road system was dragged an average of 24.3 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $60.64 per mile of county road. The total average expenditure per mile of county road was $164.40.

The total township road expenditure as shown by reports from all of the 18 townships was $43,933.89.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $58,933.50, of which $28,504.39 or 48.3% was spent on permanent bridges

and culverts; $13,602.61 or 23.1% was spent on temporary bridges and culverts; $12,247.19 or 20.8% was spent on repair work; $3,737.47 or 6.3% was spent on equipment and material; $617.88 or 1.1% was spent on filling bridges and culverts and $223.96 or 0.4% was spent on miscellaneous items.

Of the total amount $42,107.90 spent for new bridges and culverts, $28,504.39 or 67.7% was spent for permanent work; $13,602.61 or 32.3% was spent for temporary work. The amounts above referred to were spent on the following construction:

96 concrete box culverts costing $18,529.72; 487 corrugated pipe culverts costing $5,641.73; 1 boiler pipe culvert costing $14.50; 3 I-beam spans on piling abutments costing $3,367.83; 4 I-beam spans on concrete abutments costing $8,229.06; 1 pony truss with concrete abutments and floor costing $1,745.61; 7 wood pile bridges costing $4,165.83; 34 miscellaneous bridges and culverts costing $472.72.

BOONE COUNTY.

Roads:

The total county road expenditure was $21,043.46 of which $13,107.78 or 42.3% was spent for permanent work; $3,416.27 or 11.0% was spent for temporary work; $3,222.69 or 10.4% was spent for repair work; $4,427.25 or 14.3% was spent for maintenance; $3,022.01 or 9.7% was spent for equipment and unused material; $3,837.46 or 12.3% was spent for miscellaneous work.

The miles of permanent grade work was not reported, but $440 was spent on such work. 1 mile was built to temporary grade at a cost of $2,140.99. 10.75 miles were surfaced with gravel at a cost of $9,120.28. 37.75 miles were built to natural grade at a cost or $3,416.27.

The county road system was dragged an average of 37.8 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $48.41 per mile of county road. The total average expenditure per mile of county road was $196.50.

The total township road expenditure as shown by reports from all of the 17 townships was $48,520.21.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $61,134.69, of which $41,011.11 or 67.2% was spent on permanent bridges and culverts; $5,196.86 or 8.5% was spent on temporary bridges and culverts; $9,770.01 or 16.0% was spent on repair work; $2,315.65 or 3.8% was spent on equipment and materials; $2,841.06 or 4.5% was spent on filling bridges and culverts.

Of the total amount $46,207.97 spent for new bridges and culverts, $41,011.11 or 88.8% was spent for permanent work, $5,196.86 or 11.2% was spent for temporary work. The amounts above referred to were spent on the following construction:

30 concrete box culverts costing $13,053.69; 8 circular concrete culverts costing $1,781.83; 236 corrugated pipe culverts costing $5,196.86; 2 concrete slab bridges costing $2,681.04; 1 concrete arch bridge costing $1,352.36; 5 I-beam spans on concrete abutments costing $9,476.96; 1 pony truss span with concrete abutments and floor costing $2,838.50; 1 high steel truss on concrete abutments costing $7,828.73.

BREMER COUNTY.

Roads:

The total county road expenditure was $26,577.52 of which $10,563.24 or 39.6% was spent for permanent work; $6,882.04 or 25.9% was spent for temporary work; $2,220.06 or 8.4% was spent for repairs; $2,329.29 or 8.8% was spent for maintenance; $3,050.06 or 11.5% was spent for equipment and unused material; $1,532.83 or 5.8% was spent for miscellaneous work.

4.76 miles were built to permanent grade, at a cost of $8,377.79. ¼ mile was surfaced with gravel at a cost of $207.90. 40.75 miles were built to natural grade at a cost of $6,882.04.

The county road system was dragged an average of 24 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $36.25 per mile of county road. The total average expenditure per mile of county road was $209.50.

The total township road expenditure as shown by reports from all of the 14 townships was $31,277.96.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $50,105.27, of which $33,826.97 or 67.5% was spent for permanent bridges and culverts; $4,604.90 or 9.2% was spent on temporary bridges and culverts; $4,018.77 or 8.0% was spent on repair work; $5,602.50 or 11.2% was spent on equipment and materials; $1,103.09 or 2.2% was spent on filling bridges and culverts, and $948.94 or 1.9% was spent on miscellaneous items.

Of the total amount $38,431.87 spent for new bridges and culverts, $33,826.97 or 88.0% was spent for permanent work; $4,604.90 or 12.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

18 circular concrete culverts costing $6,086.03; 15 concrete arch culverts costing $2,134.05; 253 corrugated pipe culverts costing $3,681.44; 1 concrete arch bridge costing $1,361.25; 1 concrete thru girder costing $5,626.44; 2 retaining walls costing $4,747.78; 1 high steel truss on concrete abutments costing $13,877.44; 3 miscellaneous bridges and culverts costing $923.46.

BUCHANAN COUNTY.

Roads:

The total county road expenditure was $39,293.92, or which $13,399.23 or 34.1% was spent for permanent work; $4,019.17 or 10.2% was spent for temporary work; $16,170.37 or 41.2% was spent for repairs; $2,520.00 or 6.4% was spent for maintenance; $216.80 or 0.6% was spent for equipment and unused material; $2,968.35 or 7.5% was spent for miscellaneous work.

2.35 miles were built to permanent grade, at a cost of $8,422.39. 2.35 miles were surfaced with gravel at a cost of $2,943.54. 37 miles were built to natural grade at a cost of $4,019.17.

The county road system was dragged an average of 21 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $110.72 per mile of county road. The total average expenditure per mile of county road was $232.50.

The total township road expenditure as shown by reports from all of the 12 townships was $37,612.00. No reports of township road expenditures were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $69,505.00, of which $59,404.74 or 85.5% was spent on permanent bridges and culverts; $6,059.27 or 8.7% was spent on temporary bridges and culverts; $2,623.82 or 3.8% was spent on repair work; $100.00 or 0.1% was spent on equipment and materials; $722.26 or 1.0% was spent on filling bridges and culverts and $594.91 or 0.9% was spent on miscellaneous items.

Of the total amount $65,463.91, spent for new bridges and culverts, $59,404.74 or 90.7% was spent for permanent work; $6,059.27 or 9.3% was spent for temporary work. The amounts above referred to were spent on the following construction:

95 concrete box culverts costing $26,741.06; 3 circular concrete culverts costing $570.60; 237 corrugated pipe culverts costing $6,059.27; 1 concrete slab bridge costing $1,096.85; 6 concrete abutments costing $9,221.12; 4 concrete deck girders costing $15,148.26; 5 I-beam spans on concrete abutments costing $6,626.75.

BUENA VISTA COUNTY.

Roads:

The total county road expenditure was $108,445.51, of which $89,995.60 or 82.9% was spent for permanent work; $746.46 or 0.7% was spent for temporary work; $3,120.33 or 2.9% was spent for repairs; $3,148.39 or 2.9% was spent for maintenance; $4,371.21 or 4.0% was spent for equipment and unused material; $7,063.52 or 6.6% was spent for miscellaneous work. 54.7 miles were built to permanent grade at a cost of $55,742.74. 25.7 miles were surfaced with gravel at a cost of $20,202.32. 5 miles were built to natural grade at a cost of $746.46. $14,050.54 was spent for tile drainage on county roads.

The county road system was dragged an average of 24.4 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $37.54 per mile of county road. The total average expenditure per mile of county road was $649.46.

The total township road expenditure as indicated by reports from 12 of the 18 townships was $59,400.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $142,578.84, of which $88,312.38 or 62.0% was spent on permanent bridges and culverts; $24,796.25 or 17.4% was spent on temporary bridges and culverts; $1,895.99 or 1.3% was spent on repair work; $17,277.77 or 12.1% was spent on equipment and materials; $2,062.93 or 1.4% was spent on filling bridges and culverts and $8,233.52 or 5.8% was spent on miscellaneous items.

Of the total amount $113,108.63 spent for new bridges and culverts, $88,312.38 or 78.0% was spent for permanent work, $24,796.25 or 22.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

88 concrete box culverts costing $28,503.18; 1 circular concrete culvert costing $146.78; 950 corrugated pipe culverts costing $24,037.93; 2 cast iron pipe culverts costing $63.45; 1 concrete thru girder costing $2,210.30; 52 I-beam spans on concrete abutments costing $50,581.13; 3 pony truss spans with concrete abutments and floor, costing $4,944.63; 1 high steel truss on concrete abutments, costing $2,126.36; miscellaneous bridges and culverts costing $698.87.

BUTLER COUNTY.

Roads:

The total county road expenditure was $44,031.30, of which $3,251.35 or 7.4% was spent for permanent work; $15,657.85 or 35.6% was spent for temporary work; $1,426.44 or 3.2% was spent for repairs; $6,293.89 or 14.3% was spent for maintenance; $16,245.63 or 37.1% was spent for equipment and unused material; $1,056.14 or 2.4% was spent for miscellaneous work. 1½ miles were built to a permanent grade at a cost of $933.40. There was no surfacing work. 127 miles were built to natural grade at a cost of $15,657.85.

The county road system was dragged an average of 18 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $44.32 per mile of county road. The total average expenditure per mile of county road was $253.00.

The total township road expenditure as shown by reports from all of the 16 townships was $35,526.99.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $67,840.92, of which $19,318.98 or 28.5% was spent on permanent bridges and culverts; $4,069.98 or 6.0% was spent on temporary bridges and culverts; $29,520.41 or 43.5% was spent on repair work; $12,624.93 or 18.6% was spent on equipment and materials; $2,306.62 or 3.4% was spent on filling bridges and culverts.

Of the total amount, $23,388.96 spent for new bridges and culverts, $19,318.98 or 82.6% was spent for permanent work, $4,069.98 or 17.4% was spent for temporary work. The amounts above referred to were spent on the following construction:

57 concrete box culverts costing $15,342.23; 5 corrugated pipe culverts costing $321.40; 1 cast iron pipe culvert costing $133.00; 1 headwall on concrete culvert costing $66.00; 1 concrete slab bridge costing $2,527.00;

1 concrete arch bridge costing $53.75; 1 I-beam span on concrete abutments, costing $1,350.00; 2 miscellaneous bridges costing $3,615.58.

CALHOUN COUNTY.

Roads:

The total county road expenditure was $72,750.58, of which $54,537.72, or 75.0% was spent for permanent work; $3,151.46, or 4.3% was spent for temporary work; $1,851.77 or 2.5% was spent for repairs; $3,656.82 or 5.0% was spent for maintenance; $2,910.97 or 3.8% was spent for equipment and unused material; $7,541.82 or 10.4% was spent for miscellaneous work. 34.8 miles were built to permanent grade at a cost of $37,265.36. Two miles were built to temporary grade, at a cost of $1,426.55. 10.24 miles were surfaced with gravel at a cost of $12,159.82. 36.25 miles were built to natural grade at a cost of $3,151.46.

The county road system was dragged an average of 28.3 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $32.80 per mile of county road. The total average expenditure per mile of county road road was $423.90.

The total township road expenditures as shown by reports from all of the sixteen townships was $41,316.49.

Bridges:

The total expenditure for bridge and culvert work in 1916 was $58,566.34 of which $34,188.57 or 58.4% was spent on permanent bridges and culverts, $14,007.32 or 23.9% was spent on temporary bridges and culverts, $2,037.74 or 3.5% was spent on repair work, $7,088.85 or 12.1% was spent on equipment and materials, $1,079.81 or 1.8% was spent on filling bridges and culverts, and $164.05 or 0.3% was spent on miscellaneous items.

Of the total amount $48,195.89 spent for new bridges and culverts, $34,188.57 or 70.9% was spent for permanent work, $14,007.32 or 29.1% was spent for temporary work. The amounts above referred to were spent on the following construction:

27 concrete box culverts costing $12,920.76; 66 circular concrete culverts costing $7,453.49; 1,521 concrete pipe culverts costing $10,772.07; 5 concrete slab bridges costing $1,870.33; 1 concrete arch bridge costing $39.00; 3 concrete deck girders costing $1,019.54; 3 I-beam spans on piling abutments costing $530.50; 1 I-beam span on concrete abutments costing $119.85; 6 pony truss spans on piling abutments costing $2,468.45; 5 pony truss spans with concrete abutments and floors costing $10,785.60; miscellaneous bridges and culverts costing $236.30.

CARROLL COUNTY.

Roads:

The total county road expenditure was $35,786.92 of which $20,502.18 or 57.3% was spent for permanent work; $4,290.53 or 12.0% was spent for temporary work; $4,040.90 or 11.3% was spent for repairs; $3,514.52 or 9.8% was spent for maintenance; $2,052.73 or 5.7% was spent for equipment and unused material; $1,386.06 or 3.9% was spent for miscellaneous

work. 11.38 miles were built to permanent grade at a cost of $18,783.01. One-fourth of a mile was built to permanent grade at a cost of $1,142.65. There was no surfacing work done. 24.62 miles were built to natural grade at a cost of $4,205.02.

The county road system was dragged an average of 27.4 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $42.60 per mile of county road. The total average expenditure per mile of county road was $204.50.

The total township road expenditure as shown by reports from all of the sixteen townships was $41,316.49.

Bridges:

The total expenditure for bridge and culvert work for 1916 was $61,392.73, of which $35,286.78 or 57.5% was spent on permanent bridges and culverts, $11,744.65 or 19.1% was spent on temporary bridges and culverts, $8,464.77 or 13.8% was spent on repair work, $2,791.98 or 4.6% was spent on equipment and materials, $2,827.65 or 4.6% was spent on filling bridges and culverts and $276.90 or 0.4% was spent on miscellaneous items.

Of the total amount $47,031.43 spent for new bridges and culverts $35,286.78 or 75.0% was spent for permanent work, $11,744.65 or 25.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

66 concrete box culverts costing $29,542.38; 5 circular concrete culverts costing $476.72; 20 concrete pipe culverts costing $192.26; 359 corrugated pipe culverts costing $8,832.51; 7 cast iron pipe culverts costing $477.33; 1 headwall on culvert costing $275.48; 1 concrete deck girder costing $400.00; 1 retaining wall costing $506.98; 3 I-beam spans on concrete abutments costing $2,384.98; 1 pony truss with concrete abutments and floors costing $1,030.65; 16 wood pile bridges costing $2,418.74; miscellaneous bridges and culverts costing $493.40.

CASS COUNTY.

Roads:

The total road expenditure was $16,818.65, of which $2,573.74 or 15.3% was spent for permanent work; $6,915.69 or 41.1% was spent for repairs; $5,228.08 or 31.1% was spent for maintenance; $377.24 or 2.2% was spent for equipment and unused material; $1,723.90 or 10.3% was spent for miscellaneous work. 1.25 miles were built to permanent grade at a cost of $2,288.58. There were no roads built to natural grade. One-half mile was surfaced with concrete but this was paid for from donated funds —cost $8,996.00.

The county road system was dragged an average of 32 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $85.52 per mile of county road. The total average expenditure per mile of county road was $118.40.

The total township road expenditure as shown by reports from all of the eighteen townships was $32,104.52.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $75,523.98, of which $34,265.58 or 45.3% was spent on permanent bridges and culverts; $20,797.29 or 27.5% was spent on temporary bridges and culverts; $11,608.14 or 15.4% was spent on repair work; $1,876.55 or 2.5% was spent on equipment and materials; $4,430.85 or 5.9% was spent on filling bridges and culverts and $2,545.57 or 3.4% was spent on miscellaneous items.

Of the total amount $55,062.87 spent for new bridges and culverts, $34,265.58 or 62.2% was spent for permanent work; $20,797.29 or 37.8% was spent for temporary work. The amounts above referred to were spent on the following construction:

22 concrete box culverts costing $18,856.73; 5 concrete pipe culverts costing $372.22; 244 corrugated pipe culverts costing $6,272.84; 4 boiler pipe culverts costing $771.53; 1 headwall on culvert costing $114.05; 3 pony truss spans on piling abutments costing $6,084.60; 3 pony truss spans with concrete abutments and floor costing $14,922.58; 34 wood pile bridges costing $7,668.32.

CERRO GORDO COUNTY.

Roads:

The total county road expenditure was $66,352.20 of which $48,389.79 or 73.0% was spent for permanent work; $6,599.07 or 9.9% was spent for temporary work; $4,110.60 or 6.2% was spent for repairs; $3,009.05 or 4.5% was spent for maintenance; $1,239.33 or 1.9% was spent for equipment and unused material; $3,004.45 or 4.5% was spent for miscellaneous work. 21.7 miles were built to permanent grade at a cost of $37,682.03. $711.53 was spent for surfacing but the mileage was not given. 28.6 miles were built to natural grade at a cost of $6,599.07. $9,996.14 was spent for tile drainage on county roads.

The county road system was dragged an average of 25 times, the average cost of dragging being 81c per mile one round trip. The average cost of repairs and maintenance was $51.33 per mile of county road. The total average expenditure per mile of county road was $477.40.

The total township road expenditure as shown by reports from all of the eighteen townships was $46,774.53.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $47,046.57, of which $31,233.85 or 66.5% was spent on permanent bridges and culverts; $5,885.88 or 12.5% was spent on temporary bridges and culverts; $3,479.91 or 7.4% was spent on repair work, $4,069.61 or 8.6% was spent on equipment and materials, $375.45 or 0.8% was spent on filling bridges and culverts and $2,001.87 or 4.2% was spent on miscellaneous items.

Of the total amount $37,119.73 spent on new bridges and culverts, $31,233.85 or 84.3% was spent for permanent work, $5,885.88 or 15.7% was spent for temporary work. The amounts above referred to were spent on the following construction:

58 concrete box culverts costing $16,458.57; 29 circular concrete culverts costing $2,967.66; 387 corrugated pipe culverts costing $5,724.00; 1 concrete abutment costing $957.95; 3 concrete deck girders costing $7,241.57; 2 I-beam spans on concrete abutments costing $3,609.00; 3 wood pile bridges costing $161.88.

CHEROKEE COUNTY.

Roads:

The total county road expenditure was $41,524.45, of which $26,964.95 or 64.9% was spent for permanent work; $4,739.85 or 11.4% was spent for temporary work; $2,813.13 or 6.8% was spent for repairs; $2,808.02 or 6.8% was spent for maintenance; $2,877.44 or 6.9% was spent for equipment and unused material; $1,321.06 or 3.2% was spent for miscellaneous work. 18.5 miles were built to permanent grade at a cost of $26,437.86. There was no surfacing work done. Forty miles were built to natural grade at a cost of $4,739.85.

The county road system was dragged an average of 25 times, the average cost of dragging being $0.80 per mile one round trip. The average cost of repairs and maintenance was $37.98 per mile of county road. The total average expenditure per mile of county road was $280.60.

The total township road expenditure as shown by reports from all of the sixteen townships was $32,031.81.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $117,548.31, of which $86,672.15 or 73.7% was spent on permanent bridges and culverts, $12,490.65 or 10.6% was spent on temporary bridges and culverts, $6,550.97 or 5.6% was spent on repair work, $2,487.39 or 2.1% was spent on equipment and materials, $2,332.36 or 2.0% was spent on filling bridges and culverts and $7,014.79 or 6.0% was spent on miscellaneous items.

Of the total amount $99,162.80 spent for new bridges and culverts, $86,672.15 or 87.5% was spent for permanent work, $12,490.65 or 12.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

99 concrete box culverts costing $34,412.10; 19 circular concrete culverts costing $2,803.40; 427 corrugated pipe culverts costing $10,578.81; 1 cast iron pipe culvert costing $64.80; 4 concrete slab bridges costing $5,171.10; 5 concrete deck girder bridges costing $9,950.35; 6 I-beam spans on piling abutments costing $1,445.89; 10 I-beam spans on concrete abutments costing $16,295.03; 6 pony truss spans with concrete abutments and floors costing $18,040.27; 3 wood pile bridges costing $401.15.

CEDAR COUNTY.

Roads:

The total county road expenditure was $28,463.86, of which $15,176.88 or 53.3% was spent for permanent work; $1,037.25 or 3.6% was spent for

temporary work; $7,066.28 or 24.8% was spent for repairs; $1,776.39 or 13.3% was spent for maintenance; $905.68 or 3.2% was spent for equipment and unused material; $480.78 or 1.7% was spent for miscellaneous work. 3.47 miles were built to permanent grade at a cost of $11,539.41. 0.58 miles were surfaced with macadam at a cost of $2,813.49.

The county road system was dragged an average of 31.2 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $68.62 per mile of county road. The total average expenditure per mile of county road was $180.10.

The total township road expenditure as shown by reports from all of the eighteen townships was $44,999.65.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $72,860.18, of which $57,292.70 or 78.6% was spent on permanent bridges and culverts, $4,663.42 or 6.4% was spent on temporary bridges and culverts, $9,087.14 or 12.5% was spent on repair work, $3.75 or 0.0% was spent on equipment and materials, $946.60 or 1.3% was spent on filling bridges and culverts and $866.57 or 1.2% was spent on miscellaneous items.

Of the total amount $61,956.12 spent for new bridges and culverts, $57,292.70 or 92.5% was spent for permanent work, $4,663.42 or 7.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

179 concrete box culverts costing $37,143.20; 7 circular concrete culverts costing $735.38; 24 corrugated pipe culverts costing $471.55; 119 boiler pipe culverts costing $3,550.68; 1 cast iron pipe culvert costing $50.08; 1 headwall on culvert costing $107.30; 2 concrete slab bridges costing $1,019.32; 2 concrete abutments costing $993.48; 2 concrete deck girders costing $734.61; 5 I-beam spans on concrete abutments costing $5,683.82; 5 pony truss spans concrete abutments and floors costing $10,609.89; 34 miscellaneous bridges and culverts costing $816.81.

CHICKASAW COUNTY.

Roads:

The total county road expenditure was $29,645.83 of which $6,992.82 or 23.6% was spent for permanent work; $8,674.94 or 29.3% was spent for temporary work; $9,196.34 or 31.0% was spent for repairs; $1,569.88 or 5.3% was spent for maintenance; $2,709.10 or 9.1% was spent for equipment and unused material; $511.75 or 1.7% was spent for miscellaneous work. Nine miles were built to permanent grade at a cost of $3,182.49. One-half mile was built to temporary grade at a cost of $196.25. Three and one-eighth miles were surfaced with gravel at a cost of $1,490.78. 48.75 miles were built to natural grade at a cost of $8,674.94.

The county road system was dragged an average of fourteen times, the average cost of dragging being 78c per mile one round trip. The average cost of repairs and maintenance was $69.63 per mile of county road. The total average expenditure per mile of county road was $191.20.

The total township road expenditure as indicated by reports from seven of the twelve townships was $35,119.20.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $82,576.52, of which $56,080.32 or 68.0% was spent on permanent bridges and culverts, $8,381.86 or 10.2% was spent on temporary bridges and culverts, $16,052.09 or 19.5% was spent on repair work, $928.99 or 1.1% was spent on equipment and materials, $703.25 or 0.9% was spent on filling bridges and culverts and $230.01 or 0.3% was spent on miscellaneous items.

Of the total amount $64,462.18 spent for new bridges and culverts $56,080.32 or 87.0% was spent for permanent work, $8,381.86 or 13.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

58 concrete box culverts costing $13,685.94; 308 corrugated pipe culverts at $4,837.42; 1 headwall for culvert costing $16.76; 2 concrete abutments costing $980.70; 9 I-beam spans on concrete abutments costing $10,971.25; 1o pony truss spans with concrete abutments and floors costing $21,955.09; 1 high steel truss on concrete abutments costing $8,470.47; 10 wood pile bridges costing $3,358.28; 4 miscellaneous bridges and culverts costing $186.16.

CLARKE COUNTY.

Roads:

The total county road expenditure was $11,952.13, of which $3,350.34 or 28.0% was spent for temporary work; $2,158.27 or 18.1% was spent for repairs; $3,032.48 or 25.4% was spent for maintenance; $783.05 or 6.5% was spent on equipment and unused materials; $2,627.99 or 22.0% was spent for miscellaneous work. There was no permanent grading and no surfacing work done. Thirty-three miles were built to natural grade at a cost of $3,350.34.

The county road system was dragged an average of 38 times, the average cost of dragging being 70c per mile one round trip. The average cost of repairs and maintenance was $45.53 per mile of county road. The total average expenditure per mile of county road was $104.80.

No reports of township road expenditures were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $57,556.35 of which $17,406.96 or 30.0% was spent on permanent bridges and culverts, $12,626.81 or 21.8% was spent on temporary bridges and culverts, $9,096.67 or 15.7% was spent on repair work, $150.47 or 0.3% was spent on equipment and materials, $18,668.89 or 32.2% was spent on filling bridges and culverts and $6.55 or 0.0% was spent on miscellaneous items.

Of the total amount $30,033.77 spent for new bridges and culverts $17,406.96 or 57.9% was spent for permanent work, $12,626.81 or 42.1%

was spent for temporary work. The amounts above referred to were spent on the following construction:

20 concrete box culverts costing $16,942.09; 461 corrugated pipe culverts costing $9,795.39; 18 cast iron pipe culverts costing $2,894.19; 2 concrete abutments costing $464.87; miscellaneous bridges and culverts costing $27.23.

CLAY COUNTY.

Roads:

The total county road expenditure was $62,300.44, of which $18,885.46 or 78.5% was spent for permanent work; $408.00 or 0.6% was spent for temporary work; $1,953.55 or 3.1% was spent for repairs; $2,296.27 or 3.7% was spent for maintenance; $1,288.42 or 2.1% was spent for equipment and unused material; $7,468.74 or 12.0% was spent for miscellaneous work. 50.2 miles were built to permanent grade at a cost of $34,137.34. 13.8 miles were surfaced with gravel at a cost of $9,792.99. Three miles were built to natural grade at a cost of $408.00. $4,965.13 was spent for tile drainage.

The county road system was dragged an average of 20 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $28.33 per mile of county road. The total average expenditure per mile of county road was $415.36.

The total township road expenditure as shown by reports from all of the sixteen townships was $38,888.80.

Bridges:

The total expenditures for bridge and culvert work during 1916 was $92,383.02, of which $73,405.03 or 79.5% was spent on permanent bridges and culverts, $8,688.11 or 9.4% was spent on temporary bridges and culverts, $7,073.44 or 7.7% was spent on repair work; $1,281.20 or 1.4% was spent on equipment and materials; $1,070.46 or 1.1% was spent on filling bridges and culverts, and $864.78 or 0.9% was spent on miscellaneous items..

Of the total amount $82,093.14 spent for new bridges and culverts, $73,405.03 or 89.3% was spent for permanent work, $8,688.11 or 10.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

76 concrete box culverts costing $22,938.44; 433 corrugated pipe culverts costing $8,606.63; 1 boiler pipe culvert costing $61.43; 1 concrete arch bridge costing $1,040.92; 1 concrete abutment costing $1,222.10; 21 I-beam spans on concrete abutments costing $28,850.12; 8 pony truss spans with concrete abutments and floor costing $19,353.45; miscellaneous bridges and culverts costing $20.05.

CLAYTON COUNTY.

Roads:

The total county road expenditure was $28,166.35 of which $20,517.04 or 72.8% was spent for repairs; $4,761.17 or 16.9% was spent for maintenance; $777.10 or 2.8% was spent for equipment and unused material;

$2,111.04 or 7.5% was spent for miscellaneous work. There was no permanent grading, no surfacing work and no roads built to natural grade.

The county road system was dragged an average of 34 times, the average cost of dragging being 62c per mile one round trip. The average cost of repairs and maintenance was $126.83 per mile of county road. The total average expenditure per mile of county road was $141.50.

The county road system is maintained under the patrol system.

The total township road expenditure as indicated by reports from 17 of the 22 townships was $41,844.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $56,477.31, of which $40,258.54 or 71.3% was spent on permanent bridges and culverts; $6,441.00 or 11.4% was spent on temporary bridges and culverts; $3,851.37 or 6.8% was spent on repair work; $528.86 or 0.9% was spent on equipment and materials; $1,279.44 or 2.3% was spent on filling bridges and culverts, and $4,118.10 or 7.3% was spent on miscellaneous items.

Of the total amount $46,699.54 spent for new bridges and culverts, $40,258.54 or 86.4% was spent for permanent work; $6,441.00 or 13.6% was spent for temporary work. The amounts above referred to were spent on the following construction:

39 concrete box culverts costing $15,865.52; 326 corrugated pipe culverts costing $6,441.00; 1 masonry arch culvert costing $395.00; 5 concrete slab bridges costing $3,611.25; 2 concrete abutments costing $2,699.60; 2 concrete thru girder bridges costing $2,986.20; 11 I-beam spans on concrete abutments costing $8,861.32; 4 pony truss spans with concrete abutments and floor costing $5,839.65.

CLINTON COUNTY

Roads:

The total county road expenditure was $32,396.61 of which $18,109.52 or 55.9% was spent for permanent work; $3,273.41 or 10.1% was spent for temporary work; $2,919.54 or 9.0% was spent for repairs; $4,684.49 or 14.5% was spent for maintenance; $511.05 or 1.6% was spent for equipment and unused material; $2,898.60 or 8.9% was spent for miscellaneous work. 4.61 miles were built to permanent grade at a cost of $13,211.39. Two-tenths of a mile was built to temporary grade at a cost of $603.80. One and one-quarter miles were surfaced with gravel at a cost of $3,300. 18.5 miles were built to natural grade at a cost of $1,816.11.

The county road system was dragged an average of 31.8 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $38.89 per mile of county road. The total average expenditure per mile of county road was $165.30.

The total township road expenditure as shown by reports from all of the twenty townships was $41,093.38.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $74,632.86, of which $47,953.77 or 64.3% was spent on permanent bridges and culverts; $14,155.00 or 19.0% was spent on temporary bridges and culverts; $3,023.75 or 4.0% was spent on repair work; $5,530.15 or 7.4% was spent on equipment and materials; $2,050.50 or 2.8% was spent on filling bridges and culverts, and $1,919.79 or 2.5% was spent on miscellaneous items.

Of the total amount $62,108.77 spent for new bridges and culverts $47,953.77 or 77.2% was spent for permanent work; $14,155.00 or 22.8% was spent for temporary work. The amounts above referred to were spent on the following construction:

35 concrete box culverts costing $16,704.14; 340 corrugated pipe culverts costing $8,501.98; 5 boiler pipe culverts costing $450.08; 15 cast iron pipe culverts costing $1,550.48; 3 headwalls on culverts costing $445.83; 1 concrete arch bridge costing $2,322.00; 1 concrete deck girder bridge costing $4,929.58; 1 retaining wall costing $208.17; 1 I-beam span on piling abutments costing $83.25; 4 I-beam spans on concrete abutments costing $6,599.55; 1 pony truss on piling abutments costing $3,313.72; 5 pony truss spans with concrete abutments and floor costing $15,901.82; 5 wood pile bridges costing $265.49.

CRAWFORD COUNTY.

Roads:

The total county road expenditure was $90,530.80 of which $77,902.10 or 86.2% was spent for permanent work; $6,697.01 or 7.4% was spent for repairs; $3,822.17 or 4.2% was spent for maintenance; $95.80 or 0.1% was spent for equipment and unused materials; $2,013.72 or 2.1% was spent for miscellaneous work. 31.34 miles were built to permanent grade at a cost of $77,902.10. There were no roads surfaced and none built to natural grade.

The county road system was dragged on an average of 35.3 times, the average cost of dragging being 72c per mile one round trip. The average cost of repairs and maintenance was $70.60 per mile of county road. The total average expenditure per mile of county road was $607.60.

No reports were received showing the township road expenditures.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $128,920.70 of which $70,051.62 or 54.3% was spent on permanent bridges and culverts; $21,608.91 or 16.8% was spent on temporary bridges and culverts; $32,440.42 or 25.2% was spent on repair work; $2,942.54 or 2.3% was spent on filling bridges and culverts and $1,877.21 or 1.4% was spent on miscellaneous items.

Of the total amount $91,660.53 spent for new bridges and culverts, $70,051.62 or 76.4% was spent for permanent work; $21,608.91 or 23.6% was spent for temporary work. The amounts above referred to were spent on the following construction:

104 concrete box culverts costing $55,770.59; 320 corrugated pipe culverts costing $18,155.67; 20 cast iron pipe culverts costing $1,732.99; 2 I-beam spans on concrete abutments costing $3,424.49; 7 pony truss spans with concrete abutments and floor costing $8,496.44; 27 wood pile bridges costing $1,720.85 and 13 miscellaneous bridges and culverts costing $4,088.78.

DALLAS COUNTY.

Roads:

The total county road expenditure was $40,713.93 of which $14,406.77 or 35.4% was spent for permanent work; $6,740.20 or 16.6% was spent for temporary work; $1,071.10 or 2.6% was spent for repairs; $4,366.64 or 10.7% was spent for maintenance; $9,570.37 or 23.5% was spent for equipment and unused materials; $4,558.85 or 11.2% was spent for miscellaneous work.

One mile was built to permanent grade at a cost of $2,287.69; .7 of a mile was built to temporary grade at a cost of $1,937.82; 6.35 miles were surfaced with gravel at a cost of $8,067.84; 92.15 miles were built to natural grade at a cost of $6,740.20.

The county system was dragged on an average of 34 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $21.71 per mile of county road. The total average expenditures per mile of county road was $236.70.

The total township road expenditure as shown by reports from all of the 16 townships was $46,643.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $129,469.95, of which $91,058.08 or 70.3% was spent on permanent bridges and culverts; $9,983.62 or 7.7% was spent on temporary bridges and culverts; $15,544.65 or 12.0% was spent on repair work; $1,659.46 or 1.3% was spent on equipment and materials; $5,550.43 or 4.3% was spent on filling bridges and culverts and $5,664.71 or 4.4% was spent on miscellaneous items.

Of the total amount $101,041.70 spent for new bridges and culverts, $91,058.08 or 90.1% was spent for permanent work; $9,983.62 or 9.9% was spent for temporary work. The amounts above referred to were spent on the following construction:

90 concrete box culverts costing $35,276.99; 14 circular concrete culverts costing $1,796.10; 500 corrugated pipe culverts costing $9,648.42; 1 headwall on culvert costing $142.90; 10 concrete slab bridges costing $11,558.74; 2 concrete arch bridges costing $15,056.65; 4 concrete abutments costing $15,116.00; 2 concrete deck girder bridges costing $9,551.70; 2 high steel trusses on concrete abutments costing $2,559.00; 1 wood pile bridge costing $225.00 and miscellaneous bridges and culverts costing $10.20.

DAVIS COUNTY.

Roads:

The total county road expenditure was $15,993.78, of which $7,093.07 or 44.3% was spent on temporary work; $2,017.60 or 12.6% was spent for

repairs; $3,015.34 or 18.8% was spent for maintenance; $1,664.64 or 10.4% was spent for equipment and unused material and $2,203.13 or 13.9% was spent for miscellaneous work. There was no permanent grading and no surfacing work done. 66.5 miles were built to natural grade at a cost of $7,093.67.

The county road system was dragged an average of 20.1 times, the average cost of dragging being $1.00 per mile one round trip. The average cost of repairs and maintenance was $32.30 per mile of county road. The total average expenditure per mile of county road was $102.50.

No reports of township road expenditures were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $49,649.72, of which $21,720.93 or 43.7% was spent on permanent bridges and culverts; $8,639.44 or 17.4% was spent on temporary bridges and culverts; $3,659.48 or 7.4% was spent on repair work; $99.71 or 0.2% was spent on equipment and materials; $4,870.36 or 9.8% was spent on filling bridges and culverts and $10,659.80 or 21.5% was spent on miscellaneous items.

Of the total amount $30,360.37 spent for new bridges and culverts, $21,720.93 or 71.5% was spent for permanent work; $8,639.44 or 28.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

6 concrete box culverts costing $3,558.40; 14 circular concrete culverts costing $4,178.18; 2 concrete pipe culverts costing $666.96; 262 corrugated pipe culverts costing $7,316.58; 28 boiler pipe culverts costing $1,322.86; 2 head walls on culverts costing $418.31; 2 I-beam spans on concrete abutments costing $2,047.12; and 1 pony truss span with concrete abutments and floor costing $10,851.96.

DECATUR COUNTY.

Roads:

The total county road expenditure was $12,966.89, of which $42.00 or .3% was spent for permanent work; $4,807.32 or 37% was spent for temporary work; $1,028.80 or 8.0% was spent for repairs; $4,706.44 or 36.3% was spent for maintenance; $552.15 or 4.3% was spent for equipment and unused material; and $1,820.18 or 14.1% was spent for miscellaneous work. There was no permanent grading and no surfacing work. Sixty miles were built to natural grade at a cost of $4,807.32.

The county road system was dragged an average of 42 times, the average cost of dragging being $0.70 per mile one round trip. The average cost of repairs and maintenance was $37.80 per mile of county road. The total average expenditure per mile of county road was $85.30.

The total township road expenditure as shown by reports from all of the 16 townships was $28,005.32.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $44,802.68, of which $12,952.29 or 28.9% was spent on permanent bridges and culverts; $8,571.07 or 19.2% was spent on temporary bridges and culverts; $11,488.81 or 25.6% was spent on repair work; $3,732.66 or 8.3% was spent on equipment and materials; $7,448.33 or 16.6% was spent on filling bridges and culverts, and $609.52 or 1.4% was spent on miscellaneous items.

Of the total amount $21,523.36 spent for new bridges and culverts $12,952.29 or 60.3% was spent for permanent work; and $8,571.07 or 39.7% was spent for temporary work. The amounts above referred to were spent on the following construction:

19 concrete box culverts costing $11,311.69; 3 concrete pipe culverts costing $155.60; 305 corrugated pipe culverts costing $4,882.13; 1 boiler pipe culvert costing $56.00; 12 cast iron pipe culverts costing $1,144.70; 13 headwalls on culverts costing $1,485.00; and 2 pony truss spans on piling abutments costing $2,488.24.

DELAWARE COUNTY.

Roads:

The total county road expenditure was $51,468.67, of which $24,407.98 or 47.4% was spent for permanent work; $9,609.01 or 18.7% was spent for temporary work; $6,430.26 or 12.5% was spent for repairs; $4,641.89 or 9.0% was spent for maintenance; $4,547.33 or 8.8% was spent for equipment and unused material; $1,832.20 or 3.6% was spent for miscellaneous work. Five miles were built to permanent grade at a cost of $16,475.76; 2.7 miles were surfaced with gravel at a cost of $5,576.74; 28 miles were built to natural grade at a cost of $9,609.01.

The county road system was dragged an average of 34 times, the average cost of dragging being $0.80 per mile one round trip. The average cost of repairs and maintenance was $64.45 per mile of county road. The total average expenditure per mile of county road was $299.20.

The total township road expenditure as shown by reports form all of the 16 townships was $34,196.28.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $59,600.91, of which $41,114.93 or 69.0% was spent on permanent bridges and culverts; $7,990.29 or 13.4% was spent on temporary bridges and culverts; $5,720.03 or 9.6% was spent on repair work; $1,742.03 or 2.9% was spent on equipment and materials; $1,392.66 or 2.3% was spent on filling bridges and culverts; and $1,640.87 or 2.8% was spent on miscellaneous items.

Of the total amount $49,105.32 spent for new bridges and culverts, $41,114.93 or 83.7% was spent for permanent work; $7,990.39 or 16.3% was spent for temporary work. The amounts above referred to were spent on the following construction:

78 concrete box culverts costing $18,084.57; 217 corrugated pipe culverts costing $5,082.51; 1 headwall on culvert costing $54.88; 1 concrete slab bridge costing $49.44; 2 retaining walls costing $282.98; 3 I-beam spans on piling abutments costing $1,580.24; 9 I-beam spans on concrete abutments costing $15,859.00; 2 pony truss spans with concrete abutments

and floor costing $5,547.64; 1 high truss on concrete abutments costing $6,364.30, and 8 wood pile bridges costing $1,327.64.

DES MOINES COUNTY.

Roads:

The total county road expenditure was $17,090.78, of which $3,167.26 or 18.5% was spent for permanent work; $1,271.59 or 7.4% was spent for temporary work; $1,971.98 or 11.5% was spent for repairs; $2,262.10 or 13.3% was spent for maintenance; $3,531.51 or 20.6% was spent for equipment and unused material; $4,885.04 or 28.7% was spent for miscellaneous work. 1½ miles were built to permanent grade at a cost of $2,493.68. There was no surfacing work done. 18.75 miles were built to natural grade at a cost of $1,271.59.

The county road system was dragged an average of 20.3 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $51.96 per mile of county road. The total average expenditure per mile of county road was $208.40.

The total township road expenditure as shown by reports from all of the 14 townships was $27,189.43.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $32,775.97, of which $12,840.14 or 39.2% was spent on permanent bridges and culverts; $12,470.94 or 38.0% was spent on temporary bridges and culverts; $2,367.78 or 7.2% was spent on repair work; $1,508.55 or 4.6% was spent on equipment and materials; $256.25 or 0.8% was spent on filling bridges and culverts and $3,331.41 or 10.2% was spent on miscellaneous items.

Of the total amount $25,311.08 spent for new bridges and culverts, $12,840.14 or 50.7% was spent for permanent work; $12,470.94 or 49.3% was spent for temporary work. The amounts above referred to were spent on the following construction:

12 concrete box culverts costing $5,518.14; 1 circular concrete culvert costing $141.34; 380 corrugated pipe culverts costing $6,205.28; 2 boiler pipe culverts costing $131.45; 33 cast iron pipe culverts costing $1,215.48; 3 headwalls on culverts costing $151.03; 4 concrete abutments costing $1,415.68; 2 I-beam spans on piling abutments costing $307.78; 2 I-beam spans on concrete abutments costing $1,287.26; 4 pony trusses on piling abutments costing $4,609.95; 1 high steel truss on concrete abutments costing $3,464.67, and 8 miscellaneous bridges and culverts costing $882.92.

DICKINSON COUNTY.

Roads:

The total county road expenditure was $55,619.99, of which $44,344.73 or 79.7% was spent for permanent work; $2,499.21 or 4.5% was spent for temporary work; $2,146.86 or 3.9% was spent for repairs; $2,270.63 or 4.1% was spent for maintenance; $1,356.48 or 2.4% was spent for equipment and unused material; $3,002.68 or 5.4% was spent for miscellaneous

work. 19.8 miles were built to permanent grade at a cost of $15,692.26. 22.87 miles were surfaced with gravel at a cost of $21,701.67. 14.77 miles were built to natural grade at a cost of $2,499.21. $6,950.80 was spent for tile drainage.

The county road system was dragged an average of 30.3 times, the average cost of dragging being $0.76 per mile one round trip. The average cost of repairs and maintenance was $47.34 per mile of county road. The total average expenditure per mile of county road was $598.00.

The total township road expenditure as shown by reports from all of the 12 townships was $24,905.20.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $38,378.78, of which $28,984.74 or 75.4% was spent on permanent bridges and culverts; $7,525.89 or 19.7% was spent on temporary bridges and culverts; $496.87 or 1.3% was spent on repair work; $845.22 or 2.2% was spent on equipment and materials, and $528.06 or 1.4% was spent on miscellaneous items.

Of the total amount $36,508.63 spent for new bridges and culverts, $28,984.74 or 79.4% was spent for permanent work; $7,523.89 or 20.6% was spent for temporary work. The amounts above referred to were spent on the following construction:

24 concrete box culverts costing $10,150.71; 18 circular concrete culverts costing $1,427.29; 386 corrugated pipe culverts costing $7,523.89; 2 concrete abutments costing $2,122.30; 11 I-beam spans on concrete abutments costing $14,283.44; miscellaneous bridges and culverts costing $66.19.

DUBUQUE COUNTY.

Roads:

The total county road expenditure was $58,607.20, of which $20,239.55 or 34.5% was spent for permanent work; $22,351.56 or 38.2% was spent for repairs; $3,275.30 or 5.6% was spent for maintenance; $843.67 or 1.4% was spent for equipment and unused material; $11,897.12 or 20.3% was spent for miscellaneous work. 3.1 miles were built to permanent grade at a cost of $17,201.97. 1.17 miles were surfaced with gravel at a cost of $3,038.58.

The county road system was dragged an average of 24.8 times, the average cost of dragging being $0.89 per mile one round trip. The average cost of repairs and maintenance was $152.72 per mile of county road. The total average expenditure per mile of county road was $348.80.

The total township road expenditure as indicated by reports from 7 of the 18 townships was $45,540.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $137,796.43, of which $85,369.95 or 62.0% was spent on permanent bridges and culverts; $16,944.67 or 12.3% was spent on temporary bridges and culverts; $24,395.30 or 17.7% was spent on repair work; $10,306.48 or

7.5% was spent on filling bridges and culverts, and $780.03 or 0.5% was spent on miscellaneous items.

Of the total amount $102,314.62 spent for new bridges and culverts, $85,369.95 or 83.4% was spent for permanent work; $16,944.67 or 16.6% was spent for temporary work. The amounts above referred to were spent on the following construction:

119 concrete box culverts costing $46,810.90; 23 circular concrete culverts costing $2,681.57; 335 corrugated pipe culverts costing $15,797.95; 1 masonry arch culvert costing $632.72; 13 headwalls on culverts costing $3,061.85; 1 concrete arch bridge costing $6,498.00; 6 concrete abutments costing $9,515.20; 9 I-beam spans on concrete abutments costing $12,938.39; 1 pony truss span with concrete abutments and floor costing $2,221.29; 1 wood pile bridge costing $135.08, and 2 miscellaneous bridges and culverts costing $1,011.64.

EMMET COUNTY.

Roads:

The total county road expenditure was $70,102.73, of which $54,002.05 or 77.0% was spent for permanent work; $1,518.52 or 2.2% was spent for temporary work; $1,670.50 or 2.4% was spent for repairs; $1,569.01 or 2.2% was spent for maintenance; $753.99 or 1.1% was spent for equipment and unused materials; $10,588.61 or 15.1% was spent for miscellaneous work. 35.8 miles were built to permanent grade at a cost of $32,990.33. 21.05 miles were surfaced with gravel at a cost of $19,462.13. 20 miles were built to natural grade at a cost of $1,518.52.

The average cost of dragging was $0.75 per mile one round trip. The average cost of repairs and maintenance was $31.30 per mile of county road. The total average expenditure per mile of county road was $674.00.

The total township road expenditure as shown by reports from all of the twelve townships was $27,845.08.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $41,328.66, of which $29,068.08 or 70.2% was spent on permanent bridges and culverts; $6,699.03 or 16.2% was spent on temporary bridges and culverts; $2,021.23 or 4.9% was spent on repair work; $1,673.87 or 4.1% was spent on equipment and materials; $42.50 or 0.1% was spent on filling bridges and culverts and $1,823.95 or 4.4% was spent on miscellaneous items.

Of the total amount $35,767.11 spent for new bridges and culverts, $29,068.08 or 81.3% was spent for permanent work; $6,699.03 or 18.7% was spent for temporary work. The amounts above referred to were spent on the following construction:

Thirty concrete box culverts costing $6,272.64; 50 circular concrete culverts costing $4,072.04; 78 corrugated pipe culverts costing $1,543.20; 2 headwalls on culverts costing $353.10; 1 concrete arch bridge costing $5,052.13; 3 concrete deck girders costing $6,732.31; 4 I-beam spans on concrete abutments costing $6,502.86; steel girder on concrete abutments costing $83.00 and miscellaneous bridges and culverts costing $2,469.98.

FAYETTE COUNTY.

Roads:

The total county road expenditure was $29,582.90, of which $16,070.28 or 54.5% was spent for temporary work; $1,763.81 or 6.0% was spent for repairs; $3,035.32 or 10.3% was spent for maintenance; $4,648.26 or 15.4% was spent for equipment and unused material; $4,065.23 or 13.8% was spent for miscellaneous work. There was no permanent grading and no surfacing work done. 80.75 miles were built to natural grade at a cost of $16,070.28.

The county road system was dragged an average of 22 times, the average cost of dragging being $0.60 per mile one round trip. The average cost of repairs and maintenance was $23.76 per mile of county road. The total average expenditure per mile of county road was $146.50.

The total township road expenditure as shown by reports from all of the 20 townships was $54,040.65.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $133,875.69, of which $105,664.44 or 79.0% was spent on permanent bridges and culverts; $7,791.65 or 5.8% was spent on temporary bridges and culverts; $15,555.98 or 11.5% was spent on repair work; $2,464.23 or 1.8% was spent on equipment and materials; $1,316.40 or 0.9% was spent on filling bridges and culverts, and $1,371.99 or 1.0% was spent on miscellaneous items.

Of the total amount $113,367.09 spent for new bridges and culverts, $105,665.44 or 93.2% was spent for permanent work; $7,701.65 or 6.8% was spent for temporary work. The amounts above referred to were spent on the following construction:

63 concrete box culverts costing $18,173.04; 463 corrugated pipe culverts costing $7,701.69; 2 headwalls on culverts costing $218.55; 4 concrete slab bridges costing $5,328.61; 2 concrete arch bridges costing $4,837.81; 2 concrete abutments costing $601.89; 5 concrete thru girder bridges costing $11,324.42; 9 concrete deck girder bridges costing $18,931.47; 1 retaining wall costing $1,613.19; 9 I-beam spans on concrete abutments costing $17,151.46; 8 pony truss spans with concrete abutments and floor costing $21,120.65, and 1 high steel truss on concrete abutments costing $6,364.30.

FLOYD COUNTY.

Roads:

The total county road expenditure was $19,147.15 of which $1,718.53 or 9.0% was spent for permanent work; $8,448.46 or 44.1% was spent for temporary work; $4,452.39 or 23.2% was spent for repairs; $2,568.92 or 13.4% was spent for maintenance; $1,294.85 or 6.8% was spent for equipment and unused materials; $664.00 or 3.5% was spent for mis-

cellaneous work. There was no permanent grading and no surfacing work. 35 miles were built to natural grade at a cost of $7,371.15.

The county road system was dragged an average of 24.2 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $50.88 per mile of county road. The total average expenditure per mile of county road was $138.80.

No reports were received showing the township road expenditures.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $86,477.17, of which $49,089.39 or 56.8% was spent on permanent bridges and culverts; $7,140.88 or 8.3% was spent on temporary bridges and culverts; $14,410.61 or 16.6% was spent on repair work; $3,791.37 or 4.4% was spent on equipment and materials; $6,251.81 or 7.2% was spent on filling bridges and culverts, and $5,793.71 or 6.7% was spent on miscellaneous items.

Of the total amount $56,230.27 spent for new bridges and culverts, $49,089.39 or 87.3% was spent for permanent work; $7,140.88 or 12.7% was spent for temporary work. The amounts above referred to were spent on the following construction:

95 concrete box culverts costing $20,336.74; 300 corrugated pipe culverts costing $7,140.88; 3 concrete slab bridges costing $6,843.85; 1 concrete arch bridge costing $12,537.49; 2 concrete abutments costing $1,161.37; 4 concrete deck girder bridges costing $6,056.14; 1 I-beam span on concrete abutments costing $895.80 and 1 pony truss span with concrete abutments and floor costing $1,348.00.

FRANKLIN COUNTY.

Roads:

The total county road expenditure was $44,170.05, of which $16,477.34 or 37.2% was spent for permanent work; $7,433.32 or 16.9% was spent for temporary work; $8,088.19 or 18.3% was spent for repairs; $2,741.38 or 6.2% was spent for maintenance; $4,048.24 or 9.2% was spent for equipment and unused material; $5,381.58 or 12.2% was spent for miscellaneous work; 13.35 miles were built to permanent grade at a cost of $9,486.96. 11.25 miles were surfaced with gravel at a cost of $5,482.60. 38.75 miles were built to natural grade at a cost of $7,433.32.

The county road system was dragged an average of 26 times, the average cost of dragging being $0.70 per mile one round trip. The average cost of repairs and maintenance was $60.67 per mile of county road. The total average expenditure per mile of county road was $246.26.

The total township road expenditure as shown by reports from all of the 16 townships was $37,625.10.

Bridges:

The total expenditure for bridges and culvert work during 1916 was $55,837.18, of which $30,911.86 or 55.3% was spent on permanent bridges and culverts; $9,606.01 or 17.2% was spent on temporary bridges and culverts; $7,986.94 or 14.3% was spent on repair work; $4,477.70 or 8.0% was spent on equipment and materials; $2,739.77 or 4.9% was spent on filling bridges and culverts, and $115.00 or 0.3% was spent on miscellaneous items.

Of the total amount $40,517.87 spent for new bridges and culverts, $30,911.86 or 76.3% was spent for permanent work; $9,606.01 or 23.7% was spent for temporary work. The amounts above referred to were spent on the following construction:

58 concrete box culverts costing $18,133.49; 5 circular concrete culverts costing $512.87; 300 corrugated pipe culverts costing $9,056.60; 1 concrete slab bridge costing $948.65; 1 I-beam span with concrete abutments costing $3,691.85; 2 pony truss spans with concrete abutments and floor costing $7,625.00; and 2 wood pile bridges costing $549.41.

FREMONT COUNTY.

Roads:

The total county road expenditure was $17,586.20, of which $3,195.70 or 18.2% was spent for permanent work; $3,244.00 or 18.4% was spent for temporary work; $3,774.95 or 21.4% was spent for repairs; $3,648.49 or 20.8% was spent for maintenance; $1,810.01 or 10.3% was spent for equipment and unused material; $1,913.05 or 10.9% was spent for miscellaneous work. No roads were built to permanent grade. 2 miles were built to temporary grade at a cost of $3,195.70. There was no surfacing work. 30.75 miles were built to natural grade at a cost of $3,244.00.

The county road system was dragged an average of 33 times, the average cost of dragging being $0.70 per mile one round trip. The average cost of repairs and maintenance was $51.91 per mile of county road. The total average expenditure per mile of county road was $122.90.

The total township road expenditure as shown by reports from all of the 13 townships was $28,604.85.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $64,525.75, of which $21,541.23 or 33.4% was spent on permanent bridges and culverts; $16,085.87 or 24.9% was spent on temporary bridges and culverts; $10,747.17 or 16.7% was spent on repair work; $9,750.25 or 14.9% was spent on equipment and materials; $2,611.45 or 4.1% was spent on filling bridges and culverts and $3,789.78 or 6.0% was spent on miscellaneous items.

Of the total amount $37,627.10 spent for new bridges and culverts, $21,541.23 or 57.3% was spent for permanent work; $16,085.87 or 42.7% was spent for temporary work. The amounts above referred to were spent on the following construction:

21 concrete box culverts costing $15,305.27; 16 concrete pipe culverts costing $1,665.97; 127 corrugated pipe culverts costing $4,871.63; 12 boiler pipe culverts costing $1,688.36; 12 cast iron pipe culverts costing $891.10; 6 headwalls on culverts costing $1,104.01; 2 I-beam spans on concrete abutments costing $3,465.98; 1 pony truss on piling abutments costing $1,167.80, and 26 wood pile bridges on piling abutments costing $7,466.98.

GREENE COUNTY.

Roads:

The total county road expenditure was $36,396.07, of which $19,775.96 or 54.3% was spent for permanent work; $827.16 or 2.3% was spent for temporary work; $1,849.55 or 5.1% was spent for repairs; $1,692.47 or 4.7% was spent for maintenance; $227.07 or 0.6% was spent for equipment and unused material; $12,016.86 or 33.0% was spent for miscellaneous work. 3.62 miles were built to permanent grade at a cost of $3,276.25. 19 miles were surfaced with gravel at a cost of $13,999.13. 5.5 miles were built to natural grade at a cost of $827.16.

The average cost of dragging was $0.70 per mile one round trip. The average cost of repairs and maintenance was $26.78 per mile of county road. The total average expenditure per mile of county road was $273.60.

The total township road expenditure as shown by reports from all of the 16 townships was $47,204.62.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $39,777.44, of which $26,953.43 or 67.8% was spent on permanent bridges and culverts; $1,678.44 or 4.2% was spent on temporary bridges and culverts; $7,151.59 or 18.0% was spent on repair work; $2,351.09 or 5.9% was spent on equipment and materials; $177.26 or 0.4% was spent on filling bridges and culverts, and $1,465.63 or 3.7% was spent on miscellaneous items.

Of the total amount $28,631.87 spent for new bridges and culverts, $26,953.43 or 94.2% was spent for permanent work; $1,678.44 or 5.8% was spent on temporary work. The amounts above referred to were spent on the following construction:

14 concrete box culverts costing $4,287.52; 54 circular concrete culverts costing $5,308.42; 13 concrete pipe culverts costing $584.69; 60 corrugated pipe culverts costing $1,223.17; 9 headwalls on culverts costing $226.80; 4 concrete slab bridges costing $5,284.00; 5 concrete abutments costing $5,378.00; 1 concrete deck girder bridge costing $2,035.90; 2 I-beam spans on concrete abutments costing $3,849.00; 1 wood pile bridge costing $455.27.

GRUNDY COUNTY.

Roads:

The total county road expenditure was $29,313.57, of which $60.15 or 0.2% was spent for permanent work; $18,405.14 or 62.8% was spent for temporary work; $5,840.51 or 19.9% was spent for repairs; $2,905.33 or 9.9% was spent for maintenance; $1,995.77 or 6.8% was spent for equipment and unused material; $106.67 or 0.4% was spent for miscellaneous work. There was no permanent grading and no surfacing work done. 67.5 miles were built to natural grade at a cost of $18,405.14.

The county road system was dragged an average of 25 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $56.98 per mile of county road. The total average expenditure per mile of county road was $190.30.

The total township road expenditure as shown by reports from all of the 14 townships was $32,048.85.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $64,516.12, of which $46,626.90 or 72.4% was spent on permanent bridges and culverts; $6,034.60 or 9.3% was spent on temporary bridges and culverts; $2,657.05 or 4.1% was spent on repair work; $68.75 or 0.1% was spent on equipment and materials; $2,142.39 or 3.3% was spent on filling bridges and culverts, and $6,986.43 or 10.8% was spent on miscellaneous items.

Of the total amount $52,661.50 spent for new bridges and culverts, $46,626.90 or 88.5% was spent for permanent work; $6,034.60 or 11.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

40 concrete box culverts costing $17,261.91; 328 corrugated pipe culverts costing $5,904.60; 6 concrete slab bridges costing $11,742.72; 1 concrete deck girder bridge costing $4,541.85; 1 I-beam span on concrete abutments costing $2,313.60; 3 pony truss spans with concrete abutments and floor costing $10,666.82; 1 wood pile bridge costing $130.00.

GUTHRIE COUNTY.

Roads:

The total county road expenditure was $24,511.84, of which $425.37 or 1.7% was spent for permanent work; $13,372.28 or 54.6% was spent for repairs; $4,704.93 or 19.2% was spent for maintenance; $5,753.86 or 23.5% was spent for equipment and unused material; $255.67 or 1.0% was spent for miscellaneous work. There was no permanent grading or surfacing and no roads built to natural grades.

The county road system was dragged an average of 20.2 times, the average cost of dragging being $0.80 per mile one round trip. The average cost of repairs and maintenance was $92.23 per mile of county road. The total average expenditure per mile of county road was $125.00.

The total township road expenditure as shown by reports from all of the 17 townships was $37,625.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $52,794.10, of which $19,643.13 or 37.2% was spent on permanent bridges and culverts; $12,630.10 or 23.9% was spent on temporary bridges and culverts; $13,631.13 or 25.8% was spent on repair work; $2,654.60 or 5.0% was spent on equipment and materials; $4,096.22 or 7.8% was spent on filling bridges and culverts, and $138.93 or 0.3% was spent on miscellaneous items.

Of the total amount $32,273.23 spent for new bridges and culverts, $19,643.13 or 60.8% was spent for permanent work; $12,630.10 or 39.2%

was spent for temporary work. The amounts above referred to were spent on the following construction.

26 concrete box culverts costing $17,976.61; 1 concrete arch culvert costing $174.62; 427 corrugated pipe culverts costing $10,622.39; 16 boiler pipe culverts costing $1,882.80; 9 headwalls on culverts costing $1,239.36; 1 pony truss span with concrete abutments and floor costing

The total county road expenditure was $53,338.47, of which $34,953.59

HAMILTON COUNTY.

Roads:

The total county road expenditure was $53,338.47, of which $34,953.59 or 65.5% was spent for permanent work; $5,022.66 or 9.4% was spent for temporary work; $2,451.98 or 4.6% was spent for repairs; $5,359.20 or 10.1% was spent for maintenance; $4,714.18 or 8.8% was spent for equipment and unused material; $836.86 or 1.6% was spent for miscellaneous work. 15.8 miles were built to permanent grade, at a cost of $25,305.20. 11.55 miles were surfaced with gravel at a cost of $4,282.95. 45.45 miles were built to natural grade at a cost of $5,022.66. Tile drainage on county roads cost $5,365.44.

The county road system was dragged an average of 28 times, the average cost of dragging being $1.00 per mile one round trip. The average cost of repairs and maintenance was $44.13 per mile of county road. The total average expenditure per mile of county road was $391.40.

The total township road expenditure as shown by reports from all of the 16 townships was $58,438.04.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $95,129.10, of which $71,970.43 or 75.7% was spent on permanent bridges and culverts; $15,297.87 or 16.0% was spent on temporary bridges and culverts; $4,470.84 or 4.7% was spent on repair work; 2,210.14 or 2.2% was spent on equipment and materials; $904.42 or 1.0% was spent on filling bridges and culverts, and $275.40 or 0.3% was spent on miscellaneous items.

Of the total amount $87,268.30 spent for new bridges and culverts, $71,970.43 or 82.5% was spent for permanent work; $15,297.87 or 17.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

38 concrete box culverts costing $26,175.10; 18 circular concrete culverts costing $2,834.40; 850 corrugated pipe culverts costing $14,533.93; 1 concrete slab bridge costing $1,785.60; 2 concrete abutments costing $3,290.35; 1 concrete thru girder bridge costing $2,760.49; 9 concrete deck girder bridges costing $21,015.12; 1 I-beam span on piling abutments costing $341.25; 5 I-beam spans on concrete abutments costing $8,924.75; 1 pony truss span with concrete abutments and floor costing $5,185.22; 2 wood pile bridges costing $422.69.

HANCOCK COUNTY.

Roads:

The total county road expenditure was $39,945.03, of which $18,319.78 or 45.8% was spent for permanent work; $3,521.12 or 8.8% was spent for temporary work; $9,217.24 or 23.1% was spent for repairs; $6,406.00 or 16.1% was spent for maintenance; $1,583.47 or 4.0% was spent for equipment and unused material; $897.42 or 2.2% was spent for miscellaneous work. 3.75 miles were built to permanent grade at a cost of $1,835.72. 5.5 miles were built to temporary grade at a cost of $4,551.85. 6.75 miles were surfaced with gravel at a cost of $4,265.21. 15 miles were built to natural grade at a cost of $1,940.62.

The county road system was dragged an average of 40 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $103.46 per mile of county road. The total average expenditure per mile of county road was $264.50.

The total township road expenditure as shown by reports from all of the 16 townships was $34,407.82.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $28,094.86, of which $17,486.10 or 62.4% was spent on permanent bridges and culverts; $6,883.32 or 24.6% was spent on temporary bridges and culverts; $2,458.11 or 8.8% was spent on repair work; $925.00 or 3.3% was spent on equipment and materials; $67.50 or 0.2% was spent on filling bridges and culverts, and $184.83 or 0.7% was spent on miscellaneous items.

Of the total amount $24,369.42 spent for new bridges and culverts, $17,486.10 or 71.7% was spent for permanent work; $6,883.32 or 28.3% was spent for temporary work. The amounts above referred to were spent on the following construction:

38 concrete box culverts costing $11,297.45; 396 corrugated pipe culverts costing $5,427.32; 18 circular concrete culverts costing $2,553.54; 4 retaining walls costing $134.53; 1 I-beam span on concrete abutments, costing $1,341.25; 1 pony truss with concrete abutments and floor costing $2,179.33; 7 wood pile bridges costing $1,456.00.

HARDIN COUNTY.

Roads:

The total county road expenditure was $36,891.78, of which $27,071.60 or 73.5% was spent for permanent work; $1,917.30 or 5.2% was spent for temporary work; $1,548.71 or 4.2% was spent for repairs; $3,287.65 or 8.8% was spent for maintenance; $718.13 or 1.9% was spent for equipment and unused material; $2,348.39 or 6.4% was spent for miscellaneous work. 26.8 miles were built to permanent grade at a cost of $19,506.17. No roads were built to temporary grade. 8.45 miles were surfaced with gravel at a cost of $6,147.90. 25.75 miles were built to natural grade at a cost of $1,917.30.

The county road system was dragged an average of 21 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $27.83 per mile of county road. The total average expenditure per mile of county road was $212.90.

No reports of township work or expenditures were received.

Bridges:

The total expenditure for bridge and culvert work for 1916 was $58,757.39 of which $39,841.99 or 68.0% was spent on permanent bridges and culverts; $1,085.25 or 2.9% was spent on temporary bridges and culverts; $7,749.99 or 12.0% was spent on repair work; $6,154.53 or 11.0% was spent on equipment and materials; $2,875.44 or 5.0% was spent on filling bridges and culverts, and $1,050.19 or 2.0% was spent on miscellaneous items.

Of the total amount $40,927.24 spent for new bridges and culverts, $39,841.99 or 97.3% was spent for permanent work, $1,085.25 or 2.7% was spent for temporary work. The amounts above referred to were spent on the following construction:

78 concrete box culverts costing $18,019.03; 71 circular concrete culverts costing $5,540.76; 50 corrugated pipe culverts costing $616.55; 5 concrete slab bridges costing $3,167.93; 4 concrete deck girder bridges costing $8,110.43; 2 I-beam spans on concrete abutments costing $387.16; 3 pony trusses with concrete abutments and floors costing $4,616.68; 1 wood pile bridge costing $342.95; miscellaneous bridges and culverts costing $125.35.

HARRISON COUNTY.

Roads:

The total county road expenditure was $35,034.15 of which $4,922.63 or 14.06% was spent for permanent work; $17,791.49 or 50.8% was spent for temporary work; $5,232.11 or 14.9% was spent for repairs; $3,622.59 or 10.4% was spent for maintenance; $2,237.73 or 6.4% was spent for equipment and unused material; $1,227.60 or 2.5% was spent for miscellaneous work. Seven miles were built to permanent grade, at a cost of $3,767.13. No roads were built to temporary grade and no surfacing was done. Thirty-five and five tenths were built to natural grade at a cost of $15,676.10.

The county road system was dragged an average of 36 times, the average cost of dragging being $0.60 per mile one round trip. The average cost of repairs and maintenance was $52.71 per mile of county road. The total average expenditure per mile of county road was $208.50.

The total township road expenditure as shown by reports from all of the twenty townships was $44,366.44.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $176,500.65 of which $57,079.60 or 32.3% was spent on permanent bridges and culverts. $56,715.97 or 32.1% was spent on temporary bridges and culverts; $36,410.11 or 20.6% was spent on repair work; $4,023.12 or 2.3% was spent on equipment and materials. $1,271.37 or 0.8% was spent on filling bridges and culverts, and $21,000.48 or 11.8% was spent on miscellaneous items.

Of the total amount $113,795.57 spent for new bridges and culverts, $57,079.60 or 50.2% was spent for permanent work, $56,715.97 or 49.8% was spent for temporary work. The amounts above referred to were spent on the following construction:

12 concrete box culverts costing $8,855.04; 57 concrete pipe culverts costing $12,235.56; 173 corrugated pipe culverts costing $7,344.39; 1 boiler pipe culvert costing $213.16; 2 cast iron pipe culverts costing $535.67; 3 headwalls on culverts costing $380.14; 2 concrete abutments costing $1,466.00; 6 I-beam spans on piling abutments costing $2,041.58; 15 pony truss spans on piling abutments costing $29,061.67; 1 pony truss span with concrete abutments and floor costing $7,441.00; 3 high steel truss spans on concrete abutments costing $19,128.36; 31 wood pile bridges costing $11,654.79; 13 miscellaneous bridges and culverts costing $13,458.21.

HENRY COUNTY.

Roads:

The total county road expenditure was $19,727.30, of which $7,992.49 or 40.5% was spent for repairs; $5,479.03 or 27.8% was spent for maintenance; $4,367.54 or 22.1% was spent for equipment and unused material; $1,888.24 or 9.6% was spent for miscellaneous work. There were no roads built to permanent, temporary or natural grade and no surfacing work done.

The county road system was dragged an average of 62 times, the average cost of dragging being $0.70 per mile one round trip. The average cost of repairs and maintenance was $101.83 per mile of county road. The total average expenditure per mile of county road was $149.40.

No reports of township work or expenditures were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $29,749.62 of which $17,199.24 or 58.0% was spent on permanent bridges and culverts. $5,379.44 or 18.0% was spent on temporary bridges and culverts, $3,522.96 or 11.7% was spent on repair work, $2,422.91 or 8.2% was spent on equipment and materials, $1,225.07 or 4.1% was spent on filling bridges and culverts.

Of the total amount $22,578.68 spent for new bridges and culverts $17,199.24 or 76.2% was spent for permanent work; $5,379.44 or 23.8% was spent for temporary work. The amounts above referred to were spent on the following construction:

43 concrete box culverts costing $9,838.73; 225 corrugated pipe culverts costing $5,379.44; 2 concrete slab bridges costing $3,025.00; 2 concrete abutments costing $1,691.82; 3 I-beam spans on concrete abutments costing $2,643.69.

HOWARD COUNTY.

Roads:

The total county road expenditure was $24,978.60 of which $10,946.17 or 43.8% was spent for permanent work; $7,665.87 or 30.7% was spent for temporary work; $1,832.19 or 7.3% was spent for repairs; $1,715.84 or 6.9% was spent for maintenance; $817.75 or 3.3% was spent for equipment and unused material; $2,000.78 or 8.0% was spent for miscellaneous work. 4.5 miles were built to permanent grade at a cost of $4,258.92. There were no roads built to temporary grades. 5.13 miles were surfaced with gravel at a cost of $2,333.36. Thirty-one miles were built to natural grade at a cost of $7,665.87.

The county road system was dragged an average of nineteen times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $29.01 per mile of county road. The total average expenditure per mile of county road was $204.70.

No reports of township work or expenditures were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $60,071.08 of which $31,729.81 or 52.8% was spent on permanent bridges and culverts. $14,593.26 or 24.3% was spent on temporary bridges and culverts, $2,700.92 or 4.5% was spent on repair work, $3,774.18 or 6.1% was spent on equipment and materials, $6,728.91 or 11.4% was spent on filling bridges and culverts, and $544.00 or 0.9% was spent on miscellaneous items.

Of the total amount $46,323.07 spent for new bridges and culverts $31,729.81 or 68.5% was spent for permanent work, $14,593.26 or 31.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

62 concrete box culverts costing $17,509.82; 37 circular concrete culverts costing $3,986.16; 357 corrugated pipe culverts costing $6,682.96; 5 I-beam spans on concrete abutments costing $6,251.52; 3 pony truss spans with concrete abutments and floors costing $3,982.31; 39 wood pile bridges costing $8,510.30.

HUMBOLDT COUNTY.

Roads:

The total county road expenditure was $28,541.79 of which $20,764.67 or 73.0% was spent for permanent work; $1,080.85 or 3.8% was spent for temporary work; $2,305.77 or 8.0% was spent for repairs; $3,433.92 or 12.0% was spent for maintenance; $642.13 or 2.2% was spent for equipment and unused material; $317.05 or 1.0% was spent for miscellaneous work. Fourteen miles were built to permanent grade at a cost of $9,976.85. There were no roads built to temporary grades. Six miles were surfaced with gravel at a cost of $4,741.62. Eleven miles were built to natural grade at a cost of $1,080.85.

The county road system was dragged an average of 25 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $44.48 per mile of county road. The total average expenditure per mile of county road was $221.20.

The total township road expenditure as shown by reports from all of the fourteen townships was $51,705.96.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $46,225.32 of which $34,877.33 or 75.5% was spent on permanent bridges and culverts. $6,610.30 or 14.6% was spent on temporary bridges and culverts, $1,499.83 or 3.1% was spent on repair work, $2,363.86 or 5.0% was spent on equipment and materials, $299.50 or 0.6% was spent on filling bridges and culverts, and $584.50 or 1.2% was spent on miscellaneous items.

Of the total amount $41,487.63 spent for new bridges and culverts $34,877.33 or 84.1% was spent on permanent work, $6,610.30 or 15.9% was spent for temporary work. The amounts above referred to were spent on the following construction:

7 concrete box culverts costing $3,750.42; 296 corrugated pipe culverts costing $6,610.30; 7 concrete slab bridges costing $10,106.70; 3 concrete abutments costing $2,025.38; 2 concrete thru girder bridges costing $2,606.10; 2 concrete deck girder bridges costing $1,935.83; 4 I-beam spans on concrete abutments costing $6,258.06; 2 pony truss spans with concrete abutments and floors costing $8,194.84.

IDA COUNTY.

Roads:

The total county road expenditure was $14,885.56, of which $1,287.23 or 8.6% was spent for permanent work; $4,502.28 or 30.4% was spent for temporary work; $2,548.78 or 17.1% was spent for repairs; $2,528.61 or 17.0% was spent for maintenance; $1,389.95 or 9.3% was spent for equipment and used material; $2,628.71 or 17.6% was spent for miscellaneous work. There were no roads built to permanent grade, and no surfacing done. 0.5 mile was built to temporary grade at a cost of $413.95. 24 miles were built to natural grade at a cost of $4,384.78.

The county road system was dragged an average of 26.0 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $38.46 per mile of county road. The total average expenditure per mile of county road was $112.70.

The total township road expenditure as shown by reports from all of the 12 townships was $26,669.44.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $56,768.72, of which $22,781.67 or 40.0% was spent on permanent bridges and culverts. $12,965.55 or 22.9% was spent on temporary bridges and culverts; $14,791.43 or 26.1% was spent on repair work; $316.57 or 0.6% was spent on equipment and materials; $3,751.74 or 6.5% was spent on filling bridges and culverts, and $2,161.76 or 3.9% was spent on miscellaneous items.

Of the total amount $35,747.22 spent for new bridges and culverts, $22,781.67 or 63.8% was spent for permanent work; $12,965.55 or 36.2% was spent for temporary work. The amounts above referred to were spent on the following construction:

21 concrete box culverts costing $10,008.44; 30 corrugated pipe culverts costing $9,200.82; 1 concrete slab bridge costing $487.77; 1 concrete deck girder bridge costing $413.40; 6 I-beam spans on piling abutments costing $3,764.73; 2 I-beam spans on concrete abutments costing $4,364.43; 3 pony truss spans with concrete abutments and floor costing $7,507.63.

IOWA COUNTY.

Roads:

The total county road expenditure was $35,916.64, of which $23,286.77 of 64.9% was spent for permanent work; $3,799.34 or 10.6% was spent for temporary work; $1,808.18 or 5.0% was spent for repairs; $4,348.37 or 12.1% was spent for maintenance; $1,218.03 or 3.4% was spent for equipment and unused material; $1,455.95 or 4.0% was spent for miscellaneous work. $6,902.96 was spent for building roads to permanent grades, and $16,023.59 was spent for building roads to temporary grade, but the mileage was not given in either case. No surfacing work was done. 39.75 miles were built to natural grade at a cost of $3,899.34.

The county road system was dragged an average of 31.4 times, the average cost of dragging being $0.80 per mile one round trip. The average cost of repairs and maintenance was $36.00 per mile of county road. The total average expenditure per mile of county road was $210.04.

The total township road expenditure as shown by reports from all of the 18 townships was $37,643.92.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $77,285.37, of which $43,237.29 or 56.1% was spent on permanent bridges and culverts; $10,455.80 or 13.2% was spent on temporary bridges and culverts; $14,880.00 or 19.3% was spent on repair work; $5,472.52 or 7.1% was spent on equipment and materials; $1,593.34 or 2.1% was spent on filling bridges and culverts, and $1,646.42 or 2.2% was spent on miscellaneous items.

Of the total amount $53,693.09 spent for new bridges and culverts, $43,237.29 or 80.6% was spent for permanent work; $10,455.80 or 19.4% was spent for temporary work. The amounts above referred to were spent on the following construction:

59 concrete box culverts costing $28,223.72; 546 corrugated culvert pipe costing $9,741.02; 1 cast iron pipe culvert costing $56.00; 40 headwalls on culverts costing $886.69; 1 concrete abutment costing $999.83; 4 retaining walls costing $1,279.98; 7 I-beam spans on concrete abutments costing $9,776.66; 1 pony truss on piling abutments costing $658.78; 1 pony truss with concrete abutments and floor costing $2,071.01.

JACKSON COUNTY.

Roads:

The total county road expenditure was $25,880.25, of which $8,780.79 or 33.9% was spent for permanent work; $12,341.48 or 47.7% was spent for repairs; $3,510.05 or 13.6% was spent for maintenance; $565.72 or 2.2% was spent for equipment and unused material; $682.21 or 2.6% was spent for miscellaneous work. 2 miles were built to permanent grade at a cost of $8,513.79. No roads were built to temporary or natural grades, and no surfacing was done.

The county road system was dragged an average of 31 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $97.85 per mile of county road. The total average expenditure per mile of county road was $159.80.

The total township road expenditure as shown by reports from all of the 18 townships was $31,383.81.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $55,275.30 of which $23,462.87 or 42.5% was spent on permanent bridges and culverts. $12,651.00 or 22.8% was spent on temporary bridges and culverts; $16,930.56 or 30.6% was spent on repair work; $1,307.02 or 2.4% was spent on filling bridges and culverts, and $923.85 or 1.7% was spent on miscellaneous items.

Of the total amount $36,113.87 spent for new bridges and culverts, $23,462.87 or 65% was spent for permanent work; $12,651.00 or 35.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

36 concrete box culverts costing $13,965.15; 8 circular concrete culverts costing $1,560.35; 296 corrugated pipe culverts costing $7,795.20; 3 headwalls on culverts costing $434.25; 1 concrete slab bridge costing $718.00; 1 retaining wall costing $214.12; 3 I-beam spans on piling abutments costing $1,582.25; 1 I-beam span on concrete abutments costing $1,747.00; 2 pony truss spans with concrete abutments and floor costing $4,824.00; 12 wood pile bridges costing $2,607.15; miscellaneous bridges and culverts costing $666.40.

JASPER COUNTY.

Roads:

The total county road expenditure was $59,368.30 of which $30,384.59 or 51.2% was spent for permanent work; $4,206.48 or 7.1% was spent for temporary work; $11,962.99 or 20.1% was spent for repairs; $4,904.00 or 8.3% was spent for maintenance; $6,881.31 or 11.6% was spent for equipment and unused material; $1,028.93 or 1.7% was spent for miscellaneous work. 2.5 miles were built to permanent grade, at a cost of $8,490.04. Fifteen miles were built to temporary grade at a cost of $21,110.73. No surfacing work was done. 61.25 miles were built to natural grade at a cost of $4,206.48.

The county road system was dragged an average of thirty times, the average cost of dragging being $0.70 per mile one round trip. The average cost of repairs and maintenance was $104.12 per mile of county road. The total average expenditure per mile of county road was $289.60.

The total township road expenditure as shown by reports from all of the 19 townships was $51,865.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $96,550.58 of which $47,987.11 or 49.8% was spent on permanent bridges and culverts; $22,132.96 or 22.9% was spent on temporary bridges and culverts; $16,045.65 or 16.6% was spent on repair work; $8,240.44 or 8.5% was spent on filling bridges and culverts, and $2,144.42 or 2.2% was spent on miscellaneous items.

Of the total amount $70,120.07 spent for new bridges and culverts $47,987.11 or 68.5% was spent for permanent work, $22,132.96 or 31.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

80 concrete box culverts costing $27,581.40; 864 corrugated pipe culverts costing $20,161.64; 44 boiler pipe culverts costing $1,971.32; 9 headwalls on culverts costing $1,882.62; 6 concrete slab bridges costing $6,612.39; 3 pony truss spans with concrete abutments and floor costing $7,688.15; 1 high steel truss on concrete abutments costing $4,222.55.

JEFFERSON COUNTY.

Roads:

The total county road expenditure was $36,509.50 of which $10,122.29 or 27.7% was spent for permanent work; $3,798.82 or 10.4% was spent for temporary work; $3,080.00 or 8.4% was spent for repairs; $5,985.31 or 16.4% was spent for maintenance; $5,305.49 or 14.6% was spent for equipment and unused material; $8,217.59 or 22.5% was spent for miscellaneous work. Six-tenths of a mile was built to permanent grade, at a cost of $3,239.11. No roads were built to temporary grade and no surfacing work was done. 39.75 miles were built to natural grade at a cost of $3,552.06.

The county road system was dragged an average of twenty-four times, the average cost of dragging being 70c per mile one round trip. The average cost of repairs and maintenance was $64.95 per mile of county road.

The total average expenditure per mile of county road was $270.40.

The total township road expenditure as shown by reports from all of the twelve townships was $33,983.50.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $86,169.69 of which $37,976.35 or 44.1% was spent on permanent bridges and culverts. $22,223.28 or 25.8% was spent on temporary bridges and culverts; $5,896.31 or 6.8% was spent on repair work; $5,027.01 or 5.8% was spent on equipment and materials; $13,101.35 or 15.2% was spent

on filling bridges and culverts, and $1,945.39 or 2.3% was spent on miscellaneous items.

Of the total amount $60,199.63 spent for new bridges and culverts, $37,976.35 or 63.0% was spent for permanent work; $22,223.28 or 37.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

67 concrete box culverts costing $21,238.08; 718 corrugated pipe culverts costing $16,337.44; 70 boiler pipe culverts costing $8,870.46; 5 cast iron pipe culverts costing $337.50; 9 headwalls on culverts costing $804.16; 1 concrete abutment costing $1,153.94; 6 I-beam spans on concrete abutments costing $4,497.05; 1 high steel truss span on concrete abutments costing $10,283.12; 12 wood pile bridges costing $1,677.88.

JOHNSON COUNTY.

Roads:

The total county road expenditure was $33,002.31, of which $7,445.95 or 22.5% was spent for permanent work; $9,831.96 or 29.7% was spent for temporary work; $5,700.25 or 17.3% was spent for repairs; $5,622.14 or 17.0% was spent for maintenance; $2,895.49 or 9.0% was spent for equipment and material; $1,506.52 or 4.5% was spent for miscellaneous work. Six-tenths of a mile was built to permanent grade at a cost of $5,133.88. No roads were built to temporary grade and no surfacing work was done. 28.25 miles were built to natural grade at a cost of $9,831.96.

The county road system was dragged an average of 47.8 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $72.12 per mile of county road. The total average expenditure per mile of county road was $210.20.

The total township road expenditure as shown by reports from all of the 21 townships was $47,902.17.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $69,652.92, of which $37,828.45 or 54.3% was spent on permanent bridges and culverts. $14,656.31 or 21.0% was spent on temporary bridges and culverts; $7,089.34 or 10.2% was spent on repair work; $5,001.46 or 7.2% was spent for equipment and materials; $5,022.36 or 7.2% was spent on filling bridges and culverts, and $55 or 0.1% was spent on miscellaneous items.

Of the total amount $52,484.76 spent for new bridges and culverts, $37,828.45 or 72.0% was spent for permanent work; $14,656.31 or 28.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

94 concrete box culverts costing $25,463.28; 563 corrugated pipe culverts costing $10,374.78; 2 boiler pipe culverts costing $177.31; 1 cast iron pipe culvert costing $58.50; 1 concrete abutment costing $1,306.90; 9 I-beams on concrete abutments costing $6,645.59; 3 pony truss spans with concrete abutments and floor costing $4,412.68; 9 wood pile bridges costing $1,861.41, and miscellaneous bridges and culverts costing $2,184.31.

JONES COUNTY.

Roads:

The total county road expenditure was $25,793.94, of which $1,436.19 or 5.6% was spent for permanent work; $16,096.11 or 62.4% was spent for temporary work; $2,530.25 or 9.8% was spent for repairs; $4,118.97 or 16.0% was spent for maintenance; $235.68 or 0.9% was spent for equipment and unused material; $1,376.74 or 5.3% was spent for miscellaneous work. 0.75 of a mile was built to permanent grade, at a cost of $940.85. No roads were built to temporary grade and no surfacing work was done. 116 miles were built to natural grade at a cost of $13,558.20.

The county road system was dragged an average of twenty-one times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $36.73 per mile of county road. The total average expenditure per mile of county road was $142.50.

The total township road expenditure as shown by reports from all of the seventeen townships was $35,134.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $56,297.35, of which $29,633.82 or 52.5% was spent on permanent bridges and culverts; $5,994.91 or 10.6% was spent on temporary bridges and culverts; $7,911.29 or 14.3% was spent on repair work; $10,451.17 or 18.9% was spent on equipment and materials; $963.61 or 1.7% was spent on filling bridges and culverts, and $1,342.55 or 2.4% was spent on miscellaneous items.

Of the total amount, $35,628.73 spent for new bridges and culverts, $29,633.82 or 83.0% was spent for permanent work; $5,994.91 or 17.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

31 concrete box culverts costing $9,459.33; 172 corrugated pipe culverts costing $3,785.75; 1 masonry arch culvert costing $535.00; 8 I-beam spans on concrete abutments costing $12,875.69; 2 pony truss spans with concrete abutments and floor costing $6,763.80; 9 wood pile bridges costing $2,209.16.

KEOKUK COUNTY.

Roads:

The total county road expenditure was $39,900.00, of which $7,665.92 or 19.23% was spent for permanent work; $5,840.65 or 14.63% was spent for temporary work; $19,137.47 or 47.81% was spent for repairs; $4,405.32 or 11.3% was spent for maintenance; $2,772.64 or 7.0% was spent for equipment and unused material; $78.00 or 0.05% was spent for miscellaneous work. 2.1 miles were built to permanent grade at a cost of $6,197.69. The number of miles built to temporary grade was not reported, but $573.98 was spent for this work. No surfacing work was done. 100.25 miles were built to natural grade at a cost of $5,840.65.

The county road system was dragged an average of 29.8 times, the average cost of dragging being 65c per mile one round trip. The average cost of repairs and maintenance was $140.30 per mile of county road. The total average expenditure per mile of county road was $237.54.

The total township road expenditure as indicated by reports from nine of the seventeen townships was $42,840.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $65,599.62, of which $34,719.38 or 52.8% was spent on permanent bridges and culverts; $12,044.50 or 18.4% was spent on temporary bridges and culverts; $12,800.26 or 19.6% was spent on repair work; $1,653.48 or 2.5% was spent on equipment and materials; $4,155.65 or 6.3% was spent on filling bridges and culverts, and $226.35 or 0.4% was spent on miscellaneous items.

Of the total amount, $46,763.88 spent for new bridges and culverts, $34,719.38 or 74.2% was spent for permanent work; $12,044.50 or 25.8% was spent for temporary work. The amounts above referred to were spent on the following construction:

49 concrete box culverts costing $26,178.10; 62 concrete pipe culverts costing $7,512.60; 270 corrugated pipe culverts costing $5,578.51; 67 boiler pipe culverts costing $2,150.51; 24 concrete arch culverts costing $582.68; 9 concrete abutments costing $134.24; 1 masonry abutment costing $311.76; 4 pony truss spans on piling abutments costing $964.19; 17 wood pile bridges costing $3,351.29.

KOSSUTH COUNTY.

Roads:

The total county road expenditure was $55,455.68, of which $27,031.98 or 48.8% was spent for permanent work; $8,469.95 or 15.3% was spent for temporary work; $9,968.87 or 18.0% was spent for repairs; $5,631.71 or 10.2% was spent for maintenance; $1,581.92 or 2.8% was spent for equipment and unused material; $2,771.25 or 4.9% was spent for miscellaneous work. 12.4 miles were built to permanent grade at a cost of $16,695.91. One-half of a mile was built to temporary grade at a cost or $1,111.56. 5 miles were surfaced with gravel at a cost of $4,553.39. 62.0 miles were built to natural grade at a cost of $8,469.95.

The county road system was dragged an average of 26.2 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $58.87 per mile of county road. The total average expenditure per mile of county road was $209.20.

The total township road expenditure as shown by reports from all of the 28 townships was $85,362.80.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $98,454.83, of which $58,372.33 or 59.2% was spent on permanent bridges

and culverts; $15,465.86 or 15.7% was spent on temporary bridges and culverts; $20,682.27 or 21.2% was spent on repair work; $1,442.35 or 1.4% was spent on filling bridges and culverts, and $2,492.02 or 2.5% was spent on miscellaneous items.

Of the total amount $73,838.19 spent for new bridges and culverts, $58,372.33 or 79.0% was spent for permanent work; $15,465.86 or 21.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

27 concrete box culverts costing $17,289.29; 4 circular concrete culverts costing $860.94; 740 corrugated pipe culverts costing $10,191.69; 14 concrete slab bridges costing $17,875.30; 2 concrete arch bridges costing $7,639.73; 1 concrete abutment costing $757.05; 11 concrete deck girders costing $13,950.02; 8 wood pile bridges costing $1,347.57; miscellaneous bridges and culverts costing $3,926.60.

LEE COUNTY.

Roads:

The total county road expenditure was $24,255.24 of which $959.75 or 4.0% was spent for permanent work; $59.50 or 0.2% was spent for temporary work; $16,416.30 or 67.7% was spent for repairs; $4,753.52 or 19.6% was spent for maintenance; $1,475.19 or 6.1% was spent for equipment and unused material; $590.98 or 2.4% was spent for miscellaneous work. No roads were built to permanent or natural grade. Three-fourths of a mile was surfaced with gravel at a cost of $959.75. Three-fourths mile was built to natural grade at a cost of $59.50.

The county road system was dragged an average of 45.5 times, the average cost of dragging 70c per mile one round trip. The average cost of repairs and maintenance was $141.13 per mile of county road. The total average expenditure per mile of county road was $161.70.

The total township expenditure as shown by reports from all of the seventeen townships was $36,929.27.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $51,755.08, of which $35,248.35 or 68.2% was spent on permanent bridges and culverts; $3,623.58 or 7.0% was spent on temporary bridges and culverts; $9,458.71 or 18.3% was spent on repair work; $2,243.57 or 4.3% was spent on equipment and materials; $435.96 or 0.8% was spent on filling bridges and culverts and $744.91 or 1.4% was spent on miscellaneous items.

Of the total amount $38,871.93 spent for new bridges and culverts, $35,248.35 or 90.6% was spent for permanent work; $3,623.58 or 9.4% was spent for temporary work. The amounts above referred to were spent on the following construction:

62 concrete box culverts costing $17,101.99; 49 circular concrete culverts costing $4,973.00; 25 corrugated pipe culverts costing $620.93; 119 boiler pipe culverts costing $3,002.66; 19 headwalls on culverts costing $1,866.75; 6 I-beam spans on concrete abutments costing $11,306.61.

LINN COUNTY.

Roads:

The total county road expenditure was $31,095.76, of which $4,385.24 or 14.1% was spent for permanent work; $946.10 or 3.0% was spent for temporary work; $16,010.01 or 51.5% was spent for repairs; $5,153.49 or 16.6% was spent for maintenance; $4,025.92 or 12.9% was spent for equipment and unused material; $575.00 or 1.9% was spent for miscellaneous work. One-half mile was built to permanent grade at a cost of $338.75. One-fourth mile was built to temporary grade at a cost of $1,131.76. No surfacing work was done. 5.5 miles were built to natural grade at a cost of $946.10.

The average cost of repairs and maintenance was $96.73 per mile of county road. The total average expenditure per mile of county road was $141.90.

The total township road expenditure as shown by reports from sixteen of the twenty townships was $46,560.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $72,092.79 of which $54,022.12 or 75.0% was spent on permanent bridges and culverts; $6,721.52 or 9.2% was spent on temporary bridges and culverts; $8,858.43 or 12.2% was spent on repair work; $1,500.00 or 2.4% was spent on equipment and materials; $746.25 or 1.0% was spent on filling bridges and culverts and $244.47 or 0.2% was spent on miscellaneous items.

Of the total amount $60,743.64 spent for new bridges and culverts, $54,022.12 or 89.0% was spent for permanent work; $6,721.52 or 11.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

113 concrete box culverts costing $38,437.30; 2 circular concrete culverts costing $249.73; 363 corrugated pipe culverts costing $6,156.33; 2 boiler pipe culverts costing $44.50; 2 concrete abutments costing $2,525.34; 3 I-beam spans on concrete abutments costing $4,155.00; 3 pony truss spans with concrete abutments and floors costing $8,654.75; 1 wood pile bridge costing $229.21; miscellaneous bridges and culverts costing $291.48.

LOUISA COUNTY.

Roads:

The total county road expenditure was $20,654.99, of which $9,281.02 or 44.9% was spent for permanent work; $198.00 or 1.0% was spent for temporary work; $5,532.83 or 26.8% was spent for repairs; $4,157.55 or 20.1% was spent for maintenance; $741.60 or 3.6% was spent for equipment and unused material; $743.99 or 3.6% was spent for miscellaneous work. 2.5 miles were built to permanent grade at a cost of $8,593.66. Two-tenths of a mile was built to temporary grade at a cost of $393.80. No surfacing work was done. No roads were built to natural grade.

The county road system was dragged an average of 26 times, the average cost of dragging being 80c per mile one round trip. The average cost of repairs and maintenance was $88.90 per mile of county road.

The total average expenditure per mile of county road was $189.50. The county roads are maintained under the patrol system.

The total township road expenditure as shown by reports from all of the twelve townships was $27,820.20.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $59,278.15, of which $34,336.68 or 57.8% was spent on permanent bridges and culverts; $7,713.09 or 13.1% was spent on temporary bridges and culverts; $11,447.20 or 19.2% was spent on repair work; $1,223.52 or 2.3% was spent on equipment and material; $619.49 or 1.0% was spent on filling bridges and culverts and $3,938.17 or 6.6% was spent on miscellaneous items.

Of the total amount $42,049.77 spent for new bridges and culverts, $34,336.68 or 81.6% was spent for permanent work; $7,713.09 or 18.4% was spent for temporary work. The amounts above referred to were spent on the following construction:

59 concrete box culverts costing $24,669.41; 14 circular concrete culverts costing $2,244.15; 20 concrete pipe culverts costing $206.60; 400 corrugated pipe culverts costing $7,447.42; 2 boiler pipe culverts costing $265.67; 2 headwalls on culverts costing $716.48; 6 I-beam spans on concrete abutments costing $6,500.04.

LUCAS COUNTY.

Roads:

The total county road expenditure was $12,573.91, of which $1,561.55 or 8.5% was spent for permanent work; $4,824.62 or 38.4% was spent for temporary work; $2,007.94 or 15.9% was spent for repairs; $3,676.72 or 29.2% was spent for maintenance; $523.78 or 4.2% was spent for equipment and unused material; $479.30 or 3.8% was spent for miscellaneous work. There were no roads built to permanent grade and no surfacing work done. One-half mile was built to temporary grade at a cost of $813.85. 56.25 miles were built to natural grade at a cost of $4,824.62.

The county road system was dragged an average of 37.5 times, the average cost of dragging being $0.70 per mile one round trip. The average cost of repairs and maintenance was $41.80 per mile of county road. The total average expenditure per mile of county road was $92.40.

The total township road expenditure as shown by reports from all of the twelve townships was $21,827.19.

Bridges:

The total expenditure for bridges and culvert work during 1916 was $39,481.17, of which $20,123.73 or 50.9% was spent on permanent bridges and culverts; $10,684.29 or 26.8% was spent on temporary bridges and culverts; $2,806.90 or 7.2% was spent on repair work; $172.27 or 0.4% was spent on equipment and material; $40,453.06 or 11.5% was spent on filling bridges and culverts and $1,240.92 or 3.2% was spent on miscellaneous items.

Of the total amount $30,808.02 spent for new bridges and culverts, $20,123.73 or 65.4% was spent for permanent work; $10,684.29 or 34.6% was spent on temporary work. The amounts above referred to were spent on the following construction:

41 concrete box culverts costing $15,715.58; 36 concrete pipe culverts costing $1,855.59; 410 corrugated pipe culverts costing $9,077.14; 5 boiler pipe culverts costing $762.90; 42 headwalls on culverts costing $1,657.14; 1 retaining wall costing $358.57; 1 I-beam span on piling abutments costing $536.85; 9 wood pile bridges costing $629.90; miscellaneous bridges and culverts $214.35.

LYON COUNTY.

Roads:

The total county road expenditure was $28,988.70, of which $171.43 or 0.6% was spent for permanent work; $20,711.57 or 71.5% was spent for temporary work; $2,914.17 or 10.0% was spent for repairs; $2,209.81 or 7.6% was spent for maintenance; $2,631.72 or 9.1% was spent for equipment and unused material; $350.00 or 1.2% was spent for miscellaneous work. There was no permanent grading work and no surfacing work done. 52.0 miles were built to natural grade at a cost of $20,711.57.

The county road system was dragged an average of 15 times, the average cost of dragging being 75c per mile one round trip. The average cost of repairs and maintenance was $27.18 per mile of county road. The total average expenditure per mile of county road was $153.30.

The total township road expenditure as shown by reports from all of the eighteen townships was $37,838.64.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $56,011.62, of which $33,783.97 or 60.4% was spent on permanent bridges and culverts; $8,131.16 or 14.3% was spent on temporary bridges and culverts; $3,840.11 or 7.0% was spent on repair work; $7,080.86 or 12.6% was spent on equipment and materials; $2,598.87 or 4.6% was spent on filling bridges and culverts; and $576.65 or 1.1% was spent on miscellaneous items.

Of the total amount $41,915.13 spent for new bridges and culverts, $33,783.97 or 80.6% was spent for permanent work; $8,131.16 or 19.4% was spent for temporary work. The amounts above referred to were spent on the following construction:

94 concrete box culverts costing $29,146.82; 289 corrugated pipe culverts costing $7,388.04; 1 I-beam span on concrete abutments costing $600.00; 2 pony truss spans with concrete abutments and floor costing $4,037.15; 3 wood pile bridges costing $512.18; miscellaneous bridges and culverts costing $230.94.

MADISON COUNTY.

Roads:

The total county road expenditure was $19,395.80, of which $3,669.11 or 18.9% was spent for permanent work; $3,795.27 or 19.5% was spent for temporary work; $1,931.51 or 10.0% was spent for repairs; $4,644.41 or 23.9% was spent for maintenance; $2,880.98 or 14.9% was spent for equipment and unused material; $2,464.52 or 12.8% was spent for miscellaneous work. There was no permanent grading work done and no surfacing. One-half mile was built to temporary grade at a cost of $3,342.65. 14.88 miles were built to natural grade at a cost of $3,220.82.

The average cost of dragging was $0.75 per mile one round trip. The average cost of repairs and maintenance was $40.59 per mile of county road. The total average expenditure per mile of county road was $119.70.

The total township road expenditure as shown by reports from all of the sixteen townships was $33,721.77.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $44,028.55, of which $12,532.70 or 28.4% was spent on permanent bridges and culverts; $9,297.72 or 21.2% was spent on temporary bridges and culverts; $13,830.62 of 31.4% was spent on repair work; $2,264.59 or 5.1% was spent on equipment and materials; $5,052.55 or 11.5% was spent on filling bridges and culverts and $1,050.37 or 2.4% was spent on miscellaneous items.

Of the total amount $21,830.42 spent for new bridges and culverts, $12,532.70 or 57.4% was spent for permanent work; $9,297.72 or 42.6% was spent for temporary work. The amounts above referred to were spent on the following construction:

23 concrete box culverts costing $9,187.51; 248 corrugated pipe culverts costing $6,820.35; 1 masonry arch culvert costing $185.50; 9 boiler pipe culverts costing $1,503.16; 1 headwall on culvert costing $15.75; 1 I-beam span on piling abutments costing $706.94; 1 I-beam span on concrete abutments costing $2,501.58; 1 pony truss span with concrete abutments costing $200.00; 3 wood pile bridges costing $709.63.

MAHASKA COUNTY.

Roads:

The total county road expenditure was $39,518.94, of which $21,870.68 or 55.4% was spent for permanent work; $801.18 or 2.0% was spent for temporary work; $3,562.10 or 4.0% was spent for repairs; $5,141.88 or 13.0% was spent for maintenance; $7,291.17 or 18.5% was spent for equipment and unused material; $851.93 or 2.1% was spent for miscellaneous work. One mile was built to permanent grade at a cost of $1,725.00. 42.5 miles were built to temporary grades at a cost of $19,602.13. There was no surfacing work done. 7.25 miles were built to natural grade at a cost of $891.18.

The county road system was dragged an average of twenty-one times, the average cost of dragging being $0.80 per mile one round trip. The

average cost of repairs and maintenance was $66.04 per mile of county road. The total average expenditure per mile of county road was $299.40.

The total township road expenditure as shown by reports from all of the nineteen townships was $47,022.57.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $88,737.22, of which $40,241.04 or 45.3% was spent on permanent bridges and culverts. $23,970.79 or 27.1% was spent on temporary bridges and culverts; $9,625.29 or 10.7% was spent on repair work; $7,093.82 or 8.1% was spent on equipment and materials; $4,330.52 or 4.9% was spent on filling bridges and culverts, and $3,475.76 or 3.9% was spent on miscellaneous items.

Of the total amount $84,211.83 spent for new bridges and culverts, $40,241.04 or 62.6% was spent for permanent work, $23,970.79 or 37.4% was spent for temporary work. The amounts above referred to were spent on the following construction:

23 concrete box culverts costing $14,722.11; 22 concrete pipe culverts costing $1,551.20; 400 corrugated pipe culverts costing $11,558.09; 83 boiler pipe culverts costing $3,395.49; 8 headwalls on culverts costing $1,730.81; 1 concrete deck girder bridge costing $3,609.53; 26 I-beam spans on concrete abutments costing $5,711.26; 1 high steel truss on concrete abutments costing $12,916.13.

MARION COUNTY.

Roads:

The total county road expenditure was $35,118.26, of which $5,712.68 or 16.2% was spent for permanent work; $11,978.57 or 34.1% was spent for temporary work; $6,274.74 or 18.2% was spent for repairs; $5,370.25 or 15.3% was spent for maintenance; $2,203.33 or 6.3% was spent for equipment and unused materials; $3,478.69 or 9.9% was spent for miscellaneous work. 1.74 miles were built to permanent grade at a cost of $5,127.06. There were no roads built to temporary grade, and no surfacing done. Eighty-one miles were built to natural grade at a cost of $11,978.57.

The county road system was dragged an average of twenty-five times, the average cost of dragging being $0.78 per mile one round trip. The average cost on repairs and maintenance was $70.41 per mile of county road. The total average expenditure per mile of county road was $210.30.

The total township road expenditure as shown by reports from all of the fifteen townships was $35,548.81.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $146,187.39, of which $103,261.01 or 70.5% was spent on permanent bridges and culverts; $14,625.24 or 10.0% was spent on temporary bridges and culverts; $9,907.89 or 6.8% was spent on repair work; $56.98 or 0.1% was spent on equipment and materials; $17,010.46 or 11.8%

was spent on filling bridges and culverts, and $1,395.81 or 0.8% was spent on miscellaneous items.

Of the total amount $117,906.25 spent for new bridges and culverts, $103,261.01 or 87.5% was spent for permanent work; $14,645.24 or 12.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

117 concrete box culverts costing $54,403.24; 1 circular concrete culvert costing 140.25; 413 corrugated pipe culverts costing $11,389.85; 4 I-beam spans on piling abutments costing $2,187.24; 18 I-beam spans on concrete abutments costing $24,044.45; 2 pony truss spans on wood piling abutments costing $424.35; 7 pony truss spans with concrete abutments and floor costing $17,718.57; 2 high steel trusses with concrete abutments costing $6,954.50; 1 wood pile bridge costing $143.80.

MARSHALL COUNTY.

Roads:

The total county road expenditure was $23,233.29, of which $4,433.89 or 19.1% was spent for permanent work; $3,356.31 or 14.4% was spent for temporary work; $6,411.74 or 27.6% was spent for repairs; $4,882.44 or 21.0% was spent for maintenance; $1,420.87 or 6.1% was spent for equipment and unused material; $2,728.04 or 11.8% was spent for miscellaneous work. There were no roads built to permanent or temporary grade, and no surfacing done. Fifty-six miles were built to natural grade at a cost of $3,356.31.

The county road system was dragged an average of thirty-six times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $60.14 per mile of county road. The total average expenditure per mile of county road was $123.50.

The total township road expenditure as indicated by reports from fifteen of the eighteen townships was $47,880.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $132,324.80, of which $90,099.24 or 68.6% was spent on permanent bridges and culverts; $12,507.39 or 9.4% was spent on temporary bridges and culverts; $10,530.39 or 7.7% was spent on repair work; $3,864.05 or 2.8% was spent on equipment and materials; $8,248.94 or 7.0% was spent on filling bridges and culverts, and $6,074.79 or 4.5% was spent on miscellaneous items.

Of the total amount $102,606.63 spent for new bridges and culverts, $90,099.24 or 87.9% was spent for permanent work; $12,507.39 or 12.1% was spent for temporary work. The amounts above referred to were spent on the following construction:

64 concrete box culverts costing $39,325.70; 2 concrete arch culverts costing $533.81; 530 corrugated pipe culverts costing $12,427.49; 1 boiler pipe culvert costing $79.90; 1 headwall on culvert costing $40.98; 8 concrete slab bridges costing $15,716.41; 5 concrete deck girder bridges costing $29,805.79; 1 I-beam span on concrete abutments costing $392.83; 1 pony truss span with concrete abutments and floor costing $4,283.72.

MILLS COUNTY.

Roads:

The total county road expenditure was $17,504.75, of which $10,077.27 or 57.6% was spent for permanent work; $1,716.20 or 9.8% was spent for temporary work; $2,419.56 or 13.7% was spent for repairs; $1,891.84 or 10.9% was spent for maintenance; $231.95 or 1.3% was spent for equipment and unused material; $1,167.93 or 6.7% was spent for miscellaneous work. One mile was built to permanent grade at a cost of $1,018.47, 18.75 miles were built to temporary grade at a cost of $9,058.80. There was no surfacing work done. Eight miles were built to natural grade at a cost of $1,716.20.

The county road system was dragged an average of fifty times, the average cost of dragging being $0.60 per mile one round trip. The average cost of repairs and maintenance was $39.19 per mile of county road. The total average expenditure per mile of county road was $159.10.

The total township road expenditure as shown by reports from all of the thirteen townships was $30,289.35.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $58,291.69, of which $17,900.13 or 30.2% was spent on permanent bridges and culverts; $18,132.70 or 30.5% was spent on temporary bridges and culverts; $11,586.74 or 19.5% was spent on repair work; $7,355.92 or 12.5% was spent on equipment and materials; $1,457.28 or 2.5% was spent on filling bridges and culverts, and $2,858.92 or 4.8% was spent on miscellaneous items.

Of the total amount $36,032.83 spent for new bridges and culverts, $17,900.13 or 49.6% was spent for permanent work; $18,132.70 or 50.4% was spent for temporary work. The amounts above referred to were spent on the following construction:

10 concrete box culverts costing $6,130.55; 24 concrete pipe culverts costing $1,650.27; 94 corrugated pipe culverts costing $5,281.26; 6 boiler pipe culverts costing $718.00; 36 headwalls on culverts costing $3,960.00; 1 I-beam spans on concrete abutments costing $6,159.31; 1 pony truss span on wood piling costing $2,654.06; 13 wood pile bridges costing $6,030.17; miscellaneous bridges and culverts costing $3,449.21.

MITCHELL COUNTY.

Roads:

The total county road expenditure was $23,796.85, of which $6,010.93 or 25.3% was spent for permanent work; $8,572.67 or 36.0% was spent for repairs; $2,379.42 or 10.0% was spent for maintenance; $3,808.36 or 16.0% was spent for equipment and unused material; $3,025.47 or 12.7% was spent for miscellaneous work. There were no roads built to permanent, temporary, or natural grades. 3.5 miles were surfaced with gravel at a cost of $3,215.01.

The average cost of repairs and maintenance was $86.92 per mile of county road. The total average expenditure per mile of county road was $188.80.

The total township road expenditure as shown by reports from all of the sixteen townships was $26,627.06.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $57,592.12, of which $43,424.81 or 75.4% was spent on permanent bridges and culverts; $9,755.36 or 16.9% was spent on temporary bridges and culverts, $3,711.95 or 6.5% was spent on repair work; $700.00 or 1.2% was spent on equipment and materials.

Of the total amount $53,180.17 spent for new bridges and culverts $43,424.81 or 81.6% was spent for permanent work, $9,755.36 or 18.4% was spent for temporary work. The amounts above referred to were spent on the following construction:

115 concrete box culverts costing $23,879.63; 455 corrugated pipe culverts costing $9,755.36; 9 I-beam spans on concrete abutments costing $8,913.70; 4 pony truss spans with concrete abutments and floor costing $10,631.48.

MONONA COUNTY.

Roads:

The total county road expenditure was $18,365.38, of which $1,373.45 or 7.5% was spent for permanent work; $5,203.83 or 28.3% was spent for temporary work; $3,614.43 or 19.7% was spent for repairs; $4,002.07 or 21.7% was spent for maintenance; $2,047.25 or 11.2% was spent for equipment and unused material; $2,123.35 or 11.6% was spent for miscellaneous work. Nine-tenths of a mile was built to permanent grade at a cost of $1,373.45. There were no roads built to temporary grade and no surfacing done. 48.35 miles were built to natural grade at a cost of $4,603.83.

The county road system was dragged an average of 28.75 times, the average cost of dragging being $0.80 per mile one round trip. The average cost of repairs and maintenance was $29.05 per mile of county road. The total average expenditure per mile of county road was $118.50.

There were no reports received showing the township expenditures for road work.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $72,420.67, of which $13,724.30 or 18.8% was spent on permanent bridges and culverts; $34,435.52 or 47.5% was spent on temporary bridges and culverts; $14,198.37 or 19.6% was spent on repair work; $3,216.68 or 4.5% was spent on equipment and materials; $2,500.48 or 3.5% was spent on filling bridges and culverts and $4,251.32 or 6.1% was spent on miscellaneous items.

Of the total amount $48,159.82 spent for new bridges and culverts, $13,724.30 or 28.5% was spent for permanent work; $34,435.52 or 71.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

12 concrete box culverts costing $11,060.69; 2 circular concrete culverts costing $352.59; 204 corrugated pipe culverts costing $7,289.64; 1 boiler pipe culvert costing $12.80; 1 cast iron pipe culvert costing $58.30; 8 headwalls on culverts costing $311.11; 1 concrete deck girder bridge costing $2,000.00; 37 I-beam spans on piling abutments costing $22,724.89; 5 miscellaneous bridges and culverts costing $4,290.29.

MONROE COUNTY.

Roads:

The total county road expenditure was $19,212.50, of which $327.90 or 1.8% was spent for permanent work; $4,603.16 or 24.0% was spent for temporary work; $3,919.80 or 20.4% was spent for repairs; $2,936.06 or 15.2% was spent for maintenance; $5,190.24 or 27.0% was spent for equipment and unused material; $2,235.34 or 11.6% was spent for miscellaneous work. There were no roads built to permanent or temporary grades and no surfacing work was done. The number of miles of road built to natural grade was not reported, but $4,603.16 was spent for this work.

The county road system was dragged an average of 23 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $47.44 per mile of county road. The total average expenditure per mile of county road was $132.50.

The total township road expenditure as indicated by reports from ten of the 12 townships was $22,121.60.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $53,956.57, of which $24,883.41 or 46.0% was spent on permanent bridges and culverts; $12,518.25 or 23.4% was spent on temporary bridges and culverts; $6,964.81 or 12.9% was spent on repair work; $2,199.44 or 4.0% was spent on equipment and materials; $5,174.24 or 9.6% was spent on filling bridges and culverts, and $2,256.42 or 4.1% was spent on miscellaneous items.

Of the total amount $37,401.66 was spent for new bridges and culverts; $24,883.41 or 66.5% was spent for permanent work; $12,518.25 or 33.5% was spent for temporary work. The amounts referred to were spent on the following construction:

30 concrete box culverts costing $11,539.54; 56 concrete pipe culverts costing $2,240.00; 444 corrugated pipe culverts costing $9,729.14; 8 masonry arch culverts costing $3,163.77; 26 boiler pipe culverts costing $363.31; 17 cast iron pipe culverts costing $759.75; 3 headwalls on culverts costing $283.07; 1 concrete abutment costing $578.50; 1 concrete deck girder bridge costing $1,760.76; 1 retaining wall costing $648.42; 1 I-beam span on concrete abutments costing $349.83; 1 pony truss on piling abutments costing $1,319.36; 4 pony truss spans with concrete floor and abutments costing $4,222.52; 3 wood pile bridges costing $365.54, and miscellaneous bridges and culverts costing $38.15.

MONTGOMERY COUNTY.

Roads:

The total county road expenditure was $20,893.77, of which $4,165.44 or 20.0% was spent for permanent work; $4,906.04 or 23.5% was spent for temporary work; $8,387.67 or 40.1% was spent for repairs; $3,299.47 or 15.8% was spent for maintenance and $135.15 or 0.6% was spent for miscellaneous work. 3 miles were built to permanent grade at a cost of $3,000.34. 2.75 miles were built to temporary grade at a cost of $909.60. No surfacing work was done. 64.75 miles were built to natural grade at a cost of $4,906.04.

The county road system was dragged an average of 37.1 times, the average cost of dragging being $0.70 per mile one round trip. The average cost of repairs and maintenance was $73.97 per mile of county road. The total average expenditure per mile of county road was $167.10.

The total township road expenditure as shown by reports from all of the 12 townships was $28,566.62.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $53,552.96, of which $22,343.95 or 41.7% was spent on permanent bridges and culverts; $12,279.67 or 22.8% was spent on temporary bridges and culverts; $11,801.59 or 22.1% was spent on repair work; $1,932.00 or 3.7% was spent on equipment and materials; $3,890.21 or 7.3% was spent on filling bridges and culverts, and $1,305.54 or 2.4% was spent on miscellaneous items.

Of the total amount $34,623.62 spent for new bridges and culverts, $22,343.95 or 64.5% was spent for permanent work; $12,279.67 or 35.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

9 concrete box culverts costing $5,828.39; 119 concrete pipe culverts costing $4,721.24; 100 corrugated pipe culverts costing $3,425.96; 1 boiler pipe culvert costing $210.00; 50 headwalls on culverts costing $6,212.07; 1 retaining wall costing $496.32; 1 pony truss on piling abutments costing $2,100; 2 pony trusses with concrete abutments and floor costing $5,985.93 and 18 wood pile bridges costing $6,543.71.

MUSCATINE COUNTY.

Roads:

The total county road expenditure was $35,419.22, of which $12,438.03 of 35.1% was spent for permanent work; $10,975.67 or 31.0% was spent for temporary work; $3,059.34 or 8.6% was spent for repairs; $4,423.24 or 12.5% was spent for maintenance; $2,463.93 or 7.0% was spent for equipment and unused material; $2,059.01 or 5.8% was spent for miscellaneous work. 7.4 miles were built to permanent grade at a cost of $7,921.34. .73 of a mile was built to temporary grade at a cost of $3,017.13. 1.26 miles were surfaced with gravel at a cost of $1,101.40. 39.05 miles were built to natural grade at a cost of $9,223.57.

The county road system was dragged an average of 44.3 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $55.34 per mile of county road. The total average expenditure per mile of county road was $262.20.

The total township road expenditure as shown by reports from all of the 15 townships was $33,143.30.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $46,374.19, of which $25,660.28 or 55.3% was spent on permanent bridges and culverts; $12,742.17 or 27.7% was spent on temporary bridges and culverts; $5,603.88 or 12.1% was spent on repair work; $956.43 or 2.0% was spent on equipment and materials; $702.51 or 1.4% was spent on filling bridges and culverts, and $708.92 or 1.5% was spent on miscellaneous items.

Of the total amount $38,402.45 spent for new bridges and culverts, $25,660.28 or 66.8% was spent for permanent work; $12,742.17 or 33.2% was spent for temporary work. The amounts above referred to were spent on the following construction:

71 concrete box culverts costing $20,115.08; 12 circular concrete culverts costing $1,631.74; 20 concrete pipe culverts costing $987.95; 305 corrugated pipe culverts costing $4,902.91; 145 boiler pipe culverts costing $6,231.78; 22 cast iron pipe culverts costing $1,454.68; 2 headwalls on culverts costing $206.43; 1 pony truss span with concrete abutments and floor costing $2,719.08; miscellaneous bridges and culverts costing $51.80.

O'BRIEN COUNTY.

Roads:

The total county road expenditure was $35,017.57, of which $19,281.86 or 55.0% was spent for permanent work; $6,902.58 or 19.8% was spent for temporary work; $2,914.56 or 8.3% was spent for repairs; $3,081.92 or 8.8% was spent for maintenance; $1,317.84 or 3.8% was spent for equipment and unused material; $1,518.81 or 4.3% was spent for miscellaneous work; 15.25 miles were built to permanent grade at a cost of $16,094.36; 0.35 of a mile was built to temporary grade at a cost of $666.96. No surfacing work was done. 44.5 miles were built to natural grade at a cost of $6,902.58.

The county road system was dragged an average of 22.1 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $33.13 per mile of county road. The total average expenditure per mile of county road was $193.50.

The total township road expenditure as shown by reports from all of the seventeen townships was $39,618.19.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $60,558.47, of which $46,280.02 or 76.5% was spent on permanent bridges

and culverts; $3,819.92 or 6.3% was spent on temporary bridges and culverts; $6,901.55 or 11.8% was spent on repair work; $2,414.14 or 3.9% was spent on equipment and materials; $459.20 or 0.7% was spent on filling bridges and culverts, and $583.64 or 0.9% was spent on miscellaneous items.

Of the total amount $50,199.94 spent for new bridges and culverts, $46,280.02 or 92.5% was spent on permanent work; $3,819.92 or 7.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

89 concrete box culverts costing $29,852.70; 4 circular concrete culverts costing $296.95; 181 corrugated pipe culverts costing $3,819.92; 1 headwall on culvert costing $30.83; 2 concrete slab bridges costing $2,631.64; 1 concrete deck girder bridge costing $1,583.24; 3 I-beam spans on concrete abutments costing $5,735.48, and 2 pony truss spans with concrete abutments and floor costing $6,149.18.

OSCEOLA COUNTY.

Roads:

The total county road expenditure was $20,851.67, of which $11,596.95 or 55.6% was spent for permanent work; $6,415.62 or 30.8% was spent for temporary work; $725.60 or 3.5% was spent for repairs; $1,994.92 or 9.5% was spent for maintenance; $118.60 or 0.6% was spent for equipment and unused material; 8.5 miles were built to permanent grade at a cost of $8,592.64. No roads were built to temporary grade. 1 mile was surfaced with gravel at a cost of $781.30. 50 miles were built to natural grade at a cost of $6,415.62.

The county road system was dragged an average of 24 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $36.11 per mile of county road. The total average expenditure per mile of county road was $158.00.

The total township road expenditure as shown by reports from all of the 12 townships was $25,007.70.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $54,750.73 of which $35,415.36 or 64.8% was spent on permanent bridges and culverts; $13,196.05 or 24.1% was spent on temporary bridges and culverts; $1,278.41 or 2.3% was spent on repair work; $1,942.75 or 3.5% was spent on equipment and materials; $2,687.20 or 4.9% was spent on filling bridges and culverts and $230.56 or 0.4% was spent on miscellaneous items.

Of the total amount $48,611.41 spent for new bridges and culverts, $35,415.36 or 72.9% was spent for permanent work; $13,196.05 or 27.1% was spent for temporary work. The amounts above referred to were spent on the following construction:

72 concrete box culverts costing $20,332.34; 29 concrete arch culverts costing $2,779.47; 154 corrugated pipe culverts costing $3,972.23; 5 concrete deck girder bridge costing $9,788.00; 2 pony truss spans with concrete abutments and floor costing $2,515.55, and 22 wood pile bridges costing $9,223.82.

PAGE COUNTY.

Roads:

The total county road expenditure was $32,159.65, of which $13,025.78 or 40.5% was spent for permanent work; $2,270.78 or 7.1% was spent for temporary work; $2,487.07 or 7.7% was spent for repairs; $5,622.82 or 17.5% was spent for maintenance; $2,729.93 or 8.5% was spent for equipment and unused material; $6,023.27 or 18.7% was spent for miscellaneous work. .5 of a mile was built to permanent grade at a cost of $1,352.05. The number of miles built to temporary grade are not given, but $11,660.91 was spent for this work. No surfacing work done. 10 miles were built to natural grade at a cost of $2,270.78.

The county road system was dragged an average of 21 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $59.81 per mile of county road. The total average expenditure per mile of county road was $184.89.

The total township road expenditure as shown by reports from all of the 16 townships was $39,449.61.

...idges:

The total expenditure for bridge and culvert work during 1916 was $83,758.97, of which $25,722.24 or 30.6% was spent on permanent bridges and culverts; $19,989.56 or 23.9% was spent on temporary bridges and culverts; $19,881.70 or 23.8% was spent on repair work; $1,752.03 or 2.1% was spent on equipment and materials; $12,908.11 or 15.4% was spent on filling bridges and culverts, and $3,505.23 or 4.2% was spent on miscellaneous items.

Of the total amount $45,711.80 spent for new bridges and culverts, $25,722.24 or 56.3% was spent for permanent work; $19,989.56 or 43.7% was spent for temporary work. The amounts above referred to were spent on the following construction:

25 concrete box culverts costing $19,092.57; 1 concrete arch culvert costing $3,260.60; 58 concrete pipe culverts costing $3,037.32; 284 corrugated pipe culverts costing $6,426.10; 27 boiler pipe culverts costing $2,736.35; 114 cast iron pipe culverts costing $7,729.56; 1 headwall on culvert costing $232.35; 6 pony truss spans on piling abutments costing $2,349.21, and 2 wood pile bridges costing $678.24.

PALO ALTO COUNTY.

Roa...s:

The total county road expenditure was $29,386.21, of which $17,507.15 or 59.7% was spent for permanent work; $2,577.15 or 8.6% was spent for temporary work; $3,016.00 or 10.3% was spent for repairs; $2,857.44 or 9.7% was spent for maintenance; $907.75 or 3.1% was spent for equipment and unused material; $2,520.72 or 8.6% was spent for miscellaneous work. 19.05 miles were built to permanent grade at a cost of $15,514.56. No roads were built to temporary grade. 1.11 miles were

surfaced with gravel at a cost of $319.50. 23.75 miles were built to natural grade at a cost of $2,577.15.

The county road system was dragged an average of 25 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $36.25 per mile of county road. The total average expenditure per mile of county road was $181.40.

The total township road expenditure as shown by reports from all of the 16 townships was $50,836.90.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $81,510.25 of which $59,977.30 or 73.5% was spent for permanent bridges and culverts; $9,804.88 or 12.2% was spent on temporary bridges and culverts; $4,535.69 or 5.6% was spent on repair work; $1,816.61 or 2.2% was spent on equipment and materials; $783.94 or 0.9% was spent on filling bridges and culverts, and $4,591.83 or 5.6% was spent on miscellaneous items.

Of the total amount $69,782.18 spent for new bridges and culverts, $59,977.30 or 86.0% was spent for permanent work; $9,804.88 or 14.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

100 concrete box culverts costing $29,633.23; 14 circular concrete culverts costing $1,404.81; 587 corrugated pipe culverts costing $9,694.85; 6 concrete slab bridges costing $6,117.46; 1 concrete abutment costing $1,486.80; 7 I-beam spans on concrete abutments costing $16,233.00; 2 pony truss spans with concrete abutments and floor costing $5,102.00, and 1 wood pile bridge costing $200.03.

PLYMOUTH COUNTY.

Roads:

The total county road expenditure was $25,030.18, of which $627.53 or 2.5% was spent for permanent work; $10,939.51 or 43.7% was spent for temporary work; $2,001.05 or 8.0% was spent for repairs; $4,295.14 or 17.2% was spent for maintenance; $1,600.56 or 6.4% was spent for equipment and unused material; $5,566.29 or 22.2% was spent for miscellaneous work. No roads were built to permanent grade. The number of miles built to temporary grade was not reported, but $627.53 was spent for this work. No surfacing work was done. 190 miles were built to natural grade at a cost of $10,939.51.

The county road system was dragged an average of 24 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $30.19 per mile of county road. The total average expenditure per mile of county road was $119.70.

The total township road expenditure as shown by reports from all of the 24 townships was $42,051.21.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $105,420.01, of which $50,078.24 or 47.5% was spent on permanent bridges

and culverts; $22,488.25 or 21.4% was spent on temporary bridges and culverts; $17,011.65 or 16.1% was spent on repair work; $13,001.94 or 12.3% was spent in equipment and materials; $355.90 or 0.3% was spent on filling bridges and culverts, and $2,484.03 or 2.4% was spent on miscellaneous items.

Of the total amount $72,566.49 spent for new bridges and culverts, $50,078.24 or 69.0% was spent for permanent work; $22,488.25 or 31.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

42 concrete box culverts costing $23,180.31; corrugated culverts costing $5,525.17; 1 headwall on culvert costing $35.02; 6 concrete slab bridges costing $12,618.44; 1 concrete arch bridge costing $7,993.51; 1 concrete abutment costing $6,041.57; 2 I-beam spans on piling abutments costing $2,034.77; 75 wood pile bridges costing $14,726.07; miscellaneous bridges and culverts costing $411.63.

POCAHONTAS COUNTY.

Roads:

The total county road expenditure was $56,188.82, of which $28,609.95 or 50.9% was spent for permanent work; $1,114.80 or 2.0% was spent for temporary work; $4,073.73 or 7.3% was spent for repairs; $3,143.54 or 5.6% was spent for maintenance; $7,612.61 or 13.5% was spent for equipment and unused material; $11,634.19 or 20.7% was spent for miscellaneous work. 20.25 miles were built to permanent grade at a cost of $15,234.61. No roads were built to temporary grade. 13.4 miles were surfaced with gravel at a cost of $7,514.43. The number of miles built to natural grade was not reported, but $1,114.80 was spent for this work.

The county road system was dragged an average of 24 times, the average cost of dragging being $0.77 per mile one round trip. The average cost of repairs and maintenance was $42.82 per mile of county road. The total average expenditure per mile of county road was $332.40.

The total township road expenditure as shown by reports from the 19 townships was $53,730.49.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $68,583.48, of which $50,853.30 or 74.1% was spent on permanent bridges and culverts; $7,752.76 or 11.3% was spent on temporary bridges and culverts; $6,878.58 or 10.0% was spent on repair work; $55.85 or 0.1% was spent on equipment and materials; $2,986.79 or 4.4% was spent on filling bridges and culverts, and $56.20 or 0.1% was spent on miscellaneous items.

Of the total amount $58,606.15 was spent for new bridges and culverts; $50,853.30 or 86.8% was spent for permanent work; $7,752.56 or 13.2% was spent for temporary work. The amounts above referred to were spent on the following construction:

Concrete box culverts costing $6,986.68; circular concrete culverts costing $642.62; corrugated pipe culverts costing $7,752.76; 1 concrete slab bridge costing $664.23; 1 retaining wall costing $293.04; 9 I-beam spans

on concrete abutments costing $14,764.96; pony truss spans with concrete abutments and floor costing $24,588.60; high steel truss spans on concrete abutments costing; $2,876.66; miscellaneous bridges and culverts costing $36.51.

POLK COUNTY.

Roads:

The total county road expenditure was $42,987.57, of which $7,976.28 or 18.5% was spent for permanent work; $7,257.18 or 16.9% was spent for temporary work; $2,467.43 or 5.7% was spent for repairs; $15,045.56 or 35.1% was spent for maintenance; $8,443.86 or 19.6% was spent for equipment and unused material; $1,797.16 or 4.2% was spent for miscellaneous work. 1.93 miles were built to permanent grade at a cost of $2,387.87; 2.5 miles were surfaced with gravel at a cost of $2,997.81. 98 miles were built to natural grade at a cost of $5,804.51.

The county road system was dragged an average of 52 times, the average cost of dragging being $1.00 per mile one round trip. The average cost of repairs and maintenance was $97.28 per mile of county road. The total average expenditure per mile of county road was $238.80.

The total township road expenditure as indicated by reports from 14 of the 22 townships was $34,760.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $86,652.12, of which $38,934.35 or 45.1% was spent on permanent bridges and culverts; $11,841.15 or 13.8% was spent on temporary bridges and culverts; $25,108.74 or 29.0% was spent on repair work; $2,878.94 or 3.3% was spent on equipment and materials; $4,091.24 or 4.5% was spent on filling bridges and culverts, and $3,797.70 or 4.3% was spent on miscellaneous items.

Of the total amount $50,775.50 spent for new bridges and culverts, $38,934.35 or 76.5% was spent on permanent work; $11,841.15 or 23.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

38 concrete box culverts costing $27,293.63; 289 corrugated pipe culverts costing $7,408.24; 83 boiler pipe culverts costing $3,508.84; 1 cast iron pipe culvert costing $52.20; 1 headwall on culvert costing $204.42; 2 concrete slab bridges costing $1,388.30; 1 concrete arch bridge costing $4,947.00; 2 concrete thru girder bridges costing $4,251.00; 1 retaining wall costing $850.00; miscellaneous bridges and culverts costing $871.87.

POTTAWATTAMIE COUNTY.

Roads:

The total county road expenditure was $58,846.01, of which $1,317.40 or 2.2% was spent for permanent work; $29,747.70 or 50.5% was spent for temporary work; $13,318.85 or 22.7% was spent for repairs; $6,306.28 or 10.7% was spent for maintenance; $5,692.64 or 9.7% was spent for equipment and unused material; $2,463.14 or 4.2% was spent for miscellaneous work. No roads were built to permanent grade. 2 miles were built to temporary grade at a cost of $1,317.40. There was no surfacing work done. 245 miles were built to natural grade at a cost of $29,747.70.

The county road system was dragged an average of 29.4 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $77.26 per mile of county road. The total average expenditure per mile of county road was $231.70.

No reports of township work or expenditure were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $159,838.19, of which $49,573.30 or 27.3% was spent on permanent bridges and culverts; $43,235.87 or 26.5% was spent on temporary bridges and culverts; $30,877.69 or 19.5% was spent on repair work; $16,819.71 or 10.5% was spent on equipment and materials; $18,241.24 or 11.6% was spent on filling bridges and culverts, and $1,090.38 or 0.6% was spent on miscellaneous items.

Of the total amount $92,809.17 spent for new bridges and culverts, $49,573.30 or 53.4% was spent for permanent work; $43,235.87 or 46.6% was spent for temporary work. The amounts above referred to were spent on the following construction:

8 concrete box culverts costing $4,878.50; 151 concrete pipe culverts costing $8,086.02; 174 corrugated pipe culverts costing $18,599.02; 59 boiler pipe culverts costing $3,411.38; 1 cast iron pipe culvert costing $443.55; 186 headwalls on culverts costing $13,003.55; 2 I-beam spans on concrete abutments costing $2,209.94; 1 steel girder bridge on concrete abutments costing $5,749.44; 6 pony truss spans on piling abutments costing $7,603.43; 4 pony truss spans with concrete abutments and floor costing $15,645.84; 28 wood pile bridges costing $12,525.51; miscellaneous bridges and culverts costing $256.98.

POWESHIEK COUNTY.

Roads:

The total county road expenditure was $26,920.35, or which $2,878.71 or 10.7% was spent for permanent work; $10,437.79 or 38.7% was spent for temporary work; $3,637.41 or 13.5% was spent for repairs; $4,082.34 or 15.2% was spent for maintenance; $1,180.94 or 4.4% was spent for equipment and unused material; $4,706.16 or 17.5% was spent for miscellaneous work. .75 of a mile was built to permanent grade at a cost of $849.27. There were no roads built to temporary grade, and no surfacing work done. 50 miles were built to natural grade at a cost of $10,434.79.

The county road system was dragged an average of 25 times, the average cost of dragging being $0.80 per mile one round trip. The average cost of repairs and maintenance was $55.82 per mile of county road. The total average expenditure per mile of county road was $195.10.

The total township road expenditure as shown by reports from all of the 16 townships was $42,729.48.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $112,683.34, of which $78,589.75 or 70.0% was spent on permanent bridges and culverts; $12,256.70 or 10.7% was spent on temporary bridges and culverts; $8,219.69 or 7.3% was spent on repair work; $489.68 or 0.4% was spent on equipment and materials; $6,984.70 or 6.2% was spent on filling bridges and culverts, and $6,142.82 or 5.4% was spent on miscellaneous items.

Of the total amount $90,846.45 spent for new bridges and culverts, $78,589.75 or 86.5% was spent for permanent work; $12,256.70 or 13.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

46 concrete box culverts costing $34,934.58; 27 circular concrete culverts costing $7,362.17; 222 corrugated pipe culverts costing $6,185.12; 173 boiler pipe culverts costing $6,071.58; 3 headwalls on culverts costing $148.95; 1 concrete slab bridge costing $1,416.80; 13 I-beam spans on concrete abutments costing $15,304.08; 1 steel girder bridge on concrete abutments costing $571.85; 7 pony truss spans with concrete abutments and floor costing $18,851.32.

RINGGOLD COUNTY.

Roads:

The total county road expenditure was $11,729.00, of which $1,373.00 or 11.7% was spent for permanent work; $3,950.00 or 33.6% was spent for repairs; $2,625.00 or 22.5% was spent for maintenance; $1,422.00 or 12.1% was spent for equipment and unused material; $2,359.00 or 20.1% was spent for miscellaneous work. .5 miles was built to permanent grade at a cost of $1,373.00. There were no roads built to temporary grade or natural grade and no surfacing work done.

The county road system was dragged an average of 30 times, the average cost of dragging being $0.50 per mile one round trip. The average cost of repairs and maintenance was $35.93 per mile of county road. The total average expenditure per mile of county road was $64.10.

No reports of township work or expenditure were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $45,220.22, of which $16,178.65 or 35.5% was spent on permanent bridges and culverts; $9,576.55 or 21.3% was spent on temporary bridges and culverts; $10,483.95 or 23.2% was spent on repair work; $2,809.65 or 6.3% was spent on equipment and materials; $5,771.78 or 12.8% was spent on filling bridges and culverts, and $399.64 or 0.9% was spent on miscellaneous items.

Of the total amount $25,755.20 spent for new bridges and culverts, $16,178.65 or 62.8% was spent for permanent work; $9,576.55 or 37.2% was spent for temporary work. The amounts above referred to were spent on the following construction.

33 concrete box culverts costing $9,471.65; 208 corrugated pipe culverts costing $5,544.75; 16 headwalls on culverts costing $886.00; 5 I-beam spans on concrete abutments costing $5,821.00, and 34 wood pile bridges costing $4,031.80.

SAC COUNTY.

Roads:

The total county road expenditure was $46,154.82, of which $37,565.26 or 81.3% was spent for permanent work; $2,501.00 or 5.4% was spent for repairs; $2,537.43 or 5.5% was spent for maintenance; $278.38 or 0.6% was spent for equipment and unused material; $3,272.75 or 7.2% was spent for miscellaneous work. 30.33 miles were built to permanent grade at a cost of $29,429.96. There were no roads built to temporary or to natural grades. 6.67 miles were surfaced with gravel at a cost of $5,497.87.

The county road system was dragged an average of 20 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $34.04 per mile of county road. The total average expenditure per mile of county road was $311.80.

The total township road expenditure as shown by reports from all of the 16 townships was $14,855.15.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $76,832.90, of which $62,730.62 or 81.7% was spent on permanent bridges and culverts; $3,163.63 or 4.1% was spent on temporary bridges and culverts; $6,970.56 or 9.1% was spent on repair work; $1,279.57 or 1.6% was spent on equipment and materials; $489.55 or 0.6% was spent on filling bridges and culverts and $2,198.97 or 2.9% was spent on miscellaneous items.

Of the total amount $65,894.25 spent for new bridges and culverts, $62,730.62 or 95.1% was spent for permanent work; $3,163.63 or 4.9% was spent for temporary work. The amounts above referred to were spent on the following construction:

95 concrete box culverts costing $26,999.57; 46 circular concrete culverts costing $2,737.83; 98 concrete arch culverts costing $6,716.99; 169 corrugated pipe culverts costing $2,549.02; 42 masonry arch culverts costing $1,431.12; 2 I-beam spans on piling abutments costing $225.35; 6 I-beam spans on concrete abutments costing $5,050.06; 6 pony truss spans with concrete abutments and floor costing $25,795.05, and 3 wood pile bridges costing $389.26.

SCOTT COUNTY.

Roads:

The total county road expenditure was $39,073.29, of which $20,259.76 or 51.8% was spent for permanent work; $8,591.60 or 22.0% was spent for temporary work; $1,532.28 or 3.9% was spent for repairs; $4,199.74 or 10.7% was spent for maintenance; $2,837.74 or 7.2% was spent for equipment and unused material; $1,732.17 or 4.4% was spent for miscellaneous work. Six and one-half miles were built to permanent grade at a cost of $10,208.20. One-fifth of a mile was built to temporary grade

at a cost of $97.25. Two and one-half miles were surfaced with gravel and macadam at a cost of $9,156.23. Six and one-eighth miles were built to natural grade at a cost of $8,591.60.

The county road system was dragged an average of 17.4 times, the average cost of dragging being $0.85 per mile one round trip. The average cost of repairs and maintenance was $41.61 per mile of county road. The total average expenditure per mile of county road was $287.41.

The total township road expenditure as shown by reports from all of the sixteen townships was $37,967.83.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $35,718.39, of which $14,883.95 or 41.7% was spent on permanent bridges and culverts; $6,046.64 or 17.0% was spent on temporary bridges and culverts; $5,649.49 or 15.8% was spent on repair work; $6,572.59 or 18.4% was spent on equipment and materials; $585.31 or 1.6% was spent on filling bridges and culverts, and $1,980.41 or 5.5% was spent on miscellaneous items.

Of the total amount $20,930.59 spent for new bridges and culverts, $14,883.95 or 71.1% was spent for permanent work; $6,046.64 or 28.9% was spent for temporary work. The amounts above referred to were spent on the following construction:

37 concrete box culverts costing $10,213.80; 145 corrugated pipe culverts costing $1,950.24; 98 boiler pipe culverts costing $3,729.24; 5 headwalls on culverts costing $161.31; 1 concrete thru girder bridge costing $1,646.19; 1 I-beam span on concrete abutments costing $2,362.65; 1 pony truss span with concrete abutments and floor costing $200.00; miscellaneous bridges and culverts costing $367.06.

SHELBY COUNTY.

Roads:

The total county road expenditure was $17,081.23, of which $3,183.78 or 18.6% was spent for permanent work; $1,487.50 or 8.7% was spent for temporary work; $7,959.91 or 46.6% was spent for repairs; $3,606.74 or 21.1% was spent for maintenance; $283.20 or 1.7% was spent for equipment and unused material; $560.10 or 3.3% was spent for miscellaneous work; .3 mile was built to permanent grade at a cost of $2,441.78; .1 mile was built to temporary grade at a cost of $628.82; There was no surfacing work done. 11 miles were built to natural grade at a cost of $1,487.50

The county road system was dragged an average of 30 times. The average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $73.65 per mile of county road. The total average expenditure per mile of county road was $108.80.

The total township road expenditure as shown by reports from all of the 16 townships was $37,948.40.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $88,479.78, of which $26,453.75 or 29.9% was spent on permanent bridges and culverts; $40,010.48 or 45.2% was spent on temporary bridges and culverts; $14,592.58 or 16.5% was spent on repair work; $7,173.95 or 8.1% was spent on filling bridges and culverts; $249.00 or 0.3% was spent on miscellaneous items.

Of the total amount $66,464.23 spent for new bridges and culverts, $26,453.75 or 29.8% was spent for permanent work; $40,010.48 or 60.2% was spent for temporary work. The amounts above referred to were spent on the following construction:

29 concrete box culverts costing $26,010.45; 7 concrete pipe culverts costing $443.30; 253 corrugated pipe culverts costing $11,294.76; 54 boiler pipe culverts costing $5,243.41; 1 I-beam span on piling abutments costing $936.24; 9 pony truss spans on wood pile abutments costing $17,323.32; 18 wood pile bridges costing $5,155.20; miscellaneous bridges and culverts costing $57.55.

SIOUX COUNTY.

Roads:

The total county road expenditure was $18,316.58, of which $1,786.00 or 9.6% was spent for permanent work; $8,328.25 or 45.6% was spent for temporary work; $3,293.02 or 18.6% was spent for repairs; $3,077.60 or 16.8% was spent for maintenance; $1,467.71 or 18.0% was spent for equipment and unused material; $264.00 or 1.4% was spent for miscellaneous work. There were no roads built to permanent grade and no surfacing work done. The miles built to temporary grade were not given, but $1,786.00 was spent for this work. Eighty miles were built to natural grade at a cost of $8,328.25.

The county road system was dragged an average of 19.2 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $29.98 per mile of county road. The total average expenditure per mile of county road was $84.80.

No report of township work or expenditure were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $74,615.21, of which $57,643.03 or 77.3% was spent on permanent bridges and culverts; $5,409.27 or 7.2% was spent on temporary bridges and culverts; $7,816.85 or 10.5% was spent on repair work; $2,426.07 or 3.2% was spent on equipment and materials; $680.19 or 0.9% was spent on filling bridges and culverts, and $639.80 or 0.9% was spent on miscellaneous items.

Of the total amount $63,052.30 spent for new bridges and culverts, $57,643.03 or 91.4% was spent for permanent work; $5,409.27 or 8.6% was spent for temporary work. The amounts above referred to were spent on the following construction:

149 concrete box culverts costing $40,404.86; corrugated pipe culverts costing $875.70; 3 concrete slab bridges costing $4,552.37; 1 concrete thru girder costing $1,781.50; 1 pony truss span with concrete abutments and floor costing $5,920.00; 1 high steel truss on concrete abutments costing $4,984.20; 6 wood pile bridges costing $4,533.57.

STORY COUNTY.

Roads:

The total county road expenditure was $53,643.74, of which $38,046.56 or 71.0% was spent for permanent work; $4,208.80 or 7.8% was spent for repairs; $5,691.54 or 10.6% was spent for maintenance; $622.39 or 1.1% was spent for equipment and unused material; $5,080.45 or 9.5% was spent for miscellaneous work. 37.75 miles were built to permanent grade at a cost of $31,678.42. There were no roads built to temporary or natural grades. 10.75 miles were surfaced with gravel at a cost of $4,814.61. $2,147.53 was spent for tile drainage.

The county road system was dragged an average of 20 times, the average cost of dragging being $0.75 per mile on round trip. The average cost of repairs and maintenance was $57.29 per mile of county road. The total average expenditure per mile of county road was $398.10.

No reports for township work or expenditures were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $69,800.12, of which $54,295.12 or 77.8% was spent on permanent bridges and culverts; $5,325.31 or 7.7% was spent on temporary bridges and culverts; $7,772.34 or 11.1% was spent on repair work; $837.58 or 1.2% was spent on filling bridges and culverts, and $1,569.77 or 2.2% was spent on miscellaneous items.

Of the total amount $59,620.43 spent for new bridges and culverts, $54,295.12 or 91.1% was spent for permanent work; $5,325.31 or 8.9% was spent for temporary work. The amounts above referred to were spent on the following construction:

87 concrete box culverts costing $24,180.00; 70 circular concrete culverts costing $5,535.20; 342 corrugated pipe culverts costing $5,325.31; 7 I-beam spans on concrete abutments costing $12,277.55, and 3 pony truss spans with concrete abutments and floor costing $12,302.37.

TAMA COUNTY.

Roads:

The total county road expenditure was $48,316.15 of which $27,549.87 or 57.1% was spent for permanent work; $3,221.17 or 6.7% was spent for temporary work; $6,857.95 or 14.2% was spent for repairs; $4,601.33 of 9.5% was spent for maintenance; $5,398.09 or 11.1% was spent for equipment and unused material; $687.79 or 1.4% was spent for miscellaneous work. Thirteen miles were built to permanent grade at a cost of $24,587.07. One mile was built to temporary grade at a cost of $1,971.80. There was no surfacing work done. Sixty miles were built to natural grade at a cost of $2,814.03.

The county road system was dragged an average of 27 times, the average cost of dragging being $0.80 per mile one round trip. The average cost of repairs and maintenance was $55.31 per mile of county road. The total average expenditure per mile of county road was $233.40.

The total township road expenditure as shown by reports from all of the 21 townships was $52,059.03.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $164,842.50, of which $133,862.41 or 81.2% was spent on permanent bridges and culverts; $14,278.66 or 8.7% was spent on temporary bridges and culverts; $11,780.21 or 7.1% was spent on repair work; $811.18 or 0.4% was spent on equipment and materials; $3,047.37 or 1.9% was spent on filling bridges and culverts, and $1,063.67 or 0.7% was spent on miscellaneous items.

Of the total amount $148,141.07 spent for new bridges and culverts, $133,862.41 or 90.0% was spent for permanent work; $14,278.66 or 10.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

95 concrete box culverts costing $54,163.51; 365 corrugated pipe culverts costing $9,273.66; 34 cast iron pipe culverts costing $3,013.18; 2 concrete slab bridges costing $2,465.80; 1 concrete arch bridge costing $612.60; 2 concrete deck girder bridges costing $3,163.50; 17 I-beam spans on concrete abutments costing $25,099.59; 8 pony truss spans with concrete abutments and floor costing $48,356.35; 2 wood pile bridges costing $1,859.83; miscellaneous bridges and culverts costing $131.99.

TAYLOR COUNTY.

Roads:

The total county road expenditure was $15,352.83, of which $1,481.70 or 9.7% was spent for permanent work; $6,874.03 or 44.8% was spent for temporary work; $2,432.11 or 15.8% was spent for repairs; $3,979.85 or 25.9% was spent for maintenance; $585.14 or 3.8% was spent for equipment and unused material. One-third mile was built to permanent grade at a cost of $1,481.70. There were no roads built to temporary grade and no surfacing work done. Forty-seven and three-fourths miles were built to natural grade at a cost of $6,874.03.

The county road system was dragged an average of 36.9 times, the average cost of dragging being $0.60 per mile one round trip. The average cost of repairs and maintenance was $37.28 per mile of county road. The total average expenditure per mile of county road was $89.20.

The total township road expenditure as shown by reports from all of the seventeen townships was $32,171.94.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $74,028.55 of which $23,389.39 or 31.6% was spent on permanent bridges and culverts; $15,333.20 or 20.7% was spent on temporary bridges and culverts; $12,625.49 or 17.1% was spent on repair work; $9,658.56 or

13.0% was spent on equipment and materials; $10,700.83 or 14.5% was spent on filling bridges and culverts, and $2,321.08 or 3.1% was spent on miscellaneous items.

Of the total amount $38,722.59 spent for new bridges and culverts $23,389.39 or 60.4% was spent for permanent work; $15,333.20 or 39.6% was spent for temporary work. The amounts above referred to were spent on the following construction:

32 concrete box culverts costing $14,460.96; 85 concrete pipe culverts costing $2,874.75; 328 corrugated pipe culverts costing $8,780.42; 21 boiler pipe culverts costing $2,239.40; 27 cast iron pipe culverts costing $2,575.59; 184 headwalls on culverts costing $4,969.75; 1 I-beam span on concrete abutments costing $1,083.93; 10 wood pile bridges costing $1,737.79.

UNION COUNTY.

Roads:

The total county road expenditure was $10,154.85, of which $56.70 or 0.6% was spent for permanent work; $630.75 or 6.2% was spent for temporary work; $6,058.80 or 59.7% was spent for repairs; $2,203.37 or 21.7% was spent for maintenance; $223.90 or 2.2% was spent for equipment and unused material; $981.33 or 9.6% was spent for miscellaneous work. There was no permanent grading and no surfacing work done. The miles built to natural grade were not reported, but $630.75 was spent on this work.

The county road system was dragged an average of 22.5 times, the average cost of dragging being $0.60 per mile one round trip. The average cost of repairs and maintenance was $54.35 per mile of county road. The total average expenditure per mile of county road was $66.80.

No reports of township work or expenditures were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $40,373.72, of which $23,328.93 or 57.8% was spent on permanent bridges and culverts; $6,004.71 or 14.9% was spent on temporary bridges and culverts; $4,871.29 or 12.1% was spent on repair work; $2,357.91 or 5.8% was spent on equipment and materials; $2,988.22 or 7.4% was spent on filling bridges and culverts, and $822.67 or 2.0% was spent on miscellaneous items.

Of the total amount $29,333.64 spent for new bridges and culverts, $23,328.93 or 79.5% was spent for permanent work; $6,004.71 or 20.5% was spent for temporary work. The amounts above referred to were spent on the following construction.

42 concrete box culverts costing $19,436.98; 1 circular concrete culvert costing $101.91; 9 concrete pipe culverts costing $1,240.83; 145 corrugated pipe culverts costing $3,254.31; 38 headwalls on culverts costing $2,247.49; 2 retaining walls costing $291.72, and 7 wood pile bridges costing $2,750.40.

VAN BUREN COUNTY.

Roads:

The total county road expenditure was $21,714.14, of which $4,865.61 or 22.4% was spent for temporary work; $4,561.04 or 21.0% was spent for repairs; $4,161.84 or 19.2% was spent for maintenance; $7,004.11 or 32.3% was spent for equipment and unused material; $1,121.54 or 5.1% was spent for miscellaneous work. There was no permanent grading and no surfacing work done. 68 miles were built to natural grade at a cost of $4,865.61.

The average cost of repairs and maintenance was $65.68 per mile of county road. The total average expenditure per mile of county road was $163.30.

The total township road expenditure as shown by reports from all of the 14 townships was $24,661.03.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $70,265.06, of which $20,020.89 or 28.4% was spent on permanent bridges and culverts; $21,396.60 or 30.5% was spent on temporary bridges and culverts; $14,267.54 or 20.3% was spent on repair work; $12,206.30 or 17.4% was spent on equipment and materials; $1,896.81 or 2.7% was spent on filling bridges and culverts and $476.92 or 0.7% was spent on miscellaneous items.

Of the total amount $41,417.49 spent for new bridges and culverts, $20,020.89 or 48.3% was spent for permanent work; $21,396.60 or 51.7% was spent for temporary work. The amounts above referred to were spent on the following construction:

37 concrete box culverts costing $15,153.33; 544 corrugated pipe culverts costing $12,449.77; 2 masonry arch culverts costing $663.60; 48 boiler pipe culverts costing $2,598.72; 3 concrete abutments costing $3,868.81; 1 masonry abutment costing $150.70; 7 I-beam spans on piling abutments costing $1,914.21; 6 pony truss spans on wood piling abutments costing $1,748.60; 34 wood pile bridges costing $2,361.55, and miscellaneous bridges and culverts costing $768.20.

WAPELLO COUNTY.

Roads:

The total county road expenditure was $27,382.54, of which $11,799.09 or 43.0% was spent for permanent work; $3,415.97 or 12.5% was spent for temporary work; $3,034.78 or 11.1% was spent for repairs; $4,542.66 or 16.6% was spent for maintenance; $1,775.87 or 6.5% was spent for equipment and unused material; $2,814.26 or 10.3% was spent for miscellaneous work. 2.5 miles were built to permanent grade at a cost of $3,975.93. 3.5 miles were built to temporary grade at a cost of $7,670.77. There was no surfacing work done. 27 miles were built to natural grade at a cost of $2,916.53.

The county road system was dragged an average of 30 times, the average cost of dragging being $0.80 per mile one round trip. The aver-

age cost of repairs and maintenance was $62.21 per mile of county road. The total average expenditure per mile of county road was $224.40.

The total township road expenditure as shown by reports from all of the 14 townships was $32,482.71.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $84,892.89, of which $43,176.38 or 50.8% was spent on permanent bridges and culverts; $15,469.05 or 18.2% was spent on temporary bridges and culverts; $17,555.69 or 20.7% was spent on repair work; $2,889.10 or 3.4% was spent on equipment and materials; $4,552.88 or 5.4% was spent on filling bridges and culverts, and $1,258.79 or 1.5% was spent on miscellaneous items.

Of the total amount $58,645.43 spent for new bridges and culverts, $43,176.38 or 73.6% was spent for permanent work; $15,469.05 or 26.4% was spent for temporary work. The amounts above referred to were spent on the following construction:

19 concrete box culverts costing $14,612.68; 12 concrete pipe culverts costing $3,183.77; 751 corrugated pipe culverts costing $14,575.76; 1 boiler pipe culvert costing $526.89; 3 cast iron pipe culverts costing $1,859.10; 5 masonry box culverts costing $352.41; 3 I-beam spans on concrete abutments costing $7,358.48; 1 steel girder on concrete abutments costing $7,042.47; 2 pony truss spans with concrete abutments and floor costing $7,894.08; 5 wood pile bridges costing $652.19, and miscellaneous bridges and culverts costing $587.66.

WARREN COUNTY.

Roads:

The total county road expenditure was $19,059.34, of which $57.43 or 0.3% was spent for permanent work; $6,854.29 or 35.9% was spent for repairs; $5,256.07 or 27.6% was spent for maintenance; $5,466.72 or 28.7% was spent for equipment and unused material; $1,424.83 or 7.5% was spent for miscellaneous work. There was no permanent or temporary grading and no surfacing work done.

The county road system was dragged an average of 22 times, the average cost of dragging being $0.70 per mile one round trip. The average cost of repairs and maintenance was $71.24 per mile of county road. The total average expenditure per mile of county road was $112.10.

The total township road expenditure as shown by reports from all of the 17 townships was $33,367.46.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $94,289.87, of which $54,162.79 or 57.4% was spent on permanent bridges and culverts; $15,162.37 or 16.1% was spent on temporary bridges and culverts; $7,118.74 or 7.5% was spent on repair work; $2,258.07 or 2.5% was spent on equipment and materials; $14,478.21 or 15.4% was spent on filling bridges and culverts, and $109.68 or 0.1% was spent on miscellaneous items.

Of the total amount $69,325.16 spent for new bridges and culverts, $54,162.79 or 78.1% was spent for permanent work; $15,162.37 or 21.9% was spent for temporary work. The amounts above referred to were spent on the following construction:

46 concrete box culverts costing $23,241.40; 70 circular concrete culverts costing $8,016.06; 219 corrugated pipe culverts costing $4,532.53; 1 cast iron pipe culvert costing $72.50; 1 I-beam span on piling abutments costing $738.94; 5 I-beam spans on concrete abutments costing $8,582.42; 2 pony truss spans with concrete abutments and floor costing $7,322.91; 1 high steel truss on concrete abutments costing $7,000.00, and 54 wood pile bridges costing $9,724.66; miscellaneous $93.79.

WASHINGTON COUNTY.

Roads:

The total county road expenditure was $32,421.08, of which $783.08 or 2.4% was spent for permanent work; $20,295.29 or 62.6% was spent for temporary work; $3,836.79 or 11.9% was spent for repairs; $6,853.36 or 21.1% was spent for maintenance; $538.66 or 1.7% was spent for equipment and unused material; $113.90 or 0.3% was spent for miscellaneous work. There was no permanent grading and no surfacing work done. Seventy-two and one-fourth miles were built to natural grade at a cost of $19,110.56.

The county road system was dragged an average of 25 times, the average cost of dragging being $0.80 per mile one round trip. The average cost of repairs and maintenance was $60.39 per mile of county road. The total average expenditure per mile of county road was $183.20.

The total township road expenditure as shown by reports from all of the fifteen townships was $40,955.27.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $58,821.08, of which $25,793.96 or 43.8% was spent on permanent bridges and culverts; $15,493.92 or 26.4% was spent on temporary bridges and culverts; $11,245.79 or 19.1% was spent on repair work, $4,164.83 or 7.1% was spent on equipment and materials; $1,813.14 or 3.1% was spent on filling bridges and culverts, and $309.44 or 0.5% was spent on miscellaneous items.

Of the total amount $41,287.88 spent for new bridges and culverts, $25,793.96 or 62.5% was spent for permanent work; $15,493.92 or 37.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

31 concrete box culverts costing $15,491.25; 8 circular concrete culverts costing $1,739.00; 416 corrugated pipe culverts costing $9,521.93; 61 boiler pipe culverts costing $3,089.30; 4 headwalls on culverts costing $362.37; 2 concrete abutments costing $2,097.28; 1 retaining wall costing $298.54; 3 I-beam spans on concrete abutments costing $4,741.31; 2 wood pile bridges costing $2,883.59; miscellaneous bridges and culverts costing $1,073.21.

WAYNE COUNTY.

Roads:

The total county road expenditure was $15,881.56 of which $980.00 or 6.2% was spent for permanent work; $2,332.19 or 14.7% was spent for temporary work; $5,442.18 or 34.3% was spent for repairs; $4,668.08 or 29.3% was spent for maintenance; $1,981.84 or 12.5% was spent for equipment and unused material; $477.27 or 3.0% was spent for miscellaneous work. No roads were built to permanent grade. One mile was built to temporary grade at a cost of $980.00. There was no surfacing work done. Thirty-two and three fourths miles were built to natural grade at a cost of $2,332.19.

The county road system was dragged an average of twenty-seven times, the average cost of dragging being $1.00 per mile one round trip. The average cost of repairs and maintenance was $60.54 per mile of county road. The total average expenditure per mile of county road was $95.10.

The total township road expenditure as shown by reports from all of the sixteen townships was $26,175.84.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $66,134.70 of which $17,316.11 or 26.2% was spent on permanent bridges and culverts; $24,773.15 or 37.5% was spent on temporary bridges and culverts, $6,586.32 or 10.0% was spent on repair work, $2,041.96 or 3.1% was spent on equipment and materials, $12,804.27 or 19.3% was spent on filling bridges and culverts and $2,612.89 or 3.9% was spent on miscellaneous items.

Of the total amount $42,089.26 spent for new bridges and culverts $17,316.11 or 41.1% was spent for permanent work, $24,773.15 or 58.9% was spent for temporary work. The amounts above referred to were spent on the following construction:

17 concrete box culverts costing $11,992.11; 322 corrugated pipe culverts costing $9,692.33; 4 boiler pipe culverts costing $166.20; 96 cast iron pipe culverts costing $9,171.50; 3 I-beam spans on concrete abutments costing $35,124.00; 18 wood pile bridges costing $5,743.12.

WEBSTER COUNTY.

Roads:

The total county road expenditure was $36,868.35 of which $16,914.65 or 45.8% was spent for permanent work; $7,806.90 or 21.2% was spent for temporary work; $3,359.28 or 9.1% was spent for repairs; $6,044.82 or 16.4% was spent for maintenance; $882.80 or 2.4% was spent for equipment and unused material; $1,859.90 or 5.1% was spent for miscellaneous work. Ten and one-fourth miles were built to permanent grade at a cost of $7,728.83. Two miles were surfaced with gravel at a cost of $1,824.95. One hundred fifty-four miles were built to natural grade at a cost of $7,806.90. $7,361.79 was spent for drainage.

The county road system was dragged an average of 32.8 times, the average cost of dragging being $1.00 per mile one round trip. The average cost of repairs and maintenance was $51.95 per mile of county road. The total average expenditure per mile of county road was $203.60.

The total township road expenditure as shown by reports from all of the twenty-four townships was $53,554.07.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $37,674.89 of which $16,595.02 or 44.0% was spent on permanent bridges and culverts. $12,926.78 or 34.4% was spent on temporary bridges and culverts, $6,021.07 or 16.0% was spent on repair work, $348.64 or 0.9% was spent on equipment and materials, $1,402.50 or 3.7% was spent on filling bridges and culverts, and $380.88 or 1.0% was spent on miscellaneous items.

Of the total amount $29,521.80 spent for new bridges and culverts, $16,595.02 or 56.2% was spent for permanent work, $12,926.78 or 43.8% was spent for temporary work. The amounts above referred to were spent on the following construction:

15 concrete box culverts costing $3,853.72; 16 circular concrete culverts costing $1,100.60; 605 corrugated pipe culverts costing $8,647.97; 1 cast iron pipe culvert costing $36.00; 2 concrete slab bridges costing $1,865.85; one concrete thru girder bridge costing $1,357.05; 8 I-beam spans on piling abutments costing $2,842.57; 4 I-beam spans on concrete abutments costing $4,851.10; 1 pony truss span with concrete abutments and floor costing $3,567.30; 2 wood pile bridges costing $322.63; miscellaneous bridges and culverts costing $77.61.

WINNEBAGO COUNTY.

Roads:

The total county road expenditure was $25,330.10, of which $4,168.41 or 16.4% was spent for permanent work; $6,614.65 or 26.1% was spent for temporary work; $2,835.82 or 11.4% was spent for repairs; $2,400 or 9.4% was spent for maintenance; $3,279.41 or 12.9% was spent for equipment and unused material; $6,031.81 or 23.8% was spent for miscellaneous work. Five-tenths mile was built to permanent grade at a cost of $688.52. There were no roads built to temporary grade and no surfacing work done. Thirty-nine miles were built to natural grade at a cost of $4,092.30; $3,479.89 was spent for tile drainage.

The county road system was dragged an average of 25 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $40.64 per mile of county road. The total average expenditure per mile of county road was $196.40.

The total township road expenditure as indicated by reports from 11 of the 12 townships was $35,689.00.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $27,918.89, of which $7,210.85 or 25.8% was spent on permanent

bridges and culverts; $7,919.58 or 28.4% was spent on temporary bridges and culverts; $2,112.26 or 7.5% was spent on repair work; $871.78 or 3.1% was spent on equipment and materials; $9,894.42 or 35.2% was spent on filling bridges and culverts.

Of the total amount $15,130.43 spent for new bridges and culverts, $7,210.85 or 47.7% was spent for permanent work; $7,915.58 or 52.3% was spent for temporary work. The amounts above referred to were spent on the following construction:

70 concrete box culverts costing $4,830.85; 1 circular concrete culvert costing $88.00; 371 corrugated pipe culverts costing $6,861.82; 1 concrete deck girder bridge costing $660.00; 2 I-beam spans on concrete abutments costing $1,632; 4 wood pile bridges costing $813.35 and miscellaneous bridges and culverts costing $244.40.

WINNESHIEK COUNTY.

Roads:

The total county road expenditure was $37,214.30, of which $20,563.65 or 55.3% was spent for temporary work; $8,645.30 or 23.2% was spent for repairs; $4,905.55 or 13.2% was spent for maintenance; $1,980.39 or 5.3% was spent for equipment and unused material; $1,119.41 or 3.0% was spent for miscellaneous work. There was no permanent grading and no surfacing work done. Ninety-six miles were built to natural grade at a cost of $19,611.88.

The county road system was dragged an average of 24 times, the average cost of dragging being $0.80 per mile one round trip. The average cost of repairs and maintenance was $66.98 per mile of county road. The total average expenditure per mile of county road was $184.20.

No reports of township work or expenditures were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $86,009.00, of which $48,180.26 or 5.6% was spent on permanent bridges and culverts; $7,909.54 or 9.2% was spent on temporary bridges and culverts; $18,889.08 or 22.0 was spent on repair work; $4,559.87 or 5.3% was spent on equipment and materials; $2,299.49 or 2.7% was spent on filling bridges and culverts and $4,170.76 or 4.8% was spent on miscellaneous items.

Of the total amount $56,089.80 spent for new bridges and culverts, $48,180.26 or 85.9% was spent for permanent work; $7,909.54 or 14.1% was spent for temporary work. The amounts above referred to were spent on the following construction:

79 concrete box culverts costing $18,760.62; 26 circular concrete culverts costing $3,197.12; 289 corrugated pipe culverts costing $4,801.08; 20 masonry box culverts costing $3,981.54; 13 concrete abutments costing $7,203.45; 1 retaining wall costing $614.28; 2 masonry abutments costing $2,971.35; 2 I-beam spans on piling abutments costing $1,117.31; 8 I-beam spans on concrete abutments costing $11,451.90; 1 wood pile bridge costing $194.72 and miscellaneous bridges and culverts costing $1,886.43.

WOODBURY COUNTY.

Roads:

The total county road expenditures were $38,250.49 of which $13,496.28 or 35.1% was spent for permanent work; $6,597.71 or 17.3% was spent for temporary work; $7,277.93 or 19.1% was spent for repairs; $6,158.16 or 16.1% was spent for maintenance; $2,058.46 or 5.4% was spent for equipment and unused material; $2,751.95 or 7.2% was spent for miscellaneous work. One and one-half miles were built to a permanent grade at a cost of $4,143.66. Four and one-fourth miles were built to temporary grade at a cost of $9,262.62. There was no surfacing work done. The mileage of roads built to natural grade was not reported but $6,597.71 was spent on this work.

The county road system was dragged an average of fifty-seven times, the average cost of dragging being $0.49 per mile one round trip. The average cost of repairs and maintenance was $63.08 per mile of county road. The total average expenditure per mile of county road was $179.60.

No reports of township work or expenditures were received.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $77,746.76 of which $34,223.12 or 44.0% was spent on permanent bridges and culverts; $4,440.47 or 5.7% was spent on temporary bridges and culverts; $33,796.54 or 43.5% was spent on repair work; $1,139.40 or 1.5% was spent on equipment and materials; $2,956.43 or 3.8% was spent on filling bridges and culverts and $1,190.80 or 1.5% was spent on miscellaneous items.

Of the total amount $38,663.59 spent for new bridges and culverts $34,223.12 or 88.5% was spent for permanent work, $4,440.47 or 11.5% was spent for temporary work. The amounts above referred to were spent on the following construction:

32 concrete box culverts $22,030.14; 55 concrete pipe culverts costing $2,425.48; 1 corrugated pipe culvert costing $69.60; 78 headwalls on culverts costing $8,899.27; 1 concrete slab bridge costing $1,100.00; 2 I-beam spans on piling abutments costing $560.28; 1 I-beam span on concrete abutments costing $300.00; 2 pony truss spans with concrete abutments and floor costing $1,893.71; 9 wood pile bridges costing $1,180.98; miscellaneous bridges and culverts costing $294.13.

WORTH COUNTY.

Roads:

The total county road expenditure was $21,177.75 of which $5,366.53 or 25.3% was spent for permanent work; $3,562.95 or 16.8% was spent for temporary work; $6,805.56 or 32.1% was spent for repairs; $1,088.62 or 5.2% was spent for maintenance; $4,004.09 or 18.9% was spent for equipment and unused material; $350.00 or 1.7%

was spent for miscellaneous work. There were no roads built to permanent or temporary grades and no surfacing work reported.

The county road system was dragged an average of fourteen times, the average cost of dragging being $0.76 per mile one round trip. The average cost of repairs and maintenance was $68.94 per mile of county road. The total average expenditure per mile of county road was $184.10.

The total county road expenditure as shown by reports from eleven of thirteen townships was $22,425.00.

Bridges:

The total expenditure for bridge and culvert work for 1916 was $19,368.35 of which $15,175.20 or 78.4% was spent on permanent bridges and culverts, $2,256.85 or 11.7% was spent on temporary bridges and culverts, $1,893.20 or 9.7% was spent on repair work and $43.10 or 0.2% was spent on miscellaneous items.

Of the total amount $17,432.05 spent for new bridges and culverts, $15,175.20 or 87.0% was spent for permanent work, $2,256.85 or 13.0% was spent for temporary work. The amounts above referred to were spent on the following construction:

101 concrete box culverts costing $15,144.45; 168 corrugated pipe culverts costing $2,256.85; 1 headwall on culvert costing $30.75.

WRIGHT COUNTY.

Roads:

The total county road expenditure was $53,535.58, of which $25,833.30 or 48.2% was spent for permanent work; $6,077.02 or 11.4% was spent for temporary work; $11,538.33 or 21.5% was spent for repairs; $3,240.25 or 6.1% was spent for maintenance; $1,928.42 or 3.6% was spent for equipment and unused material; $4,918.26 or 9.2% was spent for miscellaneous work. Seven miles were built to permanent grade at a cost of $3,551.30. Thirty-four miles were surfaced with gravel at a cost of $18,063.19. Sixty miles were built to natural grade at a cost of $6,077.02; $4,218.81 was spent for tile drainage.

The county road system was dragged an average of 24.7 times, the average cost of dragging being $0.75 per mile one round trip. The average cost of repairs and maintenance was $85.17 per mile of county road. The total average expenditure per mile of county road was $307.60.

The total township road expenditure as shown by reports from all of the eighteen townships was $49,638.85.

Bridges:

The total expenditure for bridge and culvert work during 1916 was $62,549.20, of which $44,277.81 or 70.8% was spent on permanent bridges and culverts; $7,296.49 or 11.7% was spent on temporary bridges and culverts; $6,655.84 or 10.6% was spent on repair work; $1,145.15 or 1.8% was spent on equipment and materials; $2,167.76

or 3.5% was spent on filling bridges and culverts, and $1,006.15 or 1.6% was spent on miscellaneous items.

Of the total amount $51,574.30 spent for new bridges and culverts $44,277.81 or 85.9% was spent for permanent work, $7,296.49 or 14.1% was spent for temporary work. The amounts above referred to were spent on the following construction:

39 concrete box culverts costing $17,631.74; 1 concrete arch culvert costing $640.00; 398 corrugated pipe culverts costing $7,100.91; 1 concrete abutment costing $1,875.00; 1 deck girder bridge costing $2,489.00; 7 I-beam spans on concrete abutments costing $9,019.07; 3 pony truss spans with concrete abutments and floor costing $3,778.00; 1 high steel truss on concrete abutments costing $5,422.50; 1 deck truss on concrete abutments costing $4,422.50; miscellaneous bridges and culverts costing $195.58.

SUMMARY TABLE NO. 1.

Amount Spent for Bridge and Road Work.—All County Funds.—Annual Reports of County Engineers.

County	Bridges and Culverts					Roads				Total bridge and road expenditures
	Bridge fund	Motor vehicle fund	Road fund	All other sources	Total	County road cash fund	Motor vehicle fund	All other sources	Total	
Adair	$ 37,342.18	$ 6,876.19	$ 13,115.61	$ 19,339.08	$ 76,673.06	$ 4,732.31	$ 10,168.47		$ 14,900.78	$ 91,573.84
Adams	28,815.98	8,212.83	3,361.68		40,390.49	11,719.14	2,008.30		13,727.44	54,117.93
Allamakee	72,362.75	1,437.12	789.00		74,588.87	11,734.24	12,070.31		23,804.55	98,393.42
Appanoose	39,292.16	14,700.64	7,677.56		61,670.36	14,000.73			14,000.73	75,671.09
Audubon	44,874.48	1,836.96	5,304.90	59.73	52,076.07	10,962.75	5,013.04		15,975.79	68,051.86
Benton	88,855.99		11,655.73		100,511.72	25,153.02			25,153.02	125,664.74
Black Hawk	35,303.08	18,845.36	528.13	4,256.93	58,933.50	27,787.44			27,787.44	86,720.94
Boone	56,553.87	2,082.40	2,498.42		61,134.69	19,680.41	11,363.05		31,043.46	92,178.15
Bremer	49,002.08		1,103.19		50,105.27	25,156.02	1,241.50	180.00	26,577.52	76,682.79
Buchanan	68,782.74		722.26		69,505.00	25,068.59	14,225.33		39,293.92	108,798.92
Buena Vista	142,514.84		64.00		142,578.84	92,222.78	16,222.73		108,445.51	251,024.35
Butler	54,600.90	10,933.40	2,306.62		67,840.92	42,096.74	1,934.56		44,031.30	111,872.22
Calhoun	57,146.35		1,419.99		58,566.34	62,079.02	10,226.89	444.67	72,750.58	131,316.92
Carroll	41,131.28	17,580.30	2,681.15		61,392.73	35,509.52		277.40	35,786.92	97,179.65
Cass	52,542.09	18,551.04	4,430.85		75,523.98	16,818.65			16,818.65	92,342.63
Cedar	45,418.64			27,441.54	72,860.18	28,361.31		102.55	28,462.86	101,323.04
Cerro Gordo	47,046.57				47,046.57	53,295.32	13,056.68		66,352.00	113,398.57
Cherokee	111,060.75	1,668.56	4,819.00		117,548.31	41,524.45			41,524.45	159,072.76
Chickasaw	78,734.55	2,816.21	825.76		82,376.52	22,991.48	6,654.35		29,645.83	112,022.35
Clarke	36,328.12	2,959.34	18,668.89		57,956.35	6,671.13	5,281.00		11,952.13	69,908.48
Clay	91,187.38	329.82	865.38	.44	92,383.02	46,511.32	15,055.51	733.61	62,300.44	154,683.46
Clayton	43,955.14	4,904.20	7,617.97		56,477.31	15,327.54	12,838.81		28,166.35	84,643.66
Clinton	57,977.50	15,976.97	678.49		74,632.96	22,396.61			22,396.61	97,029.57
Crawford	126,944.14		1,976.56		128,920.70	81,532.32	8,348.48	650.00	90,530.80	219,451.50
Dallas	116,750.78	10,000.00	2,710.17		129,460.95	34,733.57	4,100.00	1,880.38	40,713.95	170,174.90
Davis	39,811.73	5,524.89	4,313.10		49,649.72	9,449.81	6,543.97		15,993.78	65,643.50
Decatur	25,080.63	12,273.73	7,448.32		44,802.68	10,154.16	2,812.73		12,966.89	57,769.57
Delaware	49,116.71	9,022.31	1,461.69		59,600.71	45,772.35	5,696.32		51,468.67	111,069.38
Des Moines	73,068.42	7,891.85	1,614.80		82,575.07	13,697.92	3,392.86		17,090.78	99,665.85
Dickinson	35,372.03		2,681.61	325.14	38,378.78	55,619.99			55,619.99	93,998.77
Dubuque	131,350.69	202.15	2,062.27	4,181.32	137,796.43	67,708.29	898.91		68,607.20	206,403.63
Emmet	34,869.11	2,852.98	3,606.57		41,328.66	68,058.53	2,044.20		70,102.73	111,431.39
Fayette	131,308.70			2,566.99	133,875.69	29,582.90			29,582.90	163,458.59
Floyd	75,831.08	4,811.93	5,834.16		86,477.17	12,960.37	6,186.78		19,147.15	105,624.32
Franklin	53,344.49		2,492.69		55,837.18	44,170.05			44,170.05	100,007.23
Fremont	61,013.30	901.00	2,611.45		64,525.75	15,861.46	1,724.74		17,586.20	82,111.95
Greene	39,078.97		177.26	521.21	39,777.44	35,440.20		955.87	36,396.07	76,173.51
Grundy	53,015.56	11,430.46	70.10		64,516.12	29,313.57			29,313.57	93,829.69
Guthrie	38,673.73	9,615.47	4,504.91		52,794.11	17,517.06	6,938.14	56.91	24,512.11	77,306.22
Hancock	27,016.86		988.00		28,004.86	25,595.92	14,349.11		39,945.03	67,949.89
Hamilton	93,841.22	284.06	904.42	99.40	95,129.10	53,338.47			53,338.47	148,467.57
Hardin	53,231.10		2,875.44	2,650.85	58,757.39	31,434.57	4,605.09	862.12	36,901.78	95,659.17
Harrison	165,258.65	11,242.00			176,500.65	31,411.56	3,622.59		35,034.15	211,534.80
Henry	18,318.11	4,827.00	6,604.51		29,749.62	18,170.30	1,557.00		19,727.30	49,476.92
Howard	39,226.65	14,115.52	6,728.91		60,071.08	24,978.60			24,978.60	85,049.68
Humboldt	46,235.32				46,235.32	27,383.52	1,158.27		28,541.79	74,777.11
Ida	42,469.57	4,988.19	9,310.96		56,768.72	14,461.16	395.15	29.25	14,885.56	71,654.28
Iowa	61,704.88	13,577.40	2,003.09		77,285.37	35,648.48	268.16		35,916.64	113,202.01
Jackson	44,183.21	10,042.20	1,049.89		55,275.30	23,658.75	2,221.50		25,880.25	81,155.55
Jasper	88,310.14		8,240.44		96,550.58	37,176.30	22,192.00		59,368.30	155,918.88
Jefferson	69,017.35	4,050.99	13,101.35		86,169.69	30,117.35	6,390.10	2.05	36,509.50	122,679.19
Johnson	59,539.94	4,493.61	5,619.37		69,652.92	16,418.52	12,777.42	3,806.37	33,002.31	102,655.23
Jones	50,503.68	5,406.17	387.50		56,297.35	19,222.49	6,571.45		25,793.94	82,091.29
Keokuk	58,602.15	2,715.22	35.60	4,156.65	65,509.62	34,967.12	4,726.38	206.50	39,900.00	105,409.62
Kossuth	98,418.83		36.00		98,454.83	40,126.22	15,329.46		55,455.68	153,910.51
Lee	39,410.56	11,993.69	350.83		51,755.08	19,122.89	5,132.35		24,255.24	76,010.32
Linn	46,570.44		25,522.35		72,092.79	81,095.76			81,095.76	153,188.55
Louisa	56,431.99	2,846.16			59,278.15	20,654.99			20,654.99	79,933.14
Lucas	35,028.11		4,453.06		39,481.17	12,573.91			12,573.91	52,055.08
Lyon	41,555.52	11,857.22	2,598.87		56,011.62	25,699.86	3,288.84		28,988.70	85,000.32
Madison	26,228.03	8,845.31	8,954.21		44,028.55	15,776.84	2,705.34	913.62	19,395.80	63,424.35
Mahaska	83,882.62	2,000.00	2,854.60		88,737.22	25,310.01	14,308.93		39,618.94	128,356.16
Marion	128,197.68		17,989.71		146,187.39	35,118.26			35,118.26	181,305.65
Marshall	125,266.38		7,058.42		132,324.80	18,277.34	4,955.95		23,233.29	155,558.09
Mills	56,972.03		2,319.66		59,291.69	17,504.75			17,504.75	76,796.44
Mitchell	50,098.78	7,403.34			57,502.12	13,559.22	8,237.63		21,796.85	79,298.97
Monona	62,422.05		9,998.62		72,420.67	9,002.70	9,362.68		18,365.38	90,786.05
Monroe	25,022.82	10,695.43	18,278.32		53,996.57	19,212.50			19,212.50	73,209.07
Montgomery	40,913.54	8,749.21	3,900.21		53,562.96	16,377.65	4,516.12		20,893.77	74,456.73
Muscatine	44,196.52	1,707.17	470.50		46,374.19	26,177.03	8,349.44	890.75	35,417.22	81,791.41
O'Brien	58,961.47	1,361.30	235.70		60,558.47	24,231.68	10,785.89		35,017.57	95,576.04
Osceola	50,095.34	2,606.08	2,048.91		54,750.33	17,341.38	3,510.29		20,851.67	75,602.00
Page	65,339.04	5,411.31	12,988.62		83,738.97	26,880.18	5,256.81	22.66	32,159.65	115,898.62

SUMMARY TABLE NO. 1.—Continued.

County	Bridges and Culverts					Roads				
	Bridge fund	Motor vehicle fund	Road fund	All other sources	Tot	County road cash fund	Motor vehicle fund	All other sources	Total	Total bridge and road expenditures
Palo Alto	81,190.50		-319.75		81,510.25	29,286.21			29,286.21	110,806.46
Plymouth	84,371.30	19,390.85	1,437.66		105,429.01	24,991.34	21.00	7.84	25,020.18	130,450.19
Pocahontas	68,075.64		507.84		68,583.48	56,188.82			56,188.82	124,772.30
Polk	72,004.42	9,925.56	4,722.14		86,652.12	35,080.08	6,727.49	1,180.00	42,987.57	129,639.69
Pottawattamie	145,324.32		14,513.87		159,838.19	58,846.01			58,846.01	218,684.20
Poweshiek	94,538.19	10,986.20	7,158.95		112,683.34	20,137.36	6,782.99		26,920.35	139,603.69
Ringgold	37,805.67	1,042.77	5,771.78		45,220.22	11,729.00			11,729.00	56,949.22
Sac	76,505.85	237.50	89.55		76,832.90	38,123.07	8,031.25		46,154.82	122,987.72
Scott	35,133.08		585.31		35,718.39	17,199.07	21,874.22		39,073.29	74,791.68
Shelby	56,015.86	26,010.45	6,453.45		88,479.76	17,081.23			17,081.23	105,560.99
Sioux	45,581.87	28,353.15	680.19		74,615.21	18,236.58		80.00	18,316.58	92,931.79
Story	57,940.37	10,120.05	1,739.70		69,800.12	53,643.74			53,643.74	123,443.86
Tama	160,686.35		1,214.00	2,943.15	164,843.50	47,872.65		443.50	48,316.15	213,159.15
Taylor	50,286.86	12,210.68	11,531.01		74,028.55	13,185.71	2,167.12		15,352.83	89,381.38
Union	27,115.11	10,270.40	2,988.22		40,373.73	10,142.25	12.60		10,154.85	50,528.58
Van Buren	54,516.49	15,203.45	545.12		70,265.06	18,889.47	2,824.67		21,714.14	91,979.20
Wapello	71,304.78	13,588.11			84,892.89	26,385.75	996.79		27,382.54	112,275.43
Warren	79,172.47		15,117.40		94,289.87	19,059.34			19,059.34	104,349.21
Washington	57,304.42	44.50	1,472.16		58,821.08	21,316.14	11,104.94		32,421.08	91,242.16
Wayne	45,505.39	7,584.91	12,904.27	50.17	66,134.70	9,012.43	6,869.13		15,881.56	82,016.26
Webster	36,621.14		117.50	936.25	37,674.89	21,134.71	15,733.64		36,868.35	74,543.24
Winnebago	11,954.91	3,751.05	12,212.16		27,918.89	25,330.10			25,330.10	55,248.99
Winneshiek	39,104.87	25,479.07	1,425.06		86,009.00	34,826.94	2,387.36		37,214.30	123,223.30
Woodbury	73,582.20		4,164.56		77,746.76	38,250.49			38,250.49	115,997.25
Worth	19,368.35				19,368.35	21,177.75			21,177.75	40,546.10
Wright	62,549.20				62,549.20	58,535.58			58,535.58	69,084.78
Totals	$6,130,409.81	$550,166.57	$422,171.82	$ 60,497.81	$7,172,246.02	$2,814,146.88	$448,125.89	$ 13,753.02	$3,276,025.71	$10,388,461.59

SUMMARY TABLE NO. 2.

Bridge and Culvert Construction—County Expenditures.—Annual Reports of County Engineers.

County	Permanent bridges and culverts	Temporary bridges and culverts	Repairs	Equipment and material	Filling bridges and culverts	Miscellaneous right of way, channel changes etc.	Total
Adair	$ 41,497.98	$ 218.86	$ 6,478.21	$ 15,162.40	$ 13,115.61		$ 76,473.05
Adams	17,839.82	13,002.36	6,150.07	16.63	3,367.68	$ 29.00	40,390.40
Allamakee	33,543.27	3,009.31	36,405.22	167.39	481.66	924.92	74,588.87
Appanoose	27,002.16	15,007.61	10,947.30		8,421.29	302.40	61,670.38
Audubon	5,376.39	29,787.91	5,116.74	6,070.20	4,774.96	941.57	52,006.07
Benton	70,642.63	4,425.62	11,756.33	155.07	11,789.57	1,707.40	100,511.72
Black Hawk	28,504.39	13,602.61	12,247.19	2,737.47	617.88	223.96	58,052.50
Boone	41,011.11	5,196.86	9,770.91	2,315.65	2,841.66		61,134.09
Bremer	32,826.97	4,604.90	4,018.77	5,602.50	1,163.19	348.94	50,106.27
Buchanan	59,404.74	6,669.27	2,623.82	100.00	722.26	394.91	69,705.60
Buena Vista	88,312.38	24,790.25	1,866.99	17,277.77	2,002.95	8,233.52	142,578.84
Butler	19,318.98	4,009.98	29,520.41	12,024.03	2,306.62		67,840.92
Calhoun	34,188.57	14,607.32	2,697.74	7,088.85	1,679.81	164.95	58,596.34
Carroll	35,286.78	11,744.65	8,464.77	2,791.98	2,827.65	276.90	61,705.73
Cass	34,265.58	20,707.29	11,608.14	1,876.56	4,430.85	2,545.57	75,325.06
Cedar	57,292.70	4,663.42	9,087.14	2.75	946.60	809.57	72,800.18
Cerro Gordo	31,233.85	5,885.88	3,479.91	4,009.61	375.45	2,001.87	47,069.57
Cherokee	86,672.15	12,400.65	6,550.97	2,487.59	2,322.36	7,914.79	117,348.37
Chickasaw	59,080.32	8,381.86	16,602.09	928.99	702.25	230.01	85,370.58
Clarke	17,406.96	12,026.81	9,006.67	150.47	18,008.80	6.35	[illegible]
Clay	73,405.02	8,088.11	7,073.41	1,281.20	1,020.40	804.79	[illegible]
Clayton	40,258.54	6,441.00	3,851.37	328.86	1,279.44	4,118.10	56,477.31
Clinton	47,963.77	14,155.00	3,023.75	5,530.15	2,050.50	1,919.79	74,625.93
Crawford	70,051.62	21,698.91	32,440.42		2,942.54	1,877.21	128,028.70
Dallas	91,058.08	9,983.62	15,544.65	1,659.46	5,556.43	5,064.71	129,469.56
Davis	21,720.93	8,639.44	3,059.48	99.71	4,870.36	10,679.80	40,649.72
Decatur	12,952.29	8,371.07	11,488.91	3,732.66	7,448.33	600.02	44,005.68
Delaware	41,114.93	7,900.39	5,730.08	1,742.03	1,392.66	1,640.87	58,600.91
Des Moines	12,840.14	12,470.94	2,367.78	1,508.55	256.25	3,331.41	42,773.07
Dickinson	28,984.74	7,523.89	496.82	845.22		328.06	38,378.78
Dubuque	85,369.95	16,944.67	24,356.30		10,306.48	780.03	137,790.43

SUMMARY TABLE NO. 2.—Continued.

County	Permanent bridges and culverts	Temporary bridges and culverts	Repairs	Equipment and material	Filling bridges and culverts	Miscellaneous right of way, channel changes etc.	Total
Emmet	29,008.08	6,609.03	2,021.23	1,673.87	42.50	1,823.95	41,228.63
Fayette	105,065.44	7,701.65	15,265.98	2,464.23	1,316.40	1,371.99	133,875.69
Floyd	49,089.39	7,140.88	14,410.01	3,791.37	6,251.81	5,793.71	86,477.17
Franklin	30,911.86	9,006.01	7,986.84	4,477.70	2,739.77	115.00	55,837.18
Fremont	21,541.23	16,085.87	10,747.17	9,750.25	2,611.45	3,789.78	64,525.73
Greene	26,963.45	1,678.44	7,151.59	2,351.09	177.26	1,465.63	39,777.44
Grundy	46,626.90	6,034.60	2,657.05	68.75	2,142.39	6,986.43	64,516.12
Guthrie	19,643.13	12,600.10	12,631.14	2,664.59	4,006.22	138.93	52,794.11
Hamilton	71,970.43	15,297.87	4,470.84	2,210.14	904.42	275.40	95,129.10
Hancock	17,486.10	6,883.32	2,458.11	925.00	67.50	184.83	28,004.86
Hardin	39,841.99	1,085.25	7,749.99	6,154.53	2,875.44	1,050.19	58,757.39
Harrison	57,079.60	56,715.97	36,410.11	4,023.12	1,271.37	21,000.48	176,500.65
Henry	17,139.24	5,379.44	3,522.96	2,422.91	1,285.07		29,749.62
Howard	31,729.81	14,366.26	2,700.92	3,774.18	6,728.91	544.00	60,071.08
Humboldt	34,877.33	6,610.30	1,420.83	2,302.86	299.50	384.50	46,225.32
Ida	22,781.67	12,965.56	14,791.43	316.87	3,751.74	2,161.76	56,768.72
Iowa	43,237.29	10,455.80	14,880.00	5,472.52	1,562.34	1,646.42	77,285.37
Jackson	23,462.87	12,651.00	16,930.56		1,307.02	923.85	55,275.30
Jasper	47,987.11	22,132.96	16,045.65		8,240.44	2,144.47	96,550.38
Jefferson	37,976.35	22,223.28	5,806.31	5,037.01	13,101.35	1,045.39	85,189.69
Johnson	37,828.45	14,656.31	7,089.34	5,001.46	5,022.36	55.00	69,652.92
Jones	29,623.82	5,904.91	7,911.29	10,451.17	963.61	1,342.55	56,297.35
Keokuk	34,719.38	12,044.50	12,800.26	1,653.48	4,155.65	226.35	65,599.62
Kossuth	58,372.33	15,465.86	20,682.27		1,442.25	2,402.02	98,404.73
Lee	35,748.35	2,623.58	9,458.71	2,243.57	435.96	744.91	51,735.08
Linn	54,022.12	6,721.32	8,858.43	1,300.00	746.25	244.47	72,092.79
Louisa	34,396.68	7,713.09	11,447.20	1,223.39	619.49	3,938.17	59,278.15
Lucas	20,123.73	10,684.29	2,806.90	172.27	4,452.00	1,240.93	39,481.17
Lyon	33,783.97	8,131.16	3,840.11	7,080.80	2,598.87	576.65	56,011.62
Madison	12,502.70	9,297.72	13,800.62	2,204.10	5,602.30	1,030.97	44,038.58
Mahaska	40,741.04	23,970.79	9,023.29	7,092.82	4,830.52	2,475.76	88,737.72
Marion	108,962.03	14,045.54	9,907.89	56.94	17,930.40	1,305.61	146,187.39

County	Permanent bridges and culverts	Temporary bridges and culverts	Repairs	Equipment and material	Filling bridges and culverts	Miscellaneous right of way, channel changes etc.	Total
Marshall	90,069.24	12,587.39	10,030.39	3,804.05	9,248.94	6,074.79	132,394.89
Mills	17,909.13	18,132.70	11,586.74	7,255.92	1,437.29	2,808.92	59,205.69
Mitchell	43,424.81	9,755.38	3,711.95	700.00			57,595.13
Monona	15,724.30	34,423.52	14,198.37	5,210.68	2,500.48	4,351.32	72,420.67
Monroe	24,885.41	12,518.25	6,984.85	2,196.44	5,174.24	2,256.42	53,996.07
Montgomery	22,343.95	12,279.67	11,801.59	1,072.00	3,800.21	1,300.54	52,597.96
Muscatine	25,600.28	22,742.17	5,603.88	906.43	702.51	708.95	56,264.19
O'Brien	46,380.02	3,819.92	6,361.56	2,414.14	439.29	283.84	60,558.47
Osceola	35,415.36	13,196.65	1,278.41	1,942.75	2,687.29	229.56	54,750.32
Page	25,752.24	19,989.36	19,881.70	1,752.03	12,308.11	3,305.33	82,758.97
Palo Alto	59,077.39	9,804.88	4,535.69	1,816.81	783.94	4,391.83	81,510.29
Plymouth	50,078.24	22,488.25	17,011.65	13,001.94	355.90	2,484.03	105,420.01
Pocahontas	50,853.30	7,752.76	6,878.58	55.85	2,386.79	56.20	68,583.48
Polk	38,504.35	11,841.15	25,108.74	2,878.94	4,001.24	3,797.70	86,632.12
Pottawattamie	49,373.30	43,235.87	30,877.69	16,819.71	18,241.24	1,000.38	159,838.19
Poweshiek	78,589.79	12,256.70	8,219.60	489.68	6,984.70	6,142.82	112,683.34
Ringgold	16,178.65	9,376.55	10,483.98	2,809.65	5,771.78	320.64	45,270.22
Sac	62,730.62	3,163.63	6,970.56	1,279.97	489.55	2,198.97	76,833.90
Scott	14,883.96	6,046.64	5,649.49	6,572.59	585.31	1,980.41	35,718.39
Shelby	26,453.75	40,010.48	14,505.58		7,173.95	249.00	88,479.70
Sioux	57,643.03	5,409.27	7,856.85	2,436.07	690.19	630.80	74,615.71
Story	54,295.12	5,325.31	7,772.34		837.58	1,369.77	69,600.12
Tama	133,902.41	14,278.66	11,780.21	811.18	3,047.37	1,062.67	164,843.60
Taylor	22,380.39	15,333.99	12,625.49	9,628.36	10,700.83	2,321.08	74,028.55
Union	23,328.03	6,004.71	4,871.39	2,337.91	2,988.22	822.67	40,372.73
Van Buren	20,030.89	21,396.60	14,367.54	12,206.30	1,898.81	476.97	70,365.06
Wapello	43,176.38	16,469.66	17,565.69	2,080.10	4,532.88	1,258.79	84,892.89
Warren	54,162.79	15,162.37	7,118.75	3,238.07	14,478.21	109.68	94,269.87
Washington	25,795.96	15,488.92	11,245.79	4,164.82	1,813.14	309.44	58,821.08
Wayne	17,316.11	24,772.15	6,396.32	2,041.96	12,804.27	2,612.89	66,134.70
Webster	16,595.02	12,926.78	6,021.07	348.64	1,402.50	380.38	37,674.89
Winnebago	7,210.85	7,919.58	2,112.26	871.79	9,804.42		27,918.89
Winneshiek	48,190.26	7,909.54	18,889.08	4,550.87	7,290.49	4,170.76	96,000.00
Woodbury	34,223.12	4,440.47	33,708.54	1,139.40	2,956.43	1,190.80	77,706.76
Worth	15,175.20	2,256.85	1,803.20			43.10	19,298.35
Wright	44,277.81	7,296.49	6,655.84	1,145.15	2,167.76	1,606.13	62,545.19
Total	$ 4,036,309.01	$ 1,222,025.37	$ 1,036,735.79	$ 318,140.67	$ 396,036.82	$ 192,410.36	$ 7,172,246.02

SUMMARY TABLE NO. 3—PART I.

Classification of Bridge and Culvert Construction for Which Warrants Were Issued in 1916.—County Expenditures.—Annual Reports of County Engineers.

County	Concrete Box Culverts		Circular Concrete Culverts		Concrete Arch Culverts		Concrete Pipe Culverts		Corrugated Pipe Culverts		Masonry Arch Culverts		Boiler Pipe Culverts	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
Adair	22	$ 11,791.27					179	$ 12,398.29	9	$ 218.86				
Adams	7	4,070.20					170	8,114.27	170	3,917.46			2	$ 349.72
Allamakee	10	2,028.01	3	$ 280.80					149	2,009.31				
Appanoose	12	6,778.76							178	3,150.68			139	9,211.76
Audubon	8	5,307.76							512	15,715.17				
Benton	163	36,706.50	23	2,233.33			49	379.42	230	2,479.13				
Black Hawk	90	18,329.72							487	5,041.73			1	14.70
Bremer			18	6,096.02	15	$ 2,134.03			256	2,681.44				
Boone	39	15,051.69	8	1,781.83					290	5,190.96				
Buchanan	95	26,741.05	3	370.60					227	6,059.27				
Buena Vista	88	28,393.18	1	146.78					900	24,033.93				
Butler	57	15,342.24							5	321.49				
Calhoun	27	12,929.76	66	7,433.49			1,021	10,772.07						
Carroll	66	29,542.38	5	476.72			20	102.56	378	8,832.31				
Cass	22	18,856.73					5	372.92	244	6,272.84			4	771.31
Cedar	179	37,143.20	7	735.38					24	471.55			119	3,590.08
Cerro Gordo	58	16,458.57	29	2,967.66					387	5,724.00				
Cherokee	99	34,412.10	19	2,803.40					427	10,578.81				
Chickasaw	58	13,685.94							308	4,827.42				
Clark	30	10,942.09							461	9,765.39				
Clay	76	22,938.44							433	8,606.62			1	61.43
Clayton	39	15,865.32							326	6,441.00	1	296.00		
Clinton	35	16,704.14							340	8,301.98			3	450.18
Crawford	104	55,770.59							329	18,155.07				
Dallas	90	35,276.90	14	1,796.10					549	9,648.42				
Davis	6	2,558.40	14	4,178.18			2	666.96	262	7,316.58			28	1,222.86
Decatur	19	11,311.60					3	155.60	305	4,892.13			1	56.00
Delaware	78	18,084.57							217	5,082.31				
Des Moines	72	3,918.14	1	141.34					280	6,203.28			2	121.43
Dickinson	84	10,150.71	18	1,427.29					286	7,323.89				
Dubuque	119	46,810.00	22	2,691.97					353	15,797.93	1	639.72		
Emmet	30	6,272.64	30	4,072.04					78	1,543.20				
Fayette	62	18,173.04							463	7,701.60				
Floyd	95	20,336.74							300	7,140.88				
Franklin	58	18,155.49	5	512.87					300	9,036.00				
Fremont	21	15,306.27					16	1,650.97	127	4,871.63			12	1,090.16
Greene	14	4,287.32	54	5,308.42			13	284.69	60	1,253.17				
Grundy	46	17,361.91							338	5,904.89				
Guthrie	30	17,076.61			1	174.63			427	19,023.39			10	1,102.06
Hamilton	38	30,179.50	18	2,834.40					820	14,533.93				
Hancock	38	11,297.45	18	2,533.54					250	5,427.32				
Hardin	78	18,010.03	71	5,540.76					30	676.10				
Harrison	72	8,855.04					32	12,235.50	173	7,344.39			1	213.16
Henry	43	9,838.73							255	5,379.44				
Howard	62	17,269.82	27	3,986.16					257	6,082.96				
Humboldt	7	3,730.42							296	6,659.30				
Ida	21	10,608.44							30	9,200.82				
Iowa	59	28,229.72							346	9,741.02				
Jackson	28	13,965.15	8	1,500.25					290	7,795.20				
Jasper	89	27,381.40							864	29,361.64			41	1,971.32
Jefferson	67	21,238.08							718	16,327.44			70	3,970.40
Johnson	94	35,465.28							763	10,374.78			2	177.91
Jones	31	9,450.33							172	3,283.75	1	535.00		
Keokuk	49	36,178.10					62	7,512.60	270	5,378.31			67	2,190.74
Kossuth	27	17,289.29	4	860.94					740	10,191.69				
Lee	62	17,101.99	49	4,973.00					25	620.92			119	3,097.06
Linn	113	38,427.30	2	249.73					303	6,156.33			3	44.50
Louisa	39	24,609.41	14	2,244.15			10	206.60	400	7,447.47			2	295.67
Lucas	41	15,715.58					30	1,855.59	410	9,077.14			3	792.10
Lyon	94	29,146.82							280	7,388.04				
Madison	23	9,187.51							248	6,820.35	1	185.50	9	*1,393.19
Mahaska	23	14,722.11					22	1,351.20	400	11,558.09			68	3,393.42
Marion	117	54,403.24	1	140.25					413	11,880.85				
Marshall	64	39,325.70			2	533.81			500	12,427.49			1	79.90
Mills	10	6,130.55					24	1,670.27	94	5,281.26			6	718.00
Mitchell	115	23,879.63							435	9,755.30				
Monona	12	11,066.67	2	372.59					204	7,286.64			1	72.40
Monroe	30	11,529.54					56	2,340.00	444	9,728.14	8	3,163.77	28	303.31
Montgomery	9	5,858.29					119	4,721.24	190	3,425.96			1	270.00
Muscatine	71	20,115.08	12	1,631.74			20	987.93	305	4,303.91			143	6,331.78
O'Brien	80	29,952.70	4	296.95					191	3,819.92				
Osceola	72	28,332.34			29	2,779.47			154	3,972.23				
Page	25	19,092.37			1	3,200.00	58	3,037.32	284	6,406.10			27	2,736.[illegible]
Palo Alto	100	29,633.23	14	1,464.81					587	9,604.85				
Plymouth	42	23,180.31								5,325.17				
Pocahontas		6,986.68		642.62						1,732.76				
Polk	38	27,226.63							290	7,408.24			83	3,509.[illegible]

SUMMARY TABLE NO. 3—PART I.—Continued.

County	Concrete Box Culverts		Circular Concrete Culverts		Concrete Arch Culverts		Concrete Pipe Culverts		Corrugated Pipe Culverts		Masonry Arch Culverts		Boiler Pipe Culverts	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
Pottawattamie	8	4,878.50					151	8,096.03	174	18,005.02			30	3,411.38
Poweshiek	46	34,934.58	27	7,302.17					222	6,185.12			173	6,071.58
Ringgold	33	9,471.65							208	5,544.75				
Sac	95	29,999.57	46	2,737.83	98	6,736.99			149	2,540.02	42	1,451.12		
Scott	37	10,213.80							145	1,960.24			98	3,729.34
Shelby	39	26,010.45					7	443.30	252	11,294.79			54	3,243.41
Sioux	149	40,408.86								875.70				
Story	87	24,189.00	70	5,585.20					362	5,395.31				
Tama	95	24,163.57							205	9,272.60				
Taylor	32	14,469.96					85	2,874.75	338	8,780.42			31	2,239.40
Union	42	19,436.98	1	101.91			9	1,250.87	145	3,254.31				
Van Buren	37	15,153.33							544	12,449.77	2	993.00	48	2,908.73
Wapello	19	14,612.68					12	3,183.77	751	14,575.70			1	705.89
Warren	46	23,241.40	70	8,016.06					210	4,582.53				
Washington	31	15,491.25	8	1,730.00					436	9,521.03			61	3,089.30
Wayne	17	11,992.12							392	9,092.33			4	166.20
Webster	15	3,853.72	16	1,100.00					666	8,647.97				
Winnebago	70	4,830.85	1	88.00					371	6,861.83				
Winneshiek	79	18,760.62	26	3,197.12					289	4,801.08				
Woodbury	22	22,030.14					105	2,425.48	1	69.00				
Worth	101	15,144.45							168	2,256.85				
Wright	39	17,631.74			1	640.00			398	7,100.91				
Total	5,130	$1,893,006.65	880	$105,754.11	147	$ 16,238.99	2,708	$ 89,614.24	20,486	$721,354.58	50	$7,066.71	1,566	$77,025.11

*$442.36 of this amount is permanent construction.
†Considered as temporary work.

SUMMARY TABLE NO. 3—PART II.

Classification of Bridge and Culvert Construction for Which Warrants Were Issued in 1916.—County Expenditures.—Annual Reports of County Engineers.

County	Cast Iron Pipe Culverts		Masonry Box Culverts		Head Walls on Culverts		Concrete Slab Bridges		Concrete Arch Bridges		Concrete Abutments		Concrete Thru Girders	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No	Cost	No.	Cost
Adair					176	$ 12,796.27								
Adams	8	$ 762.97			70	5,655.36								
Allamakee			4	$ 1,014.72										
Appanoose	1	91.00	1	213.95	9	1,307.25					2	$ 1,735.63		
Audubon	1	1,377.74			1	8.83								
Benton	19	553.60					8	$ 11,507.43					6	$ 8,368.89
Black Hawk														
Boone							2	2,681.04	1	$ 3,332.36				
Bremer									1	1,301.25			1	5,020.44
Buchanan							1	1,066.85			6	9,221.12		
Buena Vista	2	63.45											1	2,210.39
Butler	1	153.00			1	66.00	1	2,327.00	1	33.75				
Calhoun							6	1,979.53	1	20.00				
Carroll	7	477.33			1	275.48								
Cass					1	114.05								
Cedar	1	50.08			1	107.30	2	1,019.32			2	991.48		
Cerro Gordo											1	957.05		
Cherokee	1	64.80					4	5,171.10						
Chickasaw					1	16.76					2	990.71		
Clarke	18	2,804.19									3	494.87		
Clay									1	1,040.99	1	1,992.10		
Clayton							5	3,611.25			2	2,000.00	2	2,986.28
Clinton	15	1,590.48			3	445.83			1	2,322.00				
Crawford	20	1,732.99												
Dallas					1	142.90	10	11,558.74	2	15,066.65	4	15,116.00		
Davis					2	418.31								
Decatur	12	1,144.79			13	1,486.00								
Delaware					1	54.88	1	49.44						
Des Moines	33	1,216.48			3	151.03					4	1,415.68		
Dickinson											2	3,122.30		
Dubuque					13	3,061.88			1	6,498.00	6	9,315.20		

SUMMARY TABLE NO. 3—PART II.—Continued.

County	Cast Iron Pipe Culverts		Masonry Box Culverts		Head Walls on Culverts		Concrete Slab Bridges		Concrete Arch Bridges		Concrete Abutments		Concrete Thru Girders	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
Emmet					2	253.50			1	3,032.13				
Fayette					2	218.55	4	5,228.61	2	4,857.81	2	691.80	3	11,224.43
Floyd							3	6,842.85	1	12,597.49	2	1,161.32		
Franklin							1	948.65						
Fremont	12	861.10			6	1,164.03								
Greene					9	226.80	4	5,264.00			5	5,378.00		
Grundy							6	11,742.72						
Guthrie					9	1,239.30								
Hamilton							1	1,785.00			2	1,700.35	1	2,240.40
Hancock														
Hardin							5	5,167.03						
Harrison	2	585.67			3	586.14					2	1,466.00		
Henry							2	3,605.00			2	1,691.82		
Howard														
Humboldt							7	10,166.70			5	2,025.38	2	7,606.16
Ida							1	467.77						
Iowa	1	56.00			40	886.69					1	999.83		
Jackson					3	434.25	1	718.00						
Jasper					9	1,887.62	6	6,632.24						
Jefferson	5	327.50			9	804.16					1	1,153.94		
Johnson	1	58.50									1	1,306.90		
Jones														
Keokuk									24	382.68	9	134.74		
Kossuth							14	17,855.30	2	7,639.72	1	797.05		
Lee					19	1,866.75								
Linn											2	2,253.24		
Louisa					2	716.48								
Lucas					42	1,677.14								
Lyon														
Madison					1	13.75								
Mahaska					8	1,730.81								
Marion														
Marshall					1	46.58	8	10,716.41						
Mills					32	3,969.66								
Mitchell														

Monona	1	58.30			8	311.13								
Monroe	17	739.75			3	283.07					1	578.50		
Montgomery					50	6,212.07								
Muscatine	22	1,454.68			2	206.43								
O'Brien					1	30.81	2	2,631.64						
Osceola														
Page	114	7,759.56			1	362.35								
Palo Alto							6	6,117.40			1	1,486.80		
Plymouth						55.02	6	12,618.44	1	7,993.51	1	6,041.57		
Pocahontas							1	604.23						
Polk	1	32.20			1	304.42	2	1,488.30	1	4,947.00			2	4,253.00
Pottawattamie	1	443.35			186	13,002.59								
Poweshiek					2	148.50	1	1,416.89						
Ringgold					16	880.00								
Sac														
Scott					5	401.31							1	1,646.19
Shelby														
Sioux							3	4,502.57					1	1,797.50
Story														
Tama	24	3,012.18					2	2,465.80	1	613.00				
Taylor	27	2,525.59			184	4,909.75								
Union					38	2,247.49								
Van Buren											6	3,668.81		
Wapello	3	1,859.10	5	332.41										
Warren	1	72.50												
Washington					4	302.37					2	2,097.28		
Wayne	96	9,171.50												
Webster	1	36.00					2	1,865.85					1	1,377.60
Winnebago														
Winneshiek			20	3,081.54							13	7,265.45		
Woodbury					78	8,899.27	1	1,100.00						
Worth					1	30.75								
Wright											1	875.00		
Totals	478	$ 41,088.40	30	$ 5,062.63	1,085	$ 92,250.46	128	$105,555.72	42	$ 73,907.88	90	$ 91,888.26	23	$ 45,142.30

SUMMARY TABLE NO. 3—PART III.

Classification of Bridge and Culvert Construction for Which Warrants Were Issued in 1916.—County Expenditures.—Annual Reports of County Engineers.

County	Concrete Deck Girders		Retaining Walls		Masonry Abutments		I-Beam Spans on Piling Abutments		I-Beam Spans on Concrete Abutments		Steel Girders Concrete Abutments		Pony Truss on Piling—Wood Floor	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No	Cost	No.	Cost	No.	Cost
Adair									1	$ 741.15				
Adams							1	$ 837.50						
Allamakee									3	2,330.94				
Appanoose									5	8,061.60				
Audubon														
Benton														
Black Hawk							3	3,367.83	4	8,229.06				
Boone									5	9,476.96				
Bremer			2	$ 4,747.78										
Buchanan	4	$ 15,148.26							5	6,620.85				
Buena Vista									53	50,381.13				
Butler									1	1,350.00				
Calhoun	3	1,019.54					3	530.50	1	119.85			6	$ 2,468.45
Carroll	1	400.00	1	506.98					3	2,384.98				
Cass													2	6,084.00
Cedar	2	734.61							5	5,683.82				
Cerro Gordo	3	7,341.57							2	3,609.00				
Cherokee	5	9,990.25					6	1,445.89	10	16,295.03				
Chickasaw									9	10,971.35				
Clarke														
Clay									21	28,859.12				
Clayton									11	8,861.32				
Clinton	1	4,939.58	1	208.17			1	83.25	4	6,599.55			1	3,313.72
Crawford									2	3,424.49				
Dallas	2	9,551.70												
Davis									2	2,047.12				
Decatur													2	2,488.24
Delaware			2	282.98			3	1,980.24	9	15,859.00				
Des Moines							2	307.78	2	1,387.20			4	4,609.95
Dickinson									11	14,283.44				
Dubuque									9	12,998.20				

Emmet	3	6,732.31					2	2,745.85	4	6,502.85	1	$ 80.00		
Fayette	9	18,931.47	1	1,613.19					9	17,151.46				
Floyd	4	6,096.14							1	809.80				
Franklin									1	3,691.85				
Fremont									2	3,465.98			1	1,167.80
Greene	1	2,035.00							2	2,849.00				
Grundy	1	4,541.85							1	2,313.00				
Guthrie														
Hamilton	9	21,615.12					1	341.25	5	8,924.75				
Hancock			4	134.53					1	1,341.25				
Hardin	4	8,110.43							2	387.16				
Harrison							6	2,041.58					15	29,991.07
Henry									3	2,643.09				
Howard									5	6,251.32				
Humboldt	2	1,935.83							4	6,258.06				
Ida	1	413.40					6	3,764.73	2	4,304.43				
Iowa			4	1,279.98					7	9,776.06			1	658.78
Jackson			1	214.12			3	1,582.25	1	1,747.00				
Jasper														
Jefferson									6	4,497.05				
Johnson									9	6,645.59				
Jones									8	12,875.09				
Keokuk					1	$ 311.76							4	964.19
Kossuth	11	13,960.02												
Lee									6	11,306.61				
Linn									3	4,155.00				
Louisa									6	6,000.04				
Lucas			1	358.57			1	536.85						
Lyon									1	600.00				
Madison							1	706.94	1	2,501.58				
Mahaska	1	3,609.52					26	9,017.21	4	5,711.39				
Marion							4	2,187.24	18	24,014.45			2	424.33
Marshall	5	29,895.79							1	392.83				
Mills									3	6,199.31			1	2,654.06
Mitchell									9	8,913.70				
Monona	4	2,000.00					37	22,724.89						
Monroe	1	1,700.76	1	648.42					1	349.83			1	1,319.30
Montgomery			1	406.32									1	2,100.00
Muscatine														
O'Brien	1	1,582.24							3	5,735.48				
Osceola	1	9,788.00												
Page													6	2,349.21
Palo Alto									7	16,232.00				
Plymouth							2	2,634.77						
Pocahontas				226.04					9	14,764.96				
Polk			1	850.00										

SUMMARY TABLE NO. 3—PART III.—Continued.

County	Concrete Deck Girders		Retaining Walls		Masonry Abutments		Abutments I-Beam Spans on Piling		I-Beam Spans on Concrete Abutments		Steel Girders Concrete Abutments		Pony Truss on Piling—Wood Floor	
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost
Pottawattamie									2	2,200.94	1	5,749.44	6	7,605.43
Poweshiek									13	15,304.08	1	871.85		
Ringgold									3	3,821.00				
Sac							2	225.25	6	5,650.06				
Scott									1	2,302.65				
Shelby							1	106.24					9	17,325.82
Sioux														
Story									7	12,377.55				
Tama	2	3,363.30							17	25,060.59				
Taylor									1	1,082.93				
Union			2	291.72										
Van Buren					1	160.70	7	1,914.21					6	1,748.69
Wapello									3	7,358.48	1	7,642.47		
Warren							1	738.94	5	8,582.42				
Washington			1	298.54					3	4,741.33				
Wayne									3	5,264.09				
Webster							8	3,842.57	4	4,851.10				
Winnebago	1	660.00							2	1,602.00				
Winneshiek			1	614.28	2	2,971.35	2	1,117.31	8	11,451.99				
Woodbury							2	509.28	1	300.00				
Worth														
Wright	1	2,489.00							7	9,019.02				
Totals	70	$187,766.50	24	$ 12,858.02	4	$ 5,431.85	129	$ 65,171.45	411	$619,115.79	4	$ 13,446.76	68	$ 86,339.73

SUMMARY TABLE NO. 3—PART IV.

Classification of Bridge and Culvert Construction for Which Warrants Were Issued in 1916.—County Expenditures.—Annual Reports of County Engineers.

County	Pony Truss With Concrete Abutments and Floor		High Steel Trusses Concrete Abutments		Deck Trusses Concrete Abutments		Wood Pile Bridge		Miscellaneous Bridges and Culverts		Total Cost of Bridges and Culverts Constructed
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
Adair	1	$ 4,000.00									$ 41,916.84
Adams							68	3,133.61			30,812.00
Allamakee	2	13,616.31	3	$ 14,598.48							36,617.58
Appanoose	3	8,904.97							91	2,084.17	42,699.77
Audubon							59	12,635.00			45,104.59
Benton	4	11,596.45								41.48	71,656.96
Black Hawk	1	1,745.61					7	1,105.83	24	472.72	42,107.00
Boone	1	2,858.50	1	7,836.73							46,097.97
Bremer			1	15,877.44					2	923.46	38,431.87
Buchanan											45,464.61
Buena Vista	3	4,944.63	1	2,120.30						698.87	113,108.63
Butler									2	2,615.58	21,398.96
Calhoun	5	10,785.69								236.39	48,191.69
Carroll	1	1,639.65					10	2,418.74		193.49	47,071.43
Cass	3	14,922.58					34	7,068.32			56,822.97
Cedar	5	10,609.89							54	819.81	61,056.17
Cerro Gordo							3	161.88			37,139.70
Cherokee	6	18,040.27					3	401.15			99,102.90
Chickasaw	10	21,955.69	1	8,470.47			10	2,558.28	4	186.16	64,402.18
Clarke										27.23	30,055.77
Clay	8	19,253.45								20.05	92,095.14
Clayton	4	5,829.65									46,060.34
Clinton	5	15,001.82					5	955.49			107,109.77
Crawford	7	8,490.44					27	1,720.85	13	4,089.78	91,600.52
Dallas			2	2,509.60			1	325.00		10.20	101,045.70
Davis	1	10,851.96									30,891.52
Decatur											23,923.36
Delaware	2	5,547.64	1	1,295.42			8	1,227.64			49,[illegible]
Des Moines			1	3,464.67					9	802.02	73,311.04
Dickinson											30,768.65
Dubuque	1	2,231.29					1	135.08	2	1,031.64	107,314.02

SUMMARY TABLE NO. 3—PART IV.—Continued.

County	Pony Truss With Concrete Abutments and Floor		High Steel Trusses Concrete Abutments		Deck Trusses Concrete Abutments		Wood Pile Bridge		Miscellaneous Bridges and Culverts		Total Cost of Bridges and Culverts Constructed
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost	
Emmet	8	21,150.65	1	6,364.30						2,469.98	35,707.13
Fayette	1	1,348.00									115,367.09
Floyd	2	7,625.00									36,230.27
Franklin							2	549.41			40,317.87
Fremont							26	7,460.98			37,627.70
Greene	3	10,626.82					1	455.97			28,631.87
Grundy	1	422.53					1	120.00			32,691.50
Guthrie	1	5,185.22								123.91	32,273.23
Hamilton	1	2,179.33					2	422.69			87,208.93
Hancock	3	4,616.68					7	1,436.00			24,359.42
Hardin	1	7,441.00	3	19,128.36			1	342.93		125.55	46,027.24
Harrison							31	11,654.79		13,438.21	113,705.57
Henry	3	2,982.21									22,578.68
Howard	2	8,194.84					39	8,570.39			46,223.07
Humboldt	3	7,507.63									41,487.63
Ida	1	2,071.91									35,747.21
Iowa	2	4,824.00									53,603.09
Jackson	3	7,688.15	1	4,222.55			12	2,607.15		660.40	30,113.87
Jasper			1	10,283.12							70,120.07
Jefferson	3	4,412.68					12	1,677.88			60,109.63
Johnson	2	6,763.80					9	1,801.41		2,184.31	32,484.70
Jones							9	2,209.16			35,028.73
Keokuk							17	3,351.29			46,703.88
Kossuth							8	1,947.57		2,950.00	73,898.19
Lee	2	8,654.75									38,971.93
Linn							1	293.21		291.48	69,743.04
Louisa											42,040.77
Lucas	2	4,697.15					9	629.90		214.35	30,936.05
Lyon	1	200.00					3	312.18		230.94	41,915.13
Madison			1	12,966.13			3	709.63			31,830.42
Mahaska	7	17,718.87	2	6,864.50							64,571.83
Marion	1	4,283.72					1	142.80			117,906.25
Marshall											107,686.62
Mills							13	6,080.17		3,449.21	36,682.83
Mitchell	4	10,681.48									33,180.17
Monona										4,790.39	48,159.97
Monroe	4	4,392.92					3	365.54		38.10	37,401.66
Montgomery	2	5,985.93					18	6,343.71			84,033.69
Muscatine	1	2,719.08								51.80	68,402.45
O'Brien	2	6,140.18									50,192.94
Osceola	2	2,512.55					23	9,223.82			48,611.44
Page							2	678.34			85,771.99
Palo Alto	2	5,102.00					1	200.03			60,782.18
Plymouth							75	14,726.07		411.63	72,566.49
Pocahontas		24,388.60		2,876.60						36.51	58,666.06
Polk										871.97	90,775.50
Pottawattamie	4	15,645.84					28	12,395.51		256.99	99,809.17
Poweshiek	7	18,801.22									93,846.43
Ringgold							24	4,031.80			25,705.29
Sac	6	25,795.05					3	389.26			65,894.23
Scott	1	200.00								997.06	39,930.34
Shelby							18	5,156.20		57.55	66,464.29
Sioux	1	5,920.00	1	4,984.30			6	1,323.57			61,602.20
Story	3	12,302.37									59,930.43
Tama	8	48,306.35					2	1,859.83		131.99	148,141.07
Taylor							10	1,737.79			38,722.93
Union							7	2,760.43			35,233.64
Van Buren							34	2,991.55		708.20	41,417.49
Wapello	2	7,804.08					5	632.19		587.66	56,645.43
Warren	2	7,322.91	1	7,000.00			54	9,724.66		93.74	69,325.16
Washington							2	2,983.59		1,073.21	41,297.89
Wayne							18	5,745.13			43,080.91
Webster	1	3,907.30					2	332.63		77.61	39,261.80
Winnebago							4	813.35		244.40	15,130.43
Winneshiek							1	104.72		1,886.43	56,089.80
Woodbury	2	1,899.71					9	1,180.98		394.13	38,003.50
Worth											17,432.63
Wright	3	3,778.00	1	5,422.50	1	$ 4,422.50				195.58	51,574.39
Totals	180	$ 545,555.91	23	$ 139,981.99	1	$ 4,422.50	773	$ 180,402.27		$ 54,834.40	$ 5,248,322.18

SUMMARY TABLE NO. 4.

Repairs to Bridges and Culverts.—County Expenditures.—Annual Reports of County Engineers.

County	Wooden bridges and culverts	Steel bridges and culverts	Permanent bridges and culverts	Miscellaneous	Total
Adair	$ 6,220.83		$ 257.38		$ 6,478.21
Adams	4,861.11	$ 928.81	300.15		6,130.07
Allamakee	22,116.88	3,900.00	385.44		26,402.32
Appanoose	6,434.93	2,141.25	188.51	$ 2,182.62	10,947.30
Audubon	4,823.28		157.38	136.08	5,116.74
Benton	10,477.40	233.64	1,042.29		11,753.33
Black Hawk	4,986.97	6,478.31	310.14	471.77	12,247.19
Boone	5,225.16	3,236.68	1,308.17		9,770.01
Bremer	3,665.30	244.67	17.60	101.20	4,028.77
Buchanan	2,623.82				2,623.82
Buena Vista	1,131.30	732.19		38.50	1,901.99
Butler	26,425.31	2,176.75	681.65	236.70	29,520.41
Calhoun	484.57	1,523.17			2,007.74
Carroll	6,375.63	2,064.04	25.10		8,464.77
Cass	7,410.43	3,510.86	686.85		11,608.14
Cedar	9,040.64			46.50	9,087.14
Cerro Gordo	2,606.51	604.50	263.90	5.00	3,479.91
Cherokee	3,795.13	848.15	1,907.69		6,550.97
Chickasaw	15,148.99	437.61	387.86	77.63	16,052.09
Clarke	7,119.18	1,431.68	538.33	7.48	9,096.67
Clay	4,523.32	2,485.05	34.00	31.07	7,073.44
Clayton	2,920.87	264.00	666.50		3,851.37
Clinton	1,030.32	1,837.33	151.85	4.25	3,023.75
Crawford	29,491.96	2,133.10		815.36	32,440.42
Dallas	3,908.14	10,786.21		850.30	15,544.65
Davis	2,296.39	913.12	80.57	369.20	3,659.28
Decatur	7,065.37	4,386.53	39.35	8.36	11,499.61
Delaware	3,915.79	1,148.40	655.84		5,720.03
Des Moines	587.06	455.10	423.93	901.69	2,367.78
Dickinson	198.95	297.92			496.87
Dubuque	1,296.98	673.52	7,159.25	15,236.35	24,366.10
Emmet	530.48	689.85	36.00	764.90	2,021.23
Fayette	9,265.60	2,975.00	1,008.32	2,107.06	15,355.98
Floyd	8,977.39	4,325.01	1,167.41		14,469.81
Franklin	7,672.99			313.85	7,986.84
Fremont	3,829.15	4,221.47	537.90	2,158.65	10,747.17
Greene	6,922.25	96.22	81.00	32.12	7,131.59
Grundy	1,706.35	32.36	918.44		2,657.15
Guthrie	11,354.87	1,009.68	102.17	964.42	13,431.14
Hamilton	531.14	763.41	3,176.29		4,470.84
Hancock	2,300.84	25.80		131.47	2,458.11
Hardin	3,792.41	3,207.58	760.00		7,759.99
Harrison	27,695.87	8,553.91	160.33		36,410.11
Henry	3,322.96				3,322.96
Howard	1,532.01	1,047.46	121.45		2,700.92
Humboldt	820.45	212.57		406.81	1,439.83
Ida	11,867.75	90.75	2,810.98	21.95	14,791.43
Iowa	13,604.17	807.29	206.57	201.97	14,820.00
Jackson	11,745.99	1,850.06	87.30	3,247.21	16,930.56
Jasper	13,957.19		2,088.46		16,045.65
Jefferson	1,155.41	3,820.12	409.80	420.98	5,806.31
Johnson	2,784.72	4,242.30	62.32		7,089.34
Jones	7,911.29				7,911.29
Keokuk	10,124.21	1,975.58	700.47		12,800.26
Kossuth	14,756.50	5,700.21	225.50		20,682.21

SUMMARY TABLE NO. 4.—Continued.

County	Wooden bridges and culverts	Steel bridges and culverts	Permanent bridges and culverts	Miscellaneous	Total
Lee	5,720.21	3,758.50			9,478.71
Linn	1,645.85	900.75		6,261.83	8,808.43
Louisa	6,703.43	4,468.97	274.90		11,447.30
Lucas	1,586.06	390.98	653.68	720.00	2,806.90
Lyon	1,022.67	2,192.74		624.70	3,840.11
Madison	13,009.28	821.34			13,830.62
Mahaska	3,011.54	6,106.41	331.07	176.27	9,625.29
Marion	2,755.79	2,040.70	62.25	5,040.09	9,898.83
Marshall	5,027.88	1,068.81	4,133.70		10,230.39
Mills	9,954.00	305.76	194.17	913.01	11,366.94
Mitchell		2,566.06		1,145.89	3,711.95
Monona	9,275.34	3,678.90	41.70	1,202.43	14,198.37
Monroe	5,577.93	325.36	662.29	300.93	6,866.51
Montgomery	5,190.62	4,981.40	772.52	855.56	11,800.10
Muscatine	98.84	5,252.87	36.85	222.38	5,610.94
O'Brien	3,445.65	1,455.90			4,901.55
Osceola	1,278.41				1,278.41
Page	19,284.03			307.67	19,591.70
Palo Alto	4,050.09			275.00	4,325.09
Plymouth	15,208.18	1,556.65		246.82	17,011.65
Pocahontas	2,191.69	1,168.27		3,518.42	6,878.38
Polk	17,516.73	5,317.43	1,230.39	846.19	25,108.74
Pottawattamie	18,430.22	8,344.60	3,822.40	264.47	30,861.69
Poweshiek	7,864.29	375.30		40.10	8,279.69
Ringgold	9,354.85	190.70	487.29	341.00	10,483.95
Sac	2,709.39	2,791.84	993.98	475.15	6,970.36
Scott	2,985.19	2,652.90		11.40	5,649.49
Shelby	11,677.18	2,821.22		94.18	14,592.58
Sioux	7,399.91		416.94		7,816.85
Story	4,276.33	1,198.32	2,199.91	97.78	7,772.34
Tama	8,446.66	2,586.47	747.08		11,780.21
Taylor	8,997.78	2,910.61	77.10		11,985.49
Union	3,203.47	995.33	309.50	350.90	4,871.29
Van Buren	1,009.80	11,281.96	306.80	1,558.99	14,157.51
Wapello	3,176.12	9,716.09	2,719.05	1,884.43	17,555.69
Warren	4,576.70	2,365.37		176.68	7,118.75
Washington	5,612.34	5,606.45	27.00		11,245.79
Wayne	5,679.14	907.18			6,586.32
Webster	1,807.72	3,967.14	124.85	121.36	6,021.07
Winnebago	1,966.11	3.75	149.60		2,119.46
Winneshiek	2,810.30	14,105.22	823.97	1,140.55	18,880.04
Woodbury	33,537.73			258.81	33,796.54
Worth		1,643.08	249.32		1,892.40
Wright	2,467.35		1,196.00	2,992.49	6,655.84
Totals	$690,553.50	$226,408.41	$ 55,401.92	$ 64,370.36	$ 1,036,735.75

SUMMARY TABLE NO. 5.

Bridge Equipment, Unused Material and Miscellaneous Items.—County Expenditures.—Annual Reports of County Engineers.

County	Equipment and Material			Filling bridges and culverts	Miscellaneous				
	Equipment including repairs to same	Material purchased and not used	Total		Right of way	Moving and re-erecting old spans	Lengthening culverts	Miscellaneous	Total
Adair	$ 1,175.50	$ 13,986.90	$ 15,162.40	$ 13,115.61					
Adams	16.05		16.05	2,361.68	20.00				$ 20.00
Allamakee	167.39		167.39	481.66	789.00			$ 135.92	924.92
Appanoose				8,421.29	10.00			192.00	202.00
Audubon		6,070.29	6,070.29	4,773.00	250.00			291.57	541.57
Benton	155.07		155.07	11,789.07				1,727.49	1,727.49
Black Hawk		3,737.47	3,737.47	617.88				253.90	253.90
Boone	273.11	2,042.54	2,315.65	2,841.09					
Bremer	460.67	5,141.83	5,602.50	1,103.19				948.94	948.94
Buchanan		100.00	100.00	722.20				594.91	594.91
Buena Vista	831.06	16,446.71	17,277.77	2,002.93			$ 2,447.36	5,786.16	8,233.52
Butler	917.80	11,677.13	12,594.93	2,300.62					
Calhoun		7,088.85	7,088.85	1,079.81			164.05		164.05
Carroll	309.05	2,482.93	2,791.98	2,827.65	114.25			162.65	276.90
Cass	225.92	1,650.63	1,876.55	4,430.85		$ 1,307.07		1,238.00	2,545.07
Cedar	3.75		3.75	946.60	170.00	502.22	141.00	55.25	869.57
Cerro Gordo	456.61	3,613.00	4,069.61	375.45	439.41			1,562.46	2,001.87
Cherokee	229.58	2,257.81	2,487.39	2,232.30				7,014.79	7,014.79
Chickasaw	428.99	500.00	928.99	700.25	150.10			79.91	230.01
Clarke		150.47	150.47	18,698.89				6.53	6.53
Clay	61.20	1,220.09	1,281.29	1,670.40		692.12	157.15	55.47	904.74
Clayton		328.80	328.80	1,279.44	61.67	1,328.63	126.10	2,372.20	4,118.10
Clinton		5,530.15	5,530.15	2,050.00	218.95	20.00		1,674.84	1,913.79
Crawford				2,942.54	608.25			1,268.96	1,877.21
Dallas	9.78	1,649.68	1,659.46	5,326.43	23.00	315.76		5,325.95	5,664.71
Davis	99.71		99.71	4,870.30		1,022.87		9,636.93	10,659.80
Decatur	92.43	3,690.23	3,782.66	7,448.30				699.32	699.32
Delaware	692.03	1,050.00	1,742.03	1,302.60	1,370.00			270.87	1,640.87
Des Moines	331.45	1,277.12	1,608.57	256.05	10.00		1,077.28	1,744.13	2,831.41

County	Equipment including repairs to same	Material purchased and not used	Total	Filling bridges and culverts	Right of way	Moving and re-erecting old spans	Lengthening culverts	Miscellaneous	Total
Dickinson		845.22	845.22			276.00		352.00	628.00
Dubuque				10,305.48	360.75	168.25		251.29	780.29
Emmet	172.28	1,501.59	1,673.87	42.70				1,863.95	1,863.95
Fayette	1,484.23	980.00	2,464.23	1,316.10	45.00	46.50		1,280.49	1,371.99
Floyd	851.04	2,940.33	3,791.37	6,251.81	658.01	561.96		4,489.74	5,709.71
Franklin	1,462.03	3,015.67	4,477.70	2,799.77	115.00				115.00
Fremont	320.05	9,430.20	9,750.25	2,611.45	595.00	2,149.80		1,004.92	3,749.72
Greene	128.67	2,122.42	2,251.09	177.20	24.95	704.00		736.08	1,465.03
Grundy		68.73	68.73	2,142.39			3,041.93	3,944.50	6,986.43
Guthrie	158.60	2,445.99	2,604.59	4,096.22				138.98	138.98
Hamilton		2,210.14	2,210.14	904.42				275.40	275.40
Hancock		925.00	925.00	67.50			153.35	31.45	184.80
Hardin	264.72	5,889.81	6,154.53	2,877.44	50.00			1,009.19	1,059.19
Harrison		4,023.12	4,023.12	1,271.37	5,319.01	10,982.28		4,706.19	21,007.48
Henry	1,334.87	1,088.04	2,422.91	1,225.07					
Howard	602.27	3,171.91	3,774.18	6,728.91	544.00				544.00
Humboldt	74.31	2,228.55	2,302.86	299.30			242.00	342.50	584.50
Ida	216.37		216.37	3,731.74	1,105.55			1,060.21	2,165.76
Iowa		5,472.32	5,472.32	1,505.54	68.00		647.07	931.35	1,646.42
Jackson				1,307.02	130.00	479.09		214.76	823.85
Jasper				8,240.44		2,020.42		124.00	2,144.42
Jefferson	679.29	4,347.72	5,027.01	13,101.33		517.15	106.85	1,321.39	1,945.39
Johnson	829.00	4,172.46	5,001.46	5,022.30	55.00				55.00
Jones		10,451.17	10,451.17	963.61	11.92	650.80		679.83	1,342.55
Keokuk		1,653.48	1,653.48	4,165.65	79.35			147.00	226.35
Kossuth				1,442.35		1,475.32		1,016.70	2,492.02
Lee	474.35	1,769.22	2,243.57	485.90				744.91	744.91
Linn		1,500.00	1,500.00	746.25	25.00			219.47	244.47
Louisa	723.52	500.00	1,223.52	619.49				3,098.17	3,098.17
Lucas		172.27	172.27	4,452.00		691.67	549.25		1,240.92
Lyon	326.29	6,754.57	7,080.86	2,398.97				576.65	576.65
Madison	275.37	2,029.22	2,304.59	5,002.55				1,030.37	1,030.37
Mahaska		7,093.82	7,093.82	4,330.72	191.00	958.29	137.10	2,189.37	3,475.76
Marion	56.98		56.98	17,010.46	61.25			1,244.56	1,305.81
Marshall	302.48	3,561.57	3,864.05	9,248.94	2,557.40			3,517.39	6,074.79
Mills	302.17	7,053.75	7,355.92	1,437.28	1,192.90			665.97	1,858.87
Mitchell	700.00		700.00						
Monona	210.68	3,000.00	3,210.68	2,500.48	7.00	3,437.72		906.60	4,351.32
Monroe	73.10	2,126.34	2,199.44	5,174.24	50.00			2,206.42	2,256.42
Montgomery	132.00	1,800.00	1,932.00	3,880.21				1,225.34	1,225.34
Muscatine	17.13	939.30	956.43	702.51	37.80	25.75	213.28	220.09	496.92
O'Brien	294.97	2,119.17	2,414.14	479.39	282.64				282.64
Osceola	66.00	1,876.73	1,942.73	2,687.20			230.76		230.76
Page	133.40	1,638.68	1,772.08	12,908.11				3,365.33	3,365.33
Palo Alto	791.61	1,025.00	1,816.61	793.94	25.00	1,032.70		3,334.13	4,391.83
Plymouth	1,193.20	11,808.74	13,001.94	355.50	86.00	1,379.27	292.80	725.96	2,484.03

SUMMARY TABLE NO. 5.—Continued.

County	Equipment and Material: Equipment including repairs to same	Equipment and Material: Material purchased and not used	Equipment and Material: Total	Filling bridges and culverts	Miscellaneous: Right of way	Miscellaneous: Moving and re-erecting old spans	Miscellaneous: Lengthening culverts	Miscellaneous: Miscellaneous	Miscellaneous: Total
Pocahontas	55.85		55.85	2,986.79				56.20	56.20
Polk	255.18	2,623.76	2,878.94	4,091.24		543.27	2,713.34	541.09	3,797.70
Pottawattamie	4,847.49	11,972.22	16,819.71	18,241.24	409.16	242.49		438.73	1,090.38
Poweshiek	225.51	264.17	489.68	6,984.70	355.01	800.00	59.54	4,838.27	6,142.82
Ringgold	909.65	1,900.00	2,809.65	5,771.78	329.64				380.64
Sac	198.18	1,081.39	1,279.57	489.55		746.91	634.90	817.16	2,198.97
Scott	2,296.10	4,276.49	6,572.59	385.31	220.84			1,739.57	1,980.41
Shelby				7,173.96	74.00			175.00	240.00
Sioux	255.33	2,170.74	2,426.07	680.19				620.80	620.80
Story				837.38	50.00			1,519.77	1,309.77
Tama	811.18		811.18	3,047.37				1,063.67	1,063.67
Taylor	561.92	9,096.64	9,658.56	10,700.83				2,321.08	2,321.08
Union	2,048.19	309.72	2,357.91	2,988.22				822.07	822.07
Van Buren	8,909.78	3,296.52	12,206.30	1,806.81	15.00		449.32	12.40	476.92
Wapello	629.90	2,250.20	2,880.10	4,532.88			1,082.92	174.87	1,258.79
Warren	324.40	2,933.67	3,258.07	14,478.21	79.03	30.65			109.68
Washington	357.56	3,807.27	4,164.83	1,873.14			244.94	64.50	300.41
Wayne	143.41	1,898.65	2,042.96	12,804.27	415.00	867.99		1,329.90	2,612.89
Webster		348.64	348.64	1,402.50	60.00			320.88	380.88
Winnebago		871.78	871.78	9,804.42					
Winneshiek	877.12	3,682.75	4,559.87	2,299.49	315.30		240.25	3,615.61	4,170.76
Woodbury	1,139.40		1,139.40	2,956.43				1,190.80	1,190.80
Worth								43.10	43.10
Wright	210.00	935.15	1,145.15	2,167.76				1,066.15	1,066.15
Totals	$ 46,783.95	$271,427.94	$318,140.57	$586,626.82	$ 21,494.04	$ 36,653.45	$ 15,285.38	$118,977.49	$ 192,470.35

SUMMARY TABLE NO. 6.

Comparison of Bridge and Culvert Construction.—1914-1915-1916.—Annual Reports of County Engineers.

County	November 1, 1913, to November 1, 1914	November 1, 1914, to January 1, 1916	January 1, 1916, to January 1, 1917	Total Three-year Period
Adair	$ 28,502.00	$ 39,477.42	$ 41,916.84	$ 110,336.08
Adams	16,389.54	36,704.09	30,842.09	83,995.72
Allamakee	21,648.86	37,300.02	36,612.58	95,561.46
Appanoose	20,509.18	40,028.99	42,099.77	102,637.94
Audubon	22,582.80	50,441.85	35,164.50	108,189.15
Benton	56,760.49	62,481.69	75,076.26	194,318.44
Boone	13,374.39	24,713.51	46,207.97	84,095.87
Black Hawk	16,560.82	80,316.88	42,107.00	138,984.70
Bremer	10,848.60	48,258.48	38,431.87	97,538.95
Buchanan	20,245.60	48,162.40	65,464.01	133,872.01
Buena Vista	45,952.65	93,326.65	113,108.03	252,387.33
Butler	23,659.72	73,666.27	23,388.96	120,714.95
Calhoun	34,231.90	58,733.92	48,195.89	141,161.71
Carroll	34,705.27	49,707.51	47,031.43	131,444.21
Cass	19,376.95	58,280.17	55,062.87	132,719.99
Cedar	48,604.57	60,968.88	61,956.12	171,529.57
Cerro Gordo	53,511.65	48,311.84	37,119.73	138,943.22
Cherokee	48,529.34	56,329.15	99,162.80	204,021.29
Chickasaw	40,374.99	32,161.02	64,462.18	136,998.19
Clarke	4,900.78	18,268.99	30,033.77	53,203.54
Clay	77,792.65	121,815.17	82,093.14	281,700.96
Clayton	24,530.05	102,244.00	46,699.54	173,473.59
Clinton	66,495.50	73,480.93	62,108.77	202,085.20
Crawford	48,872.99	81,688.44	91,690.53	222,221.96
Dallas	33,125.54	72,561.29	101,041.70	206,728.53
Davis	39,334.95	38,408.71	30,390.77	108,194.03
Decatur	7,090.55	32,109.88	21,523.36	60,723.79
Delaware	28,092.00	47,314.84	49,105.32	124,512.16
Des Moines	17,206.32	20,018.01	25,311.08	62,535.41
Dickinson	37,751.24	45,349.26	36,508.63	119,609.13
Dubuque	41,806.51	84,966.05	102,314.62	229,087.18
Emmet	27,015.48	48,221.32	35,767.11	111,003.91
Fayette	49,107.64	69,654.53	113,367.09	232,139.26
Floyd	41,996.15	51,676.90	56,230.27	149,903.32
Franklin	22,299.68	18,381.21	40,517.87	81,198.76
Fremont	45,045.41	36,639.46	37,627.10	119,311.97
Greene	25,138.91	25,558.43	28,631.87	79,329.21
Grundy	47,179.44	69,441.92	52,661.50	169,292.86
Guthrie	16,264.75	43,236.06	32,273.23	91,774.04
Hamilton	22,300.59	65,222.64	87,298.30	174,851.53
Hancock	25,167.22	22,463.45	24,369.42	72,000.09
Hardin	22,844.36	36,986.10	40,927.24	100,757.70
Harrison	15,518.97	36,035.81	113,795.57	165,350.35
Henry	30,284.10	27,139.92	22,578.68	80,002.70
Howard	60,266.75	45,873.93	46,323.07	152,463.75
Humboldt	12,354.42	34,642.53	41,487.63	88,484.58
Ida	42,269.99	39,989.23	35,747.22	118,006.44
Iowa	43,426.87	33,668.58	53,693.09	130,788.54
Jackson	2,689.35	40,616.02	36,113.87	79,419.24
Jasper	24,095.44	82,555.36	70,120.07	176,770.87
Jefferson	30,445.85	46,571.40	60,199.63	137,216.88
Johnson	34,389.04	110,305.25	52,484.70	197,176.03
Jones	23,894.70	23,049.50	35,628.73	82,572.93
Keokuk	34,358.76	33,132.44	46,763.88	114,255.08
Kossuth	49,771.65	47,886.39	73,838.19	171,495.43

SUMMARY TABLE NO. 6.—Continued.

County	November 1, 1913, to November 1, 1914	November 1, 1914, to January 1, 1916	January 1, 1916, to January 1, 1917	Total Three-year Period
Lee	23,309.31	32,240.11	38,871.93	94,421.35
Linn	43,082.31	68,005.73	60,743.64	171,831.68
Louisa	16,292.98	32,735.22	42,049.77	91,077.97
Lucas	21,721.51	28,582.63	30,808.02	81,112.16
Lyon	25,897.65	47,609.81	41,915.13	115,422.59
Madison	29,432.89	27,005.02	21,830.42	78,268.33
Mahaska	33,800.49	60,624.95	64,211.83	158,637.27
Marion	55,775.92	120,200.18	117,906.25	293,882.35
Marshall	33,592.48	33,594.76	102,606.63	169,793.87
Mills	25,900.02	48,985.92	36,022.83	111,008.77
Mitchell	21,083.12	41,519.74	53,180.17	115,783.03
Monona	18,394.96	36,942.03	48,159.82	103,496.81
Monroe	5,815.05	38,709.11	37,401.66	81,925.82
Montgomery	26,424.92	42,800.96	34,623.62	103,849.50
Muscatine	33,610.42	29,161.39	38,402.45	101,174.26
O'Brien	40,102.70	63,553.30	50,199.94	153,855.94
Osceola	30,147.60	15,785.12	48,611.41	94,544.13
Page	38,134.17	48,430.39	45,711.80	132,276.36
Palo Alto	30,754.80	35,471.57	69,782.18	136,008.55
Plymouth	65,023.47	60,455.90	72,566.49	198,045.86
Pocahontas	10,256.63	65,472.22	58,606.06	134,334.91
Polk	103,299.22	87,372.09	50,775.50	241,446.81
Pottawattamie	120,022.05	108,140.35	92,809.17	320,971.57
Poweshiek	57,083.13	56,981.30	90,846.45	204,910.94
Ringgold	10,463.07	21,951.40	25,755.20	58,169.67
Sac	22,016.22	42,865.46	65,894.25	140,775.94
Scott	31,980.60	18,001.42	20,930.59	70,921.61
Shelby	42,347.77	50,945.35	66,464.23	159,757.35
Sioux	28,916.46	57,547.48	63,002.30	149,916.24
Story	45,128.17	49,198.23	59,620.43	153,946.83
Tama	61,980.28	55,251.98	148,141.07	265,373.33
Taylor	32,385.12	27,909.36	28,722.59	89,017.07
Union	10,115.41	45,988.36	29,332.64	85,437.41
Van Buren	26,583.25	22,592.78	41,417.49	100,593.52
Wapello	20,508.88	43,832.58	58,645.43	123,076.89
Warren	26,602.84	47,317.30	69,325.16	143,305.30
Washington	22,622.04	35,398.80	41,287.88	90,308.72
Wayne	41,904.42	27,387.08	42,089.26	111,979.77
Webster	29,682.55	32,119.36	29,521.80	111,323.61
Winnebago	11,516.59	21,201.98	15,130.43	47,849.00
Winneshiek	66,402.52	70,700.72	56,089.80	193,253.04
Woodbury	43,650.00	46,265.35	38,663.59	128,578.94
Worth	20,146.80	15,554.87	17,422.65	53,123.72
Wright	9,467.71	47,394.60	31,574.30	108,436.61
Totals	$ 3,275,807.93	$ 4,886,798.82	$ 5,248,232.58	$ 13,410,979.33

SUMMARY TABLE NO. 7.

Road Construction.—County Expenditures.—Annual Reports of County Engineers.

County	Temporary work	Permanent work	Repairs	Maintenance	Equipment and unused material	Miscellaneous	Total
Adair	$ 6,323.67	$ 146.00	$ 1,989.06	$ 3,816.82	$ 1,985.23	$ 630.00	$ 14,906.79
Adams	6,730.85	1,261.29	1,550.53	3,258.76	795.10	319.91	13,817.41
Allamakee		6,542.84	13,909.95	1,551.11	671.31	1,069.14	23,804.55
Appanoose	333.88		7,183.13	4,001.89	765.58	1,716.27	14,000.73
Audubon	2,507.09	969.10	6,003.38	3,026.54	2,421.70	470.00	15,966.79
Benton	9,089.82	8,371.25	2,335.79	4,184.11	1,060.30	211.29	25,153.02
Black Hawk	5,786.98	6,293.54	6,186.93	4,049.25	1,513.25	3,908.49	27,787.44
Boone	3,416.27	13,107.78	3,222.69	4,427.25	3,032.01	3,837.46	31,043.46
Bremer	6,882.04	10,503.24	2,220.06	2,329.29	3,050.06	1,532.83	26,577.32
Buchanan	4,019.17	13,309.23	16,170.27	2,320.00	216.80	2,968.35	39,203.97
Buena Vista	746.46	89,905.60	3,120.33	3,148.39	4,371.21	7,063.56	108,445.51
Butler	15,697.85	3,201.35	1,426.44	6,226.89	16,345.63	1,656.14	44,031.39
Calhoun	3,151.06	54,527.73	1,801.77	3,656.82	2,070.97	7,541.83	72,750.58
Carroll	4,200.53	20,502.38	4,046.90	3,514.32	2,002.73	1,386.06	35,706.92
Cass		2,573.74	6,915.69	5,228.08	377.24	1,723.90	16,818.65
Cedar	1,007.35	15,170.88	7,006.28	3,796.89	905.68	480.78	28,463.86
Cerro Gordo	6,509.07	48,389.70	4,110.40	3,009.05	1,239.33	3,004.45	66,252.39
Cherokee	4,739.85	26,964.93	2,813.13	2,808.02	2,877.44	1,321.06	41,724.43
Chickasaw	8,674.94	6,902.82	9,196.34	1,560.88	2,709.10	511.75	29,043.83
Clarke	3,350.34		2,158.27	3,032.48	783.05	2,027.90	11,982.14
Clay	408.00	48,885.46	1,953.55	2,256.27	1,288.42	7,468.74	62,300.44
Clayton			20,517.04	4,761.17	777.10	2,111.04	28,166.35
Clinton	3,273.41	18,109.32	2,919.54	4,684.49	511.05	2,898.60	32,366.61
Crawford		77,902.10	6,697.01	3,822.17	95.80	2,972.72	90,330.80
Dallas	6,740.39	14,406.77	1,071.10	4,366.64	9,370.27	4,528.85	40,713.93
Davis	7,002.67		2,017.60	3,015.34	1,664.64	2,203.13	15,902.79
Decatur	4,807.32	42.00	1,029.80	4,706.44	592.15	1,820.18	12,966.80
Delaware	9,600.01	24,407.08	6,450.96	4,641.89	4,547.33	1,832.20	51,468.67
Des Moines	1,271.59	3,167.50	1,971.98	2,363.10	3,531.51	4,885.64	17,099.78
Dickinson	2,409.21	44,344.73	2,146.86	2,270.03	1,336.48	3,002.68	55,619.90
Dubuque		20,329.55	22,331.56	3,275.30	842.67	11,897.12	58,607.30

SUMMARY TABLE NO. 7.—Continued.

County	Temporary work	Permanent work	Repairs	Maintenance	Equipment and unused material	Miscellaneous	Total
Emmet	1,518.92	34,002.08	1,670.50	1,909.62	752.90	10,388.61	70,102.73
Fayette	16,070.28		1,762.81	3,025.32	4,648.29	4,065.23	29,582.90
Floyd	8,448.46	1,718.53	4,452.70	2,368.92	1,254.80	904.00	19,147.35
Franklin	7,423.32	16,477.34	8,088.19	2,741.78	4,048.24	5,380.79	44,170.66
Fremont	3,244.00	3,196.70	3,774.90	2,048.49	1,870.01	1,915.05	17,280.20
Greene	927.16	19,775.96	1,849.55	1,699.47	227.67	12,016.80	36,766.07
Grundy	18,405.14	40.15	5,840.53	2,905.33	1,966.77	106.67	29,313.37
Guthrie		425.37	13,372.78	4,704.93	5,722.86	255.40	24,512.11
Hamilton	5,022.06	34,903.50	2,451.98	3,330.20	1,714.18	836.86	53,358.47
Hancock	3,521.12	18,319.78	9,217.24	6,406.00	1,983.47	807.42	39,915.93
Hardin	1,917.30	27,071.60	1,548.71	3,287.63	718.13	2,348.39	36,891.78
Harrison	17,794.49	4,922.63	5,232.11	3,022.50	2,232.73	1,827.00	35,034.15
Henry			7,002.49	5,479.03	4,307.54	1,888.24	19,727.30
Howard	7,625.87	10,946.17	1,832.19	1,715.84	817.75	2,000.78	24,978.60
Humboldt	1,080.85	20,764.07	2,303.77	3,433.92	642.13	317.05	28,541.79
Ida	4,502.28	1,287.23	2,548.78	2,328.61	1,389.95	2,028.71	14,885.76
Iowa	3,799.34	23,286.77	1,908.18	4,348.37	1,238.03	1,450.05	35,916.64
Jackson		8,790.79	12,341.48	3,310.05	565.72	682.21	25,890.25
Jasper	4,206.48	30,384.50	11,902.99	4,904.00	6,881.31	1,028.93	59,308.30
Jefferson	3,798.82	10,122.39	3,099.00	5,986.31	5,306.49	8,217.59	[illegible]
Johnson	9,831.96	7,445.95	5,700.25	5,022.14	2,865.49	1,506.52	32,092.31
Jones	16,036.11	1,436.19	2,330.20	4,118.97	235.08	1,376.74	25,703.94
Keokuk	5,840.65	7,085.92	19,137.47	1,405.32	2,772.64	78.00	29,900.00
Kossuth	8,469.35	27,021.58	9,908.87	5,631.71	1,581.92	2,771.35	55,455.63
Lee	39.50	939.75	16,436.30	4,752.32	1,475.19	390.98	24,255.24
Linn	946.10	4,385.24	20,070.01	5,152.40	4,025.92	275.00	31,005.73
Louisa	198.00	9,392.07	5,532.83	4,137.55	741.60	743.90	20,654.39
Lucas	4,824.62	1,061.55	2,007.94	2,676.72	323.78	475.30	12,373.91
Lyon	20,711.37	171.43	2,014.17	2,309.81	2,651.73	300.00	28,098.20
Madison	3,795.27	3,600.11	1,155.61	4,344.41	2,890.58	2,464.52	19,395.86
Mahaska	861.28	21,870.08	2,502.10	5,141.88	7,291.17	851.98	38,518.64
Marion	11,078.32	5,712.08	6,374.74	5,370.29	2,582.33	2,478.60	33,118.36
Marshall	3,236.31	4,402.89	8,411.74	4,002.44	1,420.87	2,729.04	[illegible]
Mills	1,716.20	10,077.27	2,419.56	1,891.84	231.95	1,367.98	17,304.15
Mitchell		6,016.93	8,372.67	2,379.42	3,808.36	2,015.47	23,790.85
Monona	5,203.83	1,373.45	3,014.43	4,001.07	2,047.23	2,723.35	18,363.38
Monroe	4,603.16	327.90	3,919.80	2,538.66	5,190.24	2,325.34	19,217.30
Montgomery	4,906.64	4,165.44	8,387.67	3,250.47		135.15	20,888.77
Muscatine	10,975.67	12,438.03	3,079.34	4,423.24	2,495.03	2,000.61	35,419.22
O'Brien	6,902.58	19,281.80	2,314.56	3,061.92	1,377.84	1,318.81	35,017.37
Osceola	6,415.62	11,506.08	725.60	1,504.92	118.00		20,851.67
Page	2,270.78	12,025.78	2,487.07	5,022.82	2,729.08	6,023.27	27,159.65
Palo Alto	2,577.15	17,507.15	3,016.00	2,867.44	907.73	2,320.77	29,396.21
Plymouth	10,230.51	627.73	2,001.65	4,226.14	1,600.56	5,506.39	25,030.18
Pocahontas	1,114.80	28,800.95	4,073.77	3,143.54	7,612.61	11,634.19	56,199.82
Polk	7,257.18	7,976.28	7,467.43	15,045.76	8,442.86	1,797.16	42,987.57
Pottawattamie	29,747.70	1,317.40	11,318.85	6,306.28	5,692.64	2,463.14	58,846.01
Poweshiek	10,434.79	2,878.71	3,637.41	4,082.34	1,180.94	4,706.16	26,920.35
Ringgold		1,372.00	3,000.00	2,025.00	1,422.00	3,350.00	11,729.00
Sac		37,565.29	2,501.00	2,307.42	278.38	3,272.73	46,154.87
Scott	8,701.00	20,250.76	1,582.28	4,119.74	2,857.74	1,792.17	39,023.29
Shelby	1,487.50	3,183.78	7,009.91	3,606.74	283.50	500.10	17,081.23
Sioux	8,328.25	1,786.00	3,200.02	3,077.60	1,167.71	264.00	18,316.78
Story		38,040.76	4,708.80	5,000.54	622.30	3,090.45	53,643.74
Tama	3,221.17	27,549.82	6,807.15	4,001.33	5,308.00	697.79	48,216.15
Taylor	6,874.03	1,481.79	2,432.11	3,979.85	585.14		15,352.82
Union	630.75	56.70	6,078.16	2,277.37	222.90	981.33	10,154.87
Van Buren	4,865.61		4,507.04	4,161.84	7,094.11	1,121.54	21,714.14
Wapello	3,415.97	11,790.00	3,034.78	4,542.63	1,775.87	2,814.26	27,382.54
Warren		57.43	6,854.29	5,256.07	5,466.72	1,424.83	19,059.34
Washington	20,215.29	783.08	3,836.79	6,823.76	528.66	113.90	32,421.08
Wayne	2,332.19	980.00	5,442.18	4,608.08	1,981.84	477.27	15,881.56
Webster	7,806.90	16,914.65	3,350.28	6,044.82	882.80	1,859.60	36,858.25
Winnebago	6,614.65	4,168.41	2,835.82	2,400.00	3,279.41	6,031.81	25,330.10
Winneshiek	20,503.65		8,645.30	4,905.55	1,980.29	1,119.41	37,214.18
Woodbury	6,597.71	13,406.28	7,277.99	6,158.16	2,078.46	2,751.90	38,270.49
Worth	3,562.95	5,306.58	6,865.56	1,088.02	4,004.09	350.00	21,177.73
Wright	6,077.02	25,833.30	11,739.20	3,240.25	1,928.42	4,918.76	53,337.58
Total	$ 541,602.56	$1,209,882.89	$ 542,477.54	$ 289,052.60	$ 245,962.47	$ 249,435.65	$ [illegible]

SUMMARY TABLE NO. 8.

Classification of Road Construction.—County Expenditures.—Annual Reports of County Engineers.

County	Permanent Work: Built to Finished Grade, 3-A: Miles	Built to Finished Grade, 3-A: Cost	Built to Temporary Grade, 3-B: Miles	Built to Temporary Grade, 3-B: Cost	Permanently Surfaced, 3-C: Miles	Permanently Surfaced, 3-C: Cost	Tile Drainage A-C-E, 3-D: Cost	Special cases	Temporary Work: Grade, 2-A, Built to Natural: Miles	Grade, 2-A, Built to Natural: Cost	Special Cases Oiling, etc., 2-B: Cost	Total: Total county Construction
Adair							$ 146.00		28	$ 2,291.89	$ 4,041.78	$ 6,479.67
Adams			1.0	$ 1,261.29					60.5	6,731.85		7,993.14
Allamakee	2.14	$ 6,542.84										6,542.84
Appanoose									4	323.88		323.88
Audubon							968.10		26.75	2,567.09		3,535.19
Benton	.5	3,726.68		2,782.66			1,760.91			9,089.82		17,361.07
Black Hawk	2.27	2,034.80			2.1	$ 2,471.82	1,786.92		28	5,786.98		12,079.52
Boone		440.00	1	2,140.59	10.75	9,120.38	1,406.51		37.75	3,416.27		16,524.65
Bremer	4.76	8,377.79			.26	367.90	1,877.55		40.75	6,882.04		17,445.28
Buchanan	2.35	8,423.39			2.35	2,943.54	2,032.39		37	4,019.17		17,418.49
Buena Vista	54.7	56,742.74			25.7	20,307.32	14,050.54		5	746.46		90,742.06
Butler	1.5	933.40					2,327.95		127	15,637.85		18,999.20
Calhoun	54.8	37,265.38	2	1,436.55	10.24	12,159.82	3,396.34	$ 280.46	36.25	3,151.48		57,699.19
Carroll	11.38	18,783.01	0.25	1,142.65			516.32		24.62	4,205.03	85.50	24,732.71
Cass*	1.25	7,288.58			*		285.16					7,573.74
Cedar	3.47	11,639.41			0.58	2,812.40	724.67				1,037.75	16,214.23
Cerro Gordo	21.7	37,692.63				711.53	9,906.14		28.6	6,309.07		54,589.77
Cherokee	18.5	26,437.86					144.82	392.26	40	4,739.85		31,704.80
Chickasaw	9	3,181.49	.5	196.25	3.12	1,490.78	2,122.30		48.75	8,674.94		15,665.76
Clarke									32	3,330.34		3,330.34
Clay	36.2	34,137.34			13.8	9,792.90	4,955.13		3	408.00		49,293.46
Clayton												
Clinton	4.61	13,211.39	0.2	603.80	1.25	3,300.00	994.33		18.5	1,856.11	1,457.30	21,392.93
Crawford	31.34	77,902.10										77,902.10
Dallas	1	3,297.69	0.7	1,937.82	6.35	6,067.44	637.68	3,475.64	92.15	6,740.20		21,156.97
Davis									68.5	7,096.07		7,096.07
Decatur							47.00		60	4,802.22		4,849.22
Delaware	6	56,473.78			2.7	3,576.74	2,355.48		28	9,609.01		84,016.09
Des Moines	1.5	2,495.68					302.75	314.15	18.75	1,271.59		4,439.19
Dickinson	19.8	15,697.20			22.87	21,701.67	6,000.80		14.77	2,499.21		40,847.94
Dubuque	3.1	17,301.97			1.17	3,037.68						20,339.65
Emmet	30.8	32,906.33			23.65	19,465.13	1,549.62		30	1,518.37		55,339.45
Fayette									80.73	36,670.28		36,670.28
Floyd							1,718.54		35	7,371.15	1,077.31	10,166.99
Franklin	13.39	9,496.98			11.25	5,432.60	1,490.70	78.08	18.75	7,432.82		23,930.60
Fremont			1.85	3,195.70					26.75	3,244.00		6,439.70
Greene	3.62	3,276.35			19.12	13,000.13	2,012.20	487.19	5.5	897.56		20,073.17
Grundy							60.15		67.5	18,405.14		18,465.29
Guthrie							425.37					425.37
Hamilton	15.8	25,300.20			11.56	4,292.95	3,265.44		45.45	5,022.66		39,050.25
Hancock	2.75	4,805.72	5.5	4,551.85	6.75	4,365.21	4,457.00	230.00	15	1,940.02	1,590.30	21,940.10
Hardin	26.8	19,506.17			8.45	6,147.90	1,417.53		25.75	1,917.30		28,988.90
Harrison	7	5,707.12					1,155.50		35.5	15,676.10	2,115.30	23,714.12
Henry												
Howard	4.5	4,258.07			5.13	2,321.36	4,304.79		31	7,693.87		18,613.04
Humboldt	14.0	9,976.85			6.0	4,741.62	6,045.60		11	1,080.85		21,844.92
Ida			0.5	413.95			873.28		74	4,284.78	117.50	5,789.51
Iowa		6,902.96		16,025.59				300.22	39.75	3,790.34		27,069.11
Jackson	7	8,513.79					267.00					8,780.79
Jasper	2.5	2,490.04	13	21,150.72			796.82		61.25	4,206.48		24,301.07
Jefferson	0.6	3,229.13					132.25	6,730.92	39.75	3,552.06	246.76	13,921.11
Johnson	0.6	5,135.88					2,322.07		28.25	9,831.96		17,277.91
Jones	0.75	940.85					495.34		116	13,558.20	2,527.91	17,522.30
Keokuk	2.1	6,197.69		373.98			856.23	18.00	106.25	5,840.65		13,286.57
Kossuth	12.4	16,686.91	0.5	1,111.36	5.0	4,553.39	4,671.32		62.0	8,469.95		35,501.96
Lee					.75	939.75			.75	89.50		1,019.25
Linn	0.5	338.75	0.25	1,131.76			2,914.73		5.5	946.10		5,331.34
Louisa	2.5	8,303.66	0.2	293.80			253.56				198.00	9,479.02
Lucas			0.5	813.85			247.70		56.25	4,824.62		5,886.17
Lyon							9.24	162.19	92.0	20,711.37		20,882.80
Madison			0.3	2,342.65			336.46		14.88	3,220.82	574.43	7,464.28
Mahaska	1.0	1,725.00	41.5	19,692.12			543.50		7.35	801.18		22,671.80
Marion	1.74	5,127.06					380.82		81.0	11,978.57		17,491.25
Marshall							273.01	4,160.88	58	3,296.33		7,730.22
Mills	1	1,018.47	18.75	9,058.80					4	1,756.20		11,793.47
Mitchell					3.5	3,215.01	2,795.92					6,010.93
Monona	0.9	1,273.45							48.25	4,603.83	600.00	6,477.28
Monroe							156.91	17.99		4,688.16		4,863.06
Montgomery	3	3,000.34	2.75	909.60			235.30		64.75	4,906.04		9,071.48
Muscatine	7.4	7,021.31	.73	3,017.13	1.26	1,101.40	398.16		29.65	9,223.57	1,732.19	22,413.79
O'Brien	15.25	16,004.36	.35	696.96			2,530.54		44.5	6,902.58		26,134.44
Osceola	8.5	8,592.64			1	781.30	2,222.99		50	6,415.62		18,012.55
Page	.5	1,302.65		11,690.20			12.82		10	2,270.78		15,276.56
Palo Alto	19.66	15,514.56			1.13	310.50	1,692.09		22.75	2,577.15		20,094.30
Plymouth				627.52			1,281.00		190	10,939.51		11,597.04
Pocahontas	20.25	15,234.61			13.4	7,514.43	5,869.91			1,114.80		29,734.75
Polk	1.98	2,987.37			2.5	2,067.81	1,456.70	1,134.50	98	5,804.51	1,402.67	15,253.56
Pottawattamie			2	1,317.40					245	29,747.70		31,065.10

SUMMARY TABLE NO. 8.—Continued.

County	Permanent Work								Temporary Work			Total
	Built to Finished Grade, 3-A		Built to Temporary Grade, 3-B		Permanently Surfaced, 3-C		Tile Drainage A-C-E, 3-D	Special cases	Built to Natural Grade, 2-A		Special Cases Oiling, etc. 2-B	Total county Construction
	Miles	Cost	Miles	Cost	Miles	Cost	Cost		Miles	Cost	Cost	
Poweshiek	.75	540.27					468.50	1,022.94	50	10,434.79		13,313.50
Ringgold	.5	1,373.00										1,373.00
Sac	30.33	29,429.16			6.67	5,497.87	2,637.43					37,565.29
Scott	6.5	10,398.20	.2	97.25	2.5	9,136.23	764.54	73.74	6.12	8,381.00		28,851.36
Shelby	.3	2,441.78	.4	628.82			113.18		11	1,487.50		4,671.28
Sioux				1,786.00					80	8,328.25		10,114.25
Story	37.75	31,078.47			10.75	4,804.61	2,147.33					38,040.76
Tama	13	24,567.07	1	1,971.00			991.75		60	2,314.08	407.14	30,770.99
Taylor	.37	1,481.70							47.75	6,874.03		8,355.73
Union							56.70			630.75		687.45
Van Buren									68	4,865.61		4,865.61
Wapello	7.5	3,975.93	3.5	7,660.77			162.30		27	2,916.32	499.44	15,214.97
Warren							57.43					57.43
Washington							783.08		72.24	19,110.56	1,184.73	21,078.37
Wayne			1	980.00					32.75	2,332.19		3,312.19
Webster	10.25	7,728.83			2	1,824.03	7,361.79		51.5	7,806.90		24,721.55
Winnebago	.5	688.52					3,479.80		29	4,092.30	2,522.35	10,783.06
Winneshiek									96	19,611.88	951.77	20,563.65
Woodbury	1.5	4,143.66	4.25	9,262.63						6,597.71		20,003.99
Worth							806.60	4,559.84			3,562.05	8,929.49
Wright	7	3,551.30			34	18,063.19	4,218.81		59.73	6,077.02		31,910.32
Total	625.21	$782,221.73	107.88	$133,413.15	276.98	$223,182.73	$146,863.27	$ 24,302.01	3,030.88	$513,599.68	$ 28,002.00	$ 1,851,486.45
Total‡		$ 7,342.96		$ 33,455.67		$ 711.50	$148,144.29			$ 24,328.12		

*Note: One-half mile of concrete road costing $8,996 and not paid for out of county funds is not included.
‡Number of miles not given.

SUMMARY TABLE NO. 9.

Road Repairs and Maintenance—County Expenditures—Annual Reports of County Engineers

18

Coutny	Maintenance															
	Dragging					Patrol Work										
	No. of miles regularly dragged	Average number of times dragged	Average cost per mile of road	Average cost per mile one round trip	Total cost of dragging	Average length of patrol	No. of miles in patrol system	Average number of times dragged	Average rate per mile one round trip	Average cost per mile for dragging	Average cost per mile for repair work	Average cost per mile for patrol work	Total cost of patrol work	Total cost of repairs	Total cost of repair and maintenance	Average cost per mile repairs and maintenance
Adair	172.4	37.5	$19.25	$ .70	$ 3,325.75	4	16	32	$ .70	$22.40		$30.85	$ 481.07	$ 1,989.06	$ 5,803.88	$ 33.70
Adams	125	37.2	26.00	.70	3,258.76									1,350.53	4,609.29	41.10
Allamakee	120	12.9	12.92	1.00	1,551.11									13,909.56	15,521.00	132.80
Appanoose	172	20	26.26	.60	4,001.89									7,181.12	11,185.02	71.74
Audubon	143	30	21.00	.70	3,026.54									6,503.36	9,529.90	69.56
Benton	200	13.59	20.21	.75	4,184.11									2,335.79	6,519.90	30.90
Black Hawk	168	24.3	24.10	.75	4,049.25									6,186.93	10,236.18	60.61
Boone	150	37.84	28.38	.75	4,427.25									3,222.69	7,649.94	48.41
Bremer	128.5	24	18.90	.755	2,329.29									2,220.06	4,549.35	36.25
Buchanan	160	21	15.77	.75	2,520.00									16,170.37	18,690.37	110.72
Buena Vista	172	24.4	18.30	.75	3,148.39									3,150.33	6,298.72	27.54
Butler	90	18	23.55	.75	2,115.35	10.5	74	12	.60	7.20	49.26	56.40	4,175.34	1,426.44	7,720.33	44.22
Calhoun	172	28.3	21.39	.75	3,656.82									1,851.77	5,508.59	32.80
Carroll	171	27.4	20.52	.75	3,514.52									4,040.90	7,555.42	43.17
Cass	147	32	24.00	.75	3,921.17								1,606.91	6,915.69	12,143.77	85.91
Cedar	162	31.2	27.40	.75	3,706.89									7,096.28	10,803.17	68.02
Cerro Gordo	149	25.08	20.19	.807	3,009.05									4,110.60	7,119.65	51.32
Cherokee	142	25	20.00	.80	2,808.02									2,812.13	5,621.15	37.98
Chickasaw	140	14	11.16	.78	1,560.88									9,196.34	10,757.22	69.60
Clarke	114	28	26.60	.70	3,032.48									2,158.27	5,190.75	45.53
Clay	153	20	15.00	.75	2,296.27									1,953.55	4,249.82	28.33
Clayton					4,761.17									20,517.04	25,278.21	126.80
Clinton	108	21.8	23.90	.75	4,684.49									2,919.54	7,604.03	38.38
Crawford	150	35.3	25.48	.721	3,822.17									6,697.01	10,519.18	70.00

SUMMARY TABLE NO. 9.—Continued.

County	Maintenance — Dragging: No. of miles regularly dragged	Dragging: Average number of times dragged	Dragging: Average cost per mile of road	Dragging: Average cost per mile one round trip	Dragging: Total cost of dragging	Patrol Work: Average length of patrol	Patrol Work: No. of miles in patrol system	Patrol Work: Average number of times dragged	Patrol Work: Average rate per mile one round trip	Patrol Work: Average cost per mile for dragging	Patrol Work: Average cost per mile for repair work	Patrol Work: Average cost per mile for patrol work	Patrol Work: Total cost of patrol work	Hotal cost of repairs	Total cost of repair and maintenance	Average cost per mile repairs and maintenance
Dallas	170	34	25.65	.75	4,306.64									1,071.10	5,437.74	31.71
Davis	130	20.1	30.10	1.00	3,015.34									2,017.60	5,032.94	37.70
Decatur	160	42	29.43	.70	4,706.44									1,038.80	5,745.24	37.90
Delaware	170	34	27.30	.80	4,641.89									6,430.26	11,072.15	64.45
Des Moines	82.85	29.3	27.32	.75	2,263.10									1,971.98	4,235.08	31.90
Dickinson	99	30.3	23.00	.76	2,270.03									2,146.86	4,416.89	47.34
Dubuque	148.75	24.85	22.02	.886	3,275.30									22,351.50	25,626.80	106.71
Emmet				.75	1,569.93									1,670.50	3,239.50	23.30
Fayette	212	22	14.32	.60	3,035.32									1,763.81	4,799.13	23.78
Floyd	141.6	24.2	18.14	.75	2,568.92									4,452.30	7,021.21	50.98
Franklin	150.5	26	18.21	.70	2,741.38									8,088.19	10,829.57	60.67
Fremont	156.75	33	23.31	.70	3,648.49									3,774.96	7,423.44	51.97
Greene	100		17.00	.70	1,699.47									1,849.50	3,549.02	20.78
Grundy	155	25	18.74	.75	2,905.32									5,840.31	8,745.84	56.94
Guthrie	194	30.2	24.25	.80	4,704.92									13,372.28	18,077.20	92.23
Hamilton	140	28	30.50	1.00	5,359.20									2,451.98	7,811.18	44.15
Hancock	160	40	35.50	.75	5,680.00		25				29.04	29.04	736.00	9,217.24	15,633.24	103.46
Hardin	173	21	15.75	.75	3,287.62									1,548.71	4,836.36	27.80
Harrison	167	30	21.60	.60	3,622.58									5,232.11	8,854.70	52.71
Henry	126	62	43.48	.70	5,479.05									7,992.40	12,471.22	101.80
Howard	120	19.06	14.30	.75	1,715.84									1,832.10	3,548.03	29.01
Humboldt	135	25	25.50	.75	3,433.97									2,303.77	5,737.00	44.47
Ida	133	26	19.01	.75	2,328.61									2,548.78	5,077.39	38.40
Iowa	173.25	31.37	25.00	.80	4,348.37									1,808.18	6,156.55	36.00
Jackson	156	31	22.43	.73	3,510.66									12,341.49	15,851.55	97.80
Jasper	203	30	20.50	.70	4,904.00									11,082.00	16,886.00	104.13
Jefferson	159	24	23.39	.70	4,780.75	12	24					30.07	1,201.00	3,086.00	9,062.31	47.94
Johnson	127	47.76	30.81	.75	5,622.14									5,760.50	11,382.39	72.15
Jones	180	21	22.88	.75	4,118.97									2,530.20	6,649.22	36.71
Keokuk	170	30.8	25.91	.65	4,405.22									19,137.47	23,542.79	140.70
Kossuth	285	26.2	19.76	.73	5,631.71									9,308.87	15,000.56	59.87
Lee	150	42.3	31.80	.70	4,752.02									16,416.26	21,169.07	141.13
Linn	200		25.77		5,103.40									16,619.01	21,162.50	96.51
Louisa						3.06	101	29	.80	30.65	.30	86.24	4,157.35	5,520.83	9,690.28	88.90
Lucas	140	37.5	26.56	.70	2,676.72									2,007.94	5,684.66	41.50
Lyon	197	15	11.25	.75	2,200.81									2,914.17	5,115.98	27.18
Madison	163		29.15	.75	4,644.41									1,531.51	6,175.92	40.59
Mahaska	130	23	35.48	.80	4,612.06		133					1.98	329.82	2,092.10	8,703.96	65.04
Marion	170	25	31.32	.78	5,370.25									6,374.74	11,744.99	70.41
Marshall	177	36	27.58	.75	4,882.44									6,411.74	11,294.18	60.11
Mills	115	50	30.00	.60	1,891.84									2,419.56	4,311.40	39.19
Mitchell					2,379.42									8,572.67	10,952.09	86.92
Monona	174	28.75	23.00	.80	4,003.07									3,614.43	7,617.50	49.15
Monroe	140	29	20.01	.75	2,906.06									3,919.90	6,825.96	47.44
Montgomery	127	37.1	25.98	.70	3,299.47									8,387.67	11,687.14	93.06
Muscatine	130	44.28	32.21	.75	4,423.24									3,059.34	7,482.58	56.34
O'Brien	180.5	22.1	16.58	.75	3,081.92									2,914.56	5,996.49	32.13
Osceola	110	24	18.13	.75	1,994.92									735.60	2,730.52	26.61
Page	173	21	22.12	.75	5,622.82									2,487.07	8,109.89	19.81
Palo Alto	153.25	25	18.64	.75	2,857.44									3,016.00	5,873.44	36.53
Plymouth	212	24	20.26	.75	4,295.14									2,001.00	6,796.19	30.19
Pocahontas	160	24	16.72	.77	3,143.54									4,073.73	7,217.27	42.82
Polk	54	32	32.00	1.00	2,806.06		1.18	82	1	32	54.21	308.21	12,227.50	2,467.43	17,512.99	97.29
Pottawattamie	286	29.4	22.05	.75	6,306.25									13,318.86	19,625.12	77.29
Poweshiek	158.6	25	25.20	.80	4,082.34									3,637.41	7,719.75	72.89
Ringgold	175	30	15.00	.50	2,625.00									3,900.00	6,575.00	32.95
Sac	150	20	17.37	.75	2,527.43									2,501.00	5,028.43	34.04
Scott	139	17.43	29.64	.85	4,119.74									1,323.28	5,622.02	41.62
Shelby	60	30	22.54	.75	3,606.74									7,909.91	11,506.65	73.65
Sioux	213.25	19.28	14.41	.75	3,077.60									3,393.07	6,470.67	29.98
Story	133	20	26.51	.75	3,326.34	43	133						2,165.30	4,208.80	9,500.34	37.29
Tama	210	27	21.90	.80	4,601.33									6,857.95	11,459.28	53.21
Taylor	180	26.85	22.11	.60	3,979.80									2,432.11	6,411.90	37.29
Union	162	22.5	13.60	.60	2,203.37									6,008.80	8,902.17	54.52
Van Buren	132		31.39		4,161.84									4,561.04	8,722.88	65.68
Wapello	125	30	36.20	.80	4,542.66									3,034.78	7,577.44	62.21
Warren	165	22	31.85	.70	5,256.07									6,854.29	12,110.36	71.24
Washington	172	25	29.84	.80	6,823.36									7,836.79	10,656.15	60.29
Wayne	173	27	26.88	1.00	4,628.08									5,442.19	10,110.39	60.54
Webster	184.25	32.81	32.81	1.00	6,044.92									3,359.78	9,404.10	51.10
Winnebago	128	25	18.75	.75	2,400.00									2,835.85	5,235.85	40.64
Winneshiek	203	24	24.26	.80	4,925.52									8,643.90	13,530.83	66.08
Woodbury	222	37	27.65	.49	6,158.16									7,277.93	13,436.09	60.08
Worth	100	14	10.67	.76	1,088.62									6,805.56	7,894.18	68.94
Wright	175	24.66	18.51	.75	3,240.25									11,538.33	14,778.58	85.17
Totals	14,927.45	29.2	$24.09	$ .74	$ 382,379.65	13.77	847.0	31.2	$ .74	828.79	846.94	900.57	$ 27,282.95	$ 542,477.56	$ 922,141.14	$ 59.77

SUMMARY TABLE NO. 10.

Road Equipment and Material and Miscellaneous Items—County Expenditures.—Annual Reports of County Engineers.

County	Equipment and Material: Cost of equipment including repairs to same	Equipment and Material: Cost of unused material	Equipment and Material: Total	Miscellaneous: Railroad Crossings Improved: No.	Railroad Crossings Improved: Cost	Gravel Pits Purchased: No.	Gravel Pits Purchased: Cost	Right of way	Drainage assessment	Miscellaneous	Total miscellaneous
Adair	$ 1,985.23		$ 1,985.23					$ 630.00			$ 630.00
Adams	795.10		795.10					175.00		$ 14.91	219.91
Allamakee	671.51		671.51					901.25		107.89	1,009.14
Appanoose	765.56		765.56	3	$ 741.49			465.12		509.65	1,716.27
Audubon	2,481.70		2,481.70					470.00			470.00
Benton	1,000.80		1,000.80					251.25			251.25
Black Hawk	1,513.25		1,513.25			4	$ 3,733.00			225.49	3,958.49
Boone	3,032.01		3,032.01					2,071.00	$ 994.67	771.79	3,837.46
Bremer	2,176.85	873.21	3,050.06			2	300.00			1,232.83	1,532.83
Buchanan	216.80		216.80							2,098.35	2,098.35
Buena Vista	4,371.21		4,371.21			5	1,647.75	2,352.19	2,823.18	239.40	7,062.52
Butler	15,852.46	493.17	16,345.63			5	901.14	155.00			1,056.14
Calhoun	1,899.24	111.73	2,010.97	1	517.25	2	1,264.72	50.00	5,023.63	686.40	7,541.83
Carroll	1,910.33	92.40	2,002.73					157.90	100.00	1,148.16	1,406.06
Cass	375.26	1.98	377.24					1,508.90	125.00		1,723.90
Cedar	905.68		905.68					277.50		203.28	480.78
Cerro Gordo	1,127.44	111.89	1,239.33	1	69.08	3	1,003.00	546.30	391.79	794.22	2,804.45
Cherokee	2,877.44		2,877.44							1,321.06	1,321.06
Chickasaw	2,709.10		2,709.10	1	75.50	1	240.00	75.00		121.25	511.75
Clarke	783.05		783.05	1	696.19			1,315.00		616.80	2,627.99
Clay	1,288.42		1,288.42			2	1,600.00		672.50	5,196.24	7,468.74
Clayton	706.58	70.52	777.10					11.40		2,099.64	2,111.04
Clinton	311.15	229.90	541.05	1	35.25			1,630.10	78.50	1,144.75	2,888.60
Crawford	95.80		95.80					1,923.37		90.35	2,013.72
Dallas	9,370.37		9,370.37	1	774.86	2	398.22	1,337.47		1,890.30	4,398.85
Davis	1,664.64		1,664.64					439.20		1,773.92	2,208.12
Decatur	532.13		532.13					792.80		1,036.79	1,829.59
Delaware	4,481.32	66.06	4,547.38			2	825.00	95.00	160.15	748.45	1,828.60
Des Moines	3,531.31		3,531.31						129.16	4,770.94	4,900.10
Dickinson	1,326.48		1,326.48			2	350.00		296.29	2,390.30	3,036.59
Dubuque	843.67		843.67	3	11,850.00					47.13	11,897.13
Emmet	753.99		753.99			1	175.00		3,528.35	6,886.26	10,589.61
Fayette	3,835.61	812.65	4,648.26	2	246.51			1,592.12		2,276.69	4,115.32
Floyd	1,294.85		1,294.85			1	300.00	84.25		79.75	464.00
Franklin	4,048.24		4,048.24			3	975.00	58.33	4,203.25	150.00	5,386.58
Fremont	1,736.84	73.17	1,810.01					1,553.90		359.15	1,913.05
Greene	179.06	48.01	227.07			1	292.70	45.30	8,707.63	2,854.63	11,900.26
Grundy	1,995.77		1,995.77							106.67	106.67
Guthrie	5,579.56	174.30	5,753.86					235.67			235.67
Hamilton	4,714.78		4,714.78					120.00	199.85	517.01	836.86
Hancock	1,582.47		1,582.47			1	400.00		497.42		897.42
Hardin	718.13		718.13					1,241.63	634.97	468.79	2,345.39
Harrison	1,610.99	626.74	2,237.73					995.85		231.75	1,227.60
Henry	4,387.54		4,387.54					1,092.25		795.99	1,888.24
Howard	817.75		817.75							2,000.78	2,000.78
Humboldt	642.13		642.13					205.00		112.05	317.05
Ida	1,389.95		1,389.95							2,028.71	2,028.71
Iowa	1,218.03		1,218.03	1	244.70			1,111.45		100.00	1,456.15
Jackson	565.72		565.72					201.00		281.21	482.21
Jasper	6,835.77	45.54	6,881.31	1	99.50			680.60		248.83	1,028.93
Jefferson	5,305.49		5,305.49					967.80		7,249.79	8,217.59
Johnson	2,895.49		2,895.49					366.00		1,140.32	1,506.32
Jones	235.65		235.65					105.00		1,271.74	1,376.74
Keokuk	2,772.64		2,772.64							78.00	78.00
Kossuth	1,581.92		1,581.92			3	721.16	255.00	1,305.00	490.09	2,771.25
Lee	1,475.19		1,475.19							300.98	300.98
Linn	4,025.92		4,025.92					440.00		135.00	575.00
Louisa	741.60		741.60					140.00		603.00	743.00
Lucas	523.78		523.78	1	77.70			60.00		341.60	479.30
Lyon	2,297.11	334.61	2,631.72			1	270.00				270.00
Madison	2,800.98		2,800.98					1,673.92		790.40	2,464.32
Mahaska	6,821.42	469.75	7,291.17	3	64.80			435.00		302.13	801.93
Marion	2,019.04	183.29	2,202.33	1	710.00			2,222.80		545.89	3,478.69
Marshall	1,420.87		1,420.87			2	353.90	125.75		2,298.39	2,778.04
Mills	231.95		231.95	2				1,167.03			1,167.03
Mitchell	3,808.36		3,808.36							3,025.47	3,025.47
Monona	2,047.25		2,047.25					415.50	1,100.00	607.85	2,123.35
Monroe	5,145.09	43.15	5,188.24					2,070.84		164.50	2,235.34
Montgomery										135.15	135.15
Muscatine	2,462.96		2,462.96	2	938.75			632.12		508.14	2,079.01
O'Brien	1,156.72	161.12	1,317.84							1,518.81	1,518.81
Osceola	118.60		118.60								
Page	2,729.93		2,729.93					1,680.00		4,343.77	6,023.77
Palo Alto	907.75		907.75	1	250.00				125.00	2,145.72	2,520.72

SUMMARY TABLE NO. 10.—Continued.

County	Equipment and Material			Miscellaneous							
	Cost of equipment including repairs to same	Cost of unused material	Total	Railroad Crossings Improved		Gravel Pits Purchased		Right of way	Drainage assessment	Miscellaneous	Total miscellaneous
				No.	Cost	No.	Cost				
Plymouth	1,600.56		1,600.56		69.20			3,155.25		2,342.14	5,566.59
Pocahontas	6,841.13	771.48	7,612.61			3	1,347.39		4,086.30	6,230.63	11,664.32
Polk	8,445.86		8,445.86	1	234.50	1	125.00	30.00		1,417.00	1,797.50
Pottawattamie	5,692.64		5,692.64					627.35	1,297.02	538.77	2,463.14
Poweshiek	1,180.94		1,180.94	1	3,000.00			487.67		1,218.49	4,706.16
Ringgold	1,422.60		1,422.60	1	1,000.00			590.00		773.00	2,359.00
Sac	278.38		278.38					1,350.00		1,022.75	3,372.75
Scott	2,837.74		2,837.74					300.00		1,532.17	1,732.17
Shelby	283.90		283.90					500.10			500.10
Sioux	1,467.71		1,467.71							264.00	264.00
Story	622.30		622.30			8	3,619.29	361.50	700.00	300.00	5,080.45
Tama	5,398.69		5,398.69					393.50		324.29	687.79
Taylor	585.14		585.14								
Union	223.90		223.90	1	319.53			661.80			981.33
Van Buren	7,004.11		7,004.11					681.00		440.54	1,121.54
Wapello	1,775.87		1,775.87	1	473.30			1,358.78		982.18	2,814.26
Warren	5,466.72		5,466.72					1,434.85			1,434.85
Washington	538.66		538.66					113.00			113.00
Wayne	1,081.84		1,081.84					474.27			474.27
Webster	882.80		882.80					165.00	1,365.00	99.90	1,629.90
Winnebago	3,279.41		3,279.41							6,031.81	6,031.81
Winneshiek	1,989.39		1,989.39					589.00		530.41	1,119.41
Woodbury	2,058.46		2,058.46					1,566.65	1,000.00	245.30	2,751.95
Worth	4,004.69		4,004.69			1	330.00				330.00
Wright	1,928.42		1,928.42			9	2,386.75	15.00	420.04	2,096.47	4,918.26
Total	$237,155.80	$5,806.67	$242,962.47	31	$ 22,577.00	69	$ 24,626.09	$ 54,347.78	$ 46,560.33	$107,873.53	$ 249,435.65

SUMMARY TABLE NO. 11.

Road Construction.—Township Expenditures.—Annual Reports of County Engineers.

County	No. of townships each county	No. townships reporting	Temporary work	Permanent work	Repairs	Maintenance	Equipment and unused material	Filling bridges and culverts and placing temporary culverts	Miscellaneous	Total
Adair	20									
Adams	12	12							$ 24,251.52	$ 24,251.52
Allamakee	18	14	$ 4,294.00		$ 8,188.23	$ 4,791.32	$ 844.04	$ 2,574.22	2,901.59	25,593.90
Appanoose	18	18			15,336.22	4,929.24	346.56	5,910.83	940.30	27,463.15
Audubon	12	12	8,460.15		4,691.70	5,465.70	1,139.73	4,091.92	2,256.55	26,025.75
Benton	20	20	11,710.00	$ 1,900.00	8,046.00	9,720.00	16,100.00	4,987.00	7,245.00	59,708.00
Black Hawk	18	18	5,648.65	1,236.86	16,068.10	8,257.55	7,985.67	1,823.12	2,713.04	43,733.00
Boone	17	17				8,425.12			40,067.68	48,500.21
Bremer	14	14	3,836.36	2,627.34	11,712.98	5,490.80	794.30	2,008.62	4,737.23	31,379.96
Buchanan	16	12	7,603.15	306.00	10,171.42	4,775.81	1,986.62	2,344.47	1,061.95	28,298.32
Buena Vista	18	12	7,749.87	3,809.36	6,305.60	6,240.61	2,017.38	2,934.57	10,258.61	39,316.00
Butler	16	16	17,107.84		8,443.01	7,149.31	622.06	2,214.77		35,536.99
Calhoun	16	16	15,709.91	6,221.78	2,971.20	8,613.49	5,309.44	3,809.88	17,594.80	60,505.50
Carroll	16	16	7,958.68	7,525.21	5,830.81	7,028.80	1,672.97	6,177.11	5,123.51	41,316.49
Cass	16	16	11,204.13		8,004.38	8,488.26	1,334.11	3,058.19	15.45	32,104.52
Cedar	18	18		495.15	29,750.34	9,717.85	3,452.18	1,584.13		44,999.65
Cerro Gordo	18	18	13,745.76	8,194.92	6,356.73	7,875.23	4,839.73	1,702.45	3,009.71	46,774.53
Cherokee	16	16	8,245.06	32.85	6,479.27	5,366.35	2,182.36	7,577.45	2,098.53	22,031.81
Chickasaw	12	7	7,334.00		2,723.78	2,488.05	1,860.82	1,797.32	4,296.43	20,500.50
Clark	12									
Clay	16	16	13,548.64	947.65	365.00	6,247.68	4,739.84	3,483.68	9,556.31	38,888.80
Clayton	22	17			21,849.83	6,700.00	1,334.56	1,426.64	1,034.88	32,345.91
Clinton	20	20	13,465.42		8,095.45	10,666.47	3,220.09	3,385.72	2,289.23	41,066.38
Crawford	21									
Dallas	16	16	4,584.99	1,457.27	16,256.84	9,090.10	4,933.94	4,767.32	5,604.54	46,643.00
Davis	15									
Decatur	16	16			22,009.05	4,796.27	1,230.00			28,035.32
Delaware	16	16	12,430.00		11,094.06	5,865.00	1,308.27	2,515.98	862.97	34,196.28
Des Moines	14	14		1,611.49	15,191.17	6,659.17	907.80	1,717.41	1,042.39	27,189.43

SUMMARY TABLE NO. 11.—Continued.

County	No. of townships each county	No. townships reporting	Temporary work	Permanent work	Repairs	Maintenance	Equipment and unused material	Filling bridges and culverts and placing temporary culverts	Miscellaneous	Total
Dickinson	12	12		16,206.68	3,331.61	3,254.85	800.59	833.41	300.36	21,906.70
Dubuque	18	7			10,608.96	2,603.14	184.27	2,325.45	1,779.01	17,703.82
Emmet	12	12	6,225.70	2,550.00	3,730.56	4,034.53	1,870.00	1,201.40	8,428.89	27,945.68
Fayette	20	20	33,855.62		10,000.00	10,145.62				54,000.85
Floyd	13									
Franklin	16	16	12,124.84	5,008.71	5,602.63	6,656.18	2,862.96	1,198.60	4,041.27	37,673.41
Fremont	13	13	22,007.56			5,018.47	579.33	2,016.88	8,270.00	28,094.80
Greene	16	16	5,507.30	19,275.45	3,700.85	5,884.38	3,150.06	1,430.24	6,295.47	47,304.61
Grundy	14	14							22,048.85	22,048.85
Guthrie	17	17	3,975.06	850.00	8,800.00	7,800.00	2,170.00	6,300.00	7,100.00	37,025.06
Hamilton	16	16	16,386.41	12,187.77	2,704.03	8,627.24	2,476.36	1,254.72	11,942.80	58,479.04
Hancock	16	16	12,574.00	1,600.00	3,881.12	5,670.00	1,700.00	1,700.00	7,282.70	34,408.82
Hardin	17									
Harrison	20	20	1,230.08	940.34	24,300.76	8,184.12	2,239.32	4,021.61	2,009.79	43,987.35
Henry	12									
Howard	12									
Humboldt	14	14			40,653.02	6,446.00			4,605.68	51,705.10
Ida	12	12	11,375.96		3,502.20	4,571.17	1,606.60	4,022.83	1,500.68	26,609.44
Iowa	18	18	2,463.27	9,064.48	7,276.45	8,870.41	2,420.98	4,705.63	1,242.70	37,043.02
Jackson	18	18			21,056.27	7,055.98	1,272.46	391.32	1,407.68	31,383.81
Jasper	19	19	12,600.00	4,300.00	12,240.00	10,150.00	1,845.00	5,560.00	5,060.00	51,865.00
Jefferson	12	12	2,640.30		11,233.29	7,097.94	1,702.29	7,467.42	3,822.26	33,963.50
Johnson	21	21	12,781.40		12,702.63	9,665.16	5,615.92	3,193.60	2,983.46	47,002.17
Jones	17	17	1,317.19		17,045.28	8,247.28	1,770.84	1,027.92	4,636.49	33,131.00
Keokuk	17	9		4,304.64	7,776.28	4,249.40	1,034.89	2,825.09	2,515.49	22,693.79
Kossuth	28	28	19,436.60	3,608.83	12,944.41	10,841.07	7,905.78	3,382.89	27,119.32	85,302.90
Lee	17	17		1,445.12	19,386.41	7,035.31	2,092.97	4,646.79	2,333.67	39,029.27
Linn	20	16	773.87	3,655.87	9,835.10	7,972.26	1,989.40	3,014.95	8,024.62	37,276.07
Louisa	12	12	800.00	5,000.61	5,363.28	6,632.16	615.78	4,970.40	3,678.53	27,030.29
Lucas	12	12			9,388.15	4,444.63	1,320.00	6,655.85	528.96	22,827.19
Lyon	18	18	8,305.74	3,347.78	4,329.30	10,037.12	2,640.50	3,299.15	1,926.05	37,838.64
Madison	16	16		162.96	18,352.84	6,364.97	1,300.00	5,560.00	1,400.00	33,772.77
Mahaska	19	19	4,132.80	6,650.24	5,221.72	5,474.65	1,825.29	8,501.46	11,150.33	47,022.27
Marion	15	15			12,143.39	7,284.52	1,516.16	12,517.72	1,782.09	35,548.81
Marshall	18	15	11,238.32	3,497.39	3,133.79	8,977.61	4,289.12	6,147.12	2,649.45	39,933.49
Mills	13	13	2,645.92	3,780.00	9,310.71	5,528.74	1,331.40	3,028.56	3,813.62	30,289.75
Mitchell	16	16			20,222.13	4,904.93	1,000.00			26,027.06
Monona	19									
Monroe	12	10	1,401.18		7,912.85	3,148.65	471.33	4,709.36	739.40	18,434.17
Montgomery	12	12	9,100.00		5,947.11	5,002.89	845.87	4,411.18	3,209.37	28,506.01
Muscatine	15	15	4,145.84	1,559.84	8,461.15	8,306.87	4,438.73	4,739.92	1,078.95	33,143.30
O'Brien	17	17	12,248.56	2,772.61	9,452.98	6,719.51	3,587.55	3,410.09	1,470.86	39,618.19
Osceola	12	12	8,623.82	1,454.17	2,771.84	5,415.93	2,724.28	3,305.62	1,002.72	25,007.70
Page	16	16	3,936.00	2,235.13	13,627.00	7,939.58	2,022.65	4,205.56	4,380.29	39,449.61
Palo Alto	16	16	13,209.35	8,584.20	15,651.65	5,302.13	3,441.64	2,649.15	2,538.38	50,830.50
Plymouth	24	24	27,189.76		782.70	11,673.27	2,278.08	126.30		42,051.21
Pocahontas	19	19	14,947.43	7,215.95	8,303.85	7,189.88	1,035.42	2,030.40	12,878.56	53,720.49
Polk	22	14	185.60		16,836.52	5,110.80		744.20		22,872.16
Pottawattamie	28									
Poweshiek	16	16	15,000.00	3,332.04	15,000.00	9,387.44				42,720.48
Ringgold	16									
Sac	16	16	13,861.59	5,200.27	8,958.95	8,947.21	954.15	4,632.29	2,800.19	44,855.15
Scott	16	16	7,920.02	2,701.12	12,108.33	8,309.61	2,021.04	1,719.08	2,398.62	37,197.82
Shelby	16	16			21,403.47	8,285.56	989.81	2,151.03	5,141.83	37,948.40
Sioux	23									
Story	16									
Tama	21	21	8,315.79	1,009.30	14,524.66	10,228.53	6,308.29	6,812.29	14,665.47	32,909.09
Taylor	17	17			17,684.02	6,700.54	1,822.48	5,874.30		32,171.94
Union	14									
Van Buren	14	14			20,064.10	4,596.98				24,661.08
Wapello	14	14	2,622.30	135.15	10,702.48	5,255.65	1,673.51	7,171.27	4,822.56	32,482.71
Warren	17	17	375.20		19,255.42	7,184.13	697.67	4,437.72	1,606.62	33,367.40
Washington	15	15	12,218.88		11,021.32	10,306.27	1,326.44	5,795.30	20.00	40,938.22
Wayne	16	16	1,397.48		8,137.50	5,746.05	2,020.66	8,868.18		26,175.79
Webster	24	24	10,945.30	7,576.22	7,387.27	8,783.54	9,869.04	1,475.31	7,717.35	53,554.07
Winnebago	12	11	3,563.57		14,712.49	5,204.95	435.96	339.30	8,390.71	32,715.97
Winneshiek	20									
Woodbury	24									
Worth	13	11	7,201.52	2,935.26	3,443.48	3,241.51	482.45	634.91	642.33	18,081.30
Wright	18	18	15,678.14	13,430.89	4,874.53	6,756.77	385.84	2,413.28	6,009.40	49,628.85
Total	1,645	1,300	$563,765.61	$208,211.11	$867,443.69	$593,563.79	$185,317.75	$270,541.86	$412,540.11	$3,072,023.91

SUMMARY TABLE NO. 12.

Classification of Road Construction.—Township Expenditures.—Annual Reports of County Engineers.

County	No. townships in county	No. townships reporting	Permanent Work: Built to finished grade	Permanent Work: Built to temporary grade	Permanent Work: Permanently surfaced	Permanent Work: Tile drainage	Temporary Work: Built to natural grade	Temporary Work: Filling bridges and culverts	Temporary Work: Hauling and placing temporary culverts	Total Cost: Township construction
Adair	20	9								
Adams	12	12								
Allamakee	18	14					$ 4,201.50	$ 2,574.22		$ 6,828.72
Appanoose	18	18						1,502.69	$ 4,408.74	5,910.85
Audubon	17	12					8,486.15	4,091.92		12,582.07
Benton	20	20			$ 650.00	$ 1,250.00	11,730.00	3,060.00	1,027.06	18,507.00
Black Hawk	18	18				1,280.86	5,648.65	1,426.69	306.43	8,708.65
Boone	17	17								
Bremer	14	14	$ 710.00	$ 1,633.54		284.00	3,826.59	1,296.87	781.75	8,222.75
Buchanan	16	12				206.00	7,662.15	2,344.47		10,213.62
Buena Vista	18	12		560.00		3,239.30	7,749.87	1,790.94	1,143.63	14,483.80
Butler	16	16					17,107.84	2,214.77		19,322.61
Calhoun	16	16	1,092.42	724.65		4,404.70	15,703.91	1,432.16	2,438.72	25,816.57
Carroll	16	16	1,380.00	1,137.98	3,902.80	1,044.43	7,958.08	4,119.71	2,057.40	21,600.40
Cass	16	16					11,204.13	2,535.34	322.85	14,302.32
Cedar	18	18				405.15			1,584.13	2,079.28
Cerro Gordo	18	18				8,194.22	13,745.76	1,230.19	463.30	23,702.45
Cherokee	16	16		32.85			8,245.00	5,275.75	2,301.70	15,875.30
Chickasaw	12	7					7,334.90	1,737.32		9,072.45
Clarke	12	0								
Clay	16	16	947.65				13,548.64	3,483.68		17,979.97
Clayton	22	17						1,426.64		1,426.64
Clinton	20	20					13,400.42	750.00	2,635.72	16,822.14
Crawford	21	0								
Dallas	16	16	1,000.00	279.05		78.22	4,554.20	4,037.02	730.30	10,730.58
Davis	15	0								
Decatur	16	16								
Delaware	16	16					12,430.00	2,230.00	285.08	14,945.08
Des Moines	14	14	1,270.35			380.04		887.33	800.69	3,338.99
Dickinson	12	12		10,998.13	28.50	5,189.65		853.41		17,069.69
Dubuque	18	7						2,198.45		2,198.45
Emmet	12	12				2,650.00	6,389.70	900.40	501.00	10,181.10
Fayette	20	20					23,890.03			23,890.03
Floyd	13	0								
Franklin	16	16	2,984.92			2,083.79	12,124.84	910.79	287.87	18,392.21
Fremont	13	15					12,967.50	2,038.88		15,006.38
Greene	16	16	7,603.22	4,130.77	7,161.40		5,507.20	1,222.82	197.42	26,204.03
Grundy	14	14								
Guthrie	17	17				850.00	3,975.00	3,400.00	3,500.00	11,725.00
Hamilton	16	16			1,843.12	10,344.65	16,320.41	1,254.72		29,822.90
Hancock	16	16	1,650.00				12,574.00	800.00	900.00	15,924.00
Hardin	17	0								
Harrison	20	20	950.50				1,216.08	3,205.81	735.83	6,172.59
Henry	12	0								
Howard	12	0								
Humboldt	14	14								
Ida	12	12					11,375.96	1,615.09	2,407.74	15,398.79
Iowa	18	18	782.15	9,088.99	25.00	58.34	3,463.27	3,128.46	1,577.17	17,123.38
Jackson	18	18								
Jasper	19	19		3,858.08		71.48	11,237.73	3,311.96	1,496.67	20,165.92
Jefferson	12	12					2,640.30	6,168.90	1,298.52	10,107.72
Johnson	21	21					12,781.40	2,441.54	752.06	15,975.00
Jones	17	17					1,517.19	927.92	1,000.00	3,445.11
Keokuk	17	0		4,304.64				2,823.09		7,127.73
Kossuth	28	28				3,091.85	19,416.00	3,236.10	746.79	26,491.32
Lee	17	17			1,445.12			3,671.31	975.48	6,091.91
Linn	20	16		4,432.74	433.13	770.00	773.87			6,429.74
Louisa	12	12	1,508.96	3,414.26		76.82	800.00	4,271.02	699.41	10,770.47
Lucas	12	12						3,631.16	2,424.69	6,055.85
Lyon	18	18		5,307.97	83.75		8,965.74	2,833.87	565.28	17,676.61
Madison	16	16				102.96		3,500.00	2,000.00	5,602.96
Mahaska	19	19		6,006.55	200.00	444.79	4,152.89	6,376.10	2,125.36	19,305.69
Marion	15	15						8,117.72	4,400.00	12,517.72
Marshall	18	15	802.00	2,379.53		315.67	11,259.32	4,812.28	1,334.84	20,903.64
Mills	13	13		3,790.60			2,645.92	3,085.16	553.40	10,075.08
Mitchell	16	16								
Monona	19	0								
Monroe	12	10					1,401.18	2,886.68	1,892.68	6,170.54
Montgomery	12	12					9,100.00	2,800.00	1,611.18	13,511.18
Muscatine	15	15	1,020.95			228.91	4,143.84	3,693.96	1,158.00	10,302.60
O'Brien	17	17		734.15		2,038.46	12,748.59	2,928.46	480.63	18,431.29
Osceola	12	12				1,434.17	8,023.82	3,566.02		13,093.61
Page	16	16		1,840.00		295.13	3,950.00	1,805.54	2,400.00	10,290.67
Palo Alto	16	16	1,085.40			7,498.80	13,309.35	550.98	2,098.17	24,442.70
Plymouth	24	24								27,316.20

SUMMARY TABLE NO. 12.—Continued.

County	No. townships in county	No. townships reporting	Permanent Work: Built to finished grade	Permanent Work: Built to temporary grade	Permanent Work: Permanently surfaced	Permanent Work: Tile drainage	Temporary Work: Built to natural grade	Temporary Work: Filling bridges and culverts	Temporary Work: Hauling and placing temporary culverts	Total Cost: Township construction
Pocahontas	19	19			160.00	7,052.95	11,947.43	1,390.13	700.27	24,251.78
Polk	22	14					181.60	464.90	279.30	925.80
Pottawattamie	23	0								
Poweshiek	16	16								35,342.94
Ringgold	16	0								
Sac	16	16	1,106.67		1,214.02	2,919.58	13,961.99	2,592.34	479.05	23,094.75
Scott	16	16	2,701.12				7,030.06	871.28	847.80	11,440.33
Shelby	16	16							2,131.63	2,131.63
Sioux	23	0								
Story	16	0								
Tama	21	21				1,006.30	8,515.79	5,174.30	1,637.93	16,337.38
Taylor	17	17						4,432.45	1,140.85	5,573.30
Union	14	0								
Van Buren	14	14								
Wapello	14	14	135.15	634.32			2,622.20	5,183.20	1,988.07	10,562.13
Warren	17	17					375.00	3,264.41	1,173.21	4,812.62
Washington	15	15					12,218.88	5,795.36		18,014.24
Wayne	16	16					1,397.40		8,898.18	10,295.58
Webster	24	24		1,533.25		6,042.97	10,945.34	944.74	530.37	19,006.87
Winnebago	12	11					3,563.57	320.30		3,883.87
Winneshiek	20	0								
Woodbury	24	0								
Worth	12	11	570.23			2,364.51	7,201.22	417.37	257.54	10,791.49
Wright	18	18			5,124.70	10,305.10	13,678.14	1,687.78	223.50	31,592.31
Totals			$ 29,572.41	$ 67,402.49	$ 20,371.60	$ 91,558.27	$562,763.51	$186,884.86	$ 83,857.90	$ 1,043,022.14

SUMMARY TABLE NO. 13.

Road Repairs and Maintenance—Township Expenditures—Annual Reports of County Engineers.

County	Maintenance: No. of townships in county	Maintenance: No. of townships reporting	Maintenance: No. of miles regularly dragged	Maintenance: Average number of times dragged	Maintenance: Average cost per mile of road	Maintenance: Average cost per mile one round trip	Maintenance: Total cost of dragging	Total cost of repairs	Total cost of repairs and maintenance
Adair	20	0							
Adams	17	12							
Allamakee	18	14					$ 4,791.32	$ 8,188.23	$ 12,979.55
Appanoose	18	18	594	14	$ 8.39	$ .58	4,929.24	15,326.22	20,255.46
Audubon	12	12	500	16.83	10.93	.65	5,465.70	4,601.70	10,067.40
Benton	20	20				.70	9,730.00	8,040.00	17,760.00
Black Hawk	18	17				.80	8,237.55	16,668.10	24,905.65
Boone	17	17					8,423.12		8,423.12
Bremer	14	14	284	22	19.33	.75	5,499.80	11,712.98	17,212.78
Buchanan	16	12	455	21	10.50	.50	4,775.81	10,171.42	14,947.23
Buena Vista	18	12	172	24.4	18.30	.75	6,240.61	6,305.60	12,546.21
Butler	16	16					7,149.31	8,442.01	15,591.32
Calhoun	16	16	658	17.5	13.14	.75	8,613.49	2,971.20	11,584.69
Carroll	16	16					7,028.80	5,820.81	12,849.61
Cass	16	16				.60	8,488.36	8,004.78	16,492.04
Cedar	18	18	500	25.9	19.43	.75	9,717.85	29,730.34	39,448.19
Cerro Gordo	18	18	725	14.5	10.84	.75	7,875.23	6,356.73	14,231.96
Cherokee	16	16				.78	5,396.35	6,479.37	11,874.02
Chickasaw	13	7	250	14	9.95	.75	2,488.05	2,723.78	5,211.83
Clarke	12	0							
Clay	16	16					6,247.68	365.00	6,612.68
Clayton	22	17				.67	6,700.00	21,849.83	28,549.83
Clinton	20	20	850	17.9	12.53	.73	10,695.47	8,035.45	18,731.92
Crawford	21	0							
Dallas	16	16	780	15.5	11.62	.75	9,030.10	16,256.84	25,316.94
Davis	15	0							
Decatur	16	16			5.33	.60	4,796.27	22,009.05	26,805.32
Delaware	16	16					5,865.00	11,094.06	16,959.06
Des Moines	14	14					6,679.17	13,191.17	21,870.34

SUMMARY TABLE No. 13—Continued

County	Maintenance							Total cost of repairs	Total cost of repairs and maintenance
	No. of townships in county	No. of townships reporting	No. of miles regularly dragged	Average number of times dragged	Average cost per mile of road	Average cost per mile one round trip	Total cost of dragging		
Dickinson	12	12				.75	3,254.86	3,321.81	6,576.66
Dubuque	18	7					2,692.14	10,028.96	12,721.10
Emmet	12	12	420	14.96	9.36	.68	4,014.55	2,739.56	7,754.09
Fayette	20	20					10,145.62	10,000.00	20,145.62
Floyd	12	0							
Franklin	16	16					6,656.18	5,642.63	12,298.81
Fremont	13	13					5,018.47		5,018.47
Greene	16	16				.63	5,884.28	5,706.85	11,591.13
Grundy	14	14							
Guthrie	17	17	500	20.8	15.60	.75	7,800.00	8,800.00	16,600.00
Hamilton	16	16				.75	8,692.24	2,504.00	11,196.24
Hancock	16	16	400	19	14.12	.75	5,650.00	3,881.12	9,531.12
Hardin	17	0							
Harrison	20	20				.60	8,184.12	24,390.76	32,574.88
Henry	12	0							
Howard	12	0							
Humboldt	14	14	480	17		.75	6,446.66	40,653.62	47,100.28
Ida	12	12				.75	4,571.17	3,592.20	8,163.37
Iowa	18	18	978	12.1	9.08	.75	8,870.41	7,276.45	16,146.86
Jackson	18	18				.71	7,055.98	21,056.37	28,112.35
Jasper	19	19					10,150.00	12,240.00	22,390.00
Jefferson	12	12	670		10.60	.65	7,097.94	11,223.29	18,321.23
Johnson	21	21	1,113	11.6	8.69	.75	9,665.16	12,762.63	22,427.79
Jones	17	17					8,247.28	17,045.28	25,292.56
Keokuk	17	9				.66	4,249.40	7,756.28	12,005.68
Kossuth	28	28				.75	10,841.97	12,944.41	23,786.38
Lee	17	17	504.7	18.65	11.86	.64	7,055.31	19,385.41	26,440.72
Linn	20	16					7,972.20	9,825.16	17,797.36
Louisa	12	12					6,032.16	5,300.28	11,332.44
Lucas	12	12	523	14	8.50	.61	4,444.63	9,368.15	13,812.78
Lyon	18	18					10,037.12	4,539.30	14,576.42
Madison	16	16					6,894.97	18,358.94	25,253.91
Mahaska	19	19	774	17.50	13.39	.71	9,474.66	5,391.73	14,866.39
Marion	15	15	600	19	17.14	.68	7,384.38	12,448.39	19,727.91
Marshall	18	15	697.3	19.3	15.10	.67	8,977.01	3,132.79	12,110.80
Mills	13	13	400	13	20.00	.60	5,502.74	9,316.71	14,869.45
Mitchell	16	16				.75	4,804.93	20,292.13	25,077.08
Monona	19	0							
Monroe	12	10	400	10		.70	3,148.06	7,912.80	11,060.86
Montgomery	12	12	500	16	10.11	.63	5,032.89	5,947.11	11,000.00
Muscatine	15	15	443	25.56	18.65	.73	8,300.87	8,461.15	16,762.02
O'Brien	17	17	677.25	13.2	9.92	.75	6,719.51	9,432.98	16,173.49
Osceola	12	12	400	18	13.74	.75	5,415.90	2,771.84	8,187.74
Page	16	16				.76	7,919.98	13,627.00	21,546.98
Palo Alto	16	16	330	16	10.10	.65	5,302.13	15,051.00	20,413.18
Plymouth	24	24	1,100	12.2	10.61	.80	11,673.27	782.70	12,455.97
Pocahontas	19	19					7,190.88	8,362.85	15,553.73
Polk	23	14					5,110.83	16,836.53	21,947.36
Pottawattamie	28	0							
Poweshiek	16	16				.60	9,387.44	15,000.00	24,387.44
Ringgold	16	0							
Sac	16	16	700	17	12.50	.73	8,947.31	8,958.95	17,906.26
Scott	16	16	400	11.3	17.08	.75	8,309.61	12,168.33	20,477.94
Shelby	16	16	780	15	10.50	.70	8,292.26	21,403.47	29,695.73
Sioux	22	0							
Story	16	0							
Tama	21	21	908	14	10.50	.75	10,223.23	14,524.66	24,747.89
Taylor	17	17					6,790.54	17,684.62	24,475.16
Union	14	0							
Van Buren	14	14	951		4.94		4,596.93	20,064.70	24,661.63
Wapello	14	14	420	20	12.60	.50	5,295.05	10,762.48	16,057.53
Warren	17	17	800	15	8.98	.60	7,184.13	19,265.42	26,449.55
Washington	15	15	600	14	17.00	.65	10,306.27	11,091.32	21,397.59
Wayne	16	16	638	12	9.00	.75	5,746.05	8,137.50	13,883.55
Webster	24	24	732	15	12.00	.80	8,783.54	7,387.27	16,170.81
Winnebago	12	11					5,264.95	14,712.49	19,977.44
Winneshiek	20	0							
Woodbury	24	0							
Worth	13	11	369	12	9.12	.76	3,241.51	3,443.48	6,684.99
Wright	18	18					6,756.77	4,874.53	11,631.30
Total	1,645	1,300		16.34		$ .70	$ 563,563.79	$ 887,443.69	$ 1,450,907.48

SUMMARY TABLE NO. 14.

Road Equipment and Material and Miscellaneous Items—Township Expenditures—Annual Reports of County Engineers.

County	No. of townships in county	No. of townships reporting	Cost of equipment and unused material	Miscellaneous: R. R. Crossings improved: No.	Miscellaneous: R. R. Crossings improved: Cost	Miscellaneous: Drainage assessments	Miscellaneous: Miscellaneous	Miscellaneous: Total miscellaneous
Adair	20	0						
Adams	12	12					$ 74,251.26	$ 74,251.26
Allamakee	18	14	$ 844.04				2,501.39	2,501.39
Appanoose	18	18	316.96				940.30	940.30
Audubon	12	12	1,139.73				2,236.55	2,236.55
Benton	20	20	16,100.00				7,250.00	7,250.00
Black Hawk	18	18	7,585.67	1	$552.00	37.48	2,324.46	2,713.94
Bremer	14	14	794.20				4,777.75	4,777.75
Boone	17	17					40,037.68	40,037.68
Buchanan	16	12	1,986.62				1,491.65	1,491.65
Buena Vista	18	15	2,917.38			6,956.05	3,562.59	10,518.64
Butler	16	16	612.60					
Calhoun	16	16	5,560.44			11,627.06	5,952.14	17,579.20
Carroll	16	16	1,672.97			1,469.42	3,781.09	5,250.51
Cass	16	16	1,334.14			15.45		15.45
Cedar	18	18	3,422.18					
Cerro Gordo	18	18	4,859.73				3,999.71	3,999.71
Cherokee	16	16	2,183.30				2,098.53	2,098.53
Chickasaw	12	7	1,895.92				4,239.43	4,239.43
Clarke	12	0						
Clay	16	16	4,759.84					
Clayton	22	17	1,354.56				9,506.31	9,506.31
Clinton	20	20	2,220.09				1,694.88	1,694.88
Crawford	21	0					2,289.23	2,289.23
Dallas	16	16	4,931.94				5,601.54	5,601.54
Davis	13	0						
Decatur	16	16	1,760.03					
Delaware	16	16	1,308.27				982.97	982.97
Des Moines	14	14	967.80				1,042.39	1,042.39
Dickinson	12	12	860.39				399.36	399.36
Dubuque	18	7	184.27				1,779.01	1,779.01
Emmet	12	12	1,850.00			7,220.00	839.89	8,059.89
Fayette	20	20						
Floyd	12	0						
Franklin	16	16	2,993.06			1,402.14	2,639.18	4,041.32
Fremont	12	13	309.21				8,220.69	8,220.69
Greene	16	16	3,150.96				6,365.45	6,365.45
Grundy	14	14					22,048.85	22,048.85
Guthrie	17	17	2,150.00				7,150.00	7,150.00
Hamilton	16	16	2,476.10			11,632.78	3,910.02	14,542.80
Hancock	16	16	1,300.00			7,582.70		7,582.70
Hardin	17	0						
Harrison	20	20	2,336.32			1,352.85	1,550.94	2,903.79
Henry	12	0						
Howard	12	0						
Humboldt	14	14				4,605.68		4,605.68
Ida	12	12	1,606.60				1,500.68	1,500.68
Iowa	18	18	2,420.98				1,042.70	1,042.70
Jackson	18	18	1,272.46				1,467.68	1,467.68
Jasper	19	19	1,945.00				5,080.00	5,080.00
Jefferson	12	12	1,582.26				2,952.26	2,952.26
Johnson	21	21	5,015.90				2,982.46	2,982.46

SUMMARY TABLE No. 14—Continued

County	No. of townships in county	No. of townships reporting	Cost of equipment and unused material	Miscellaneous: R. R. Crossings improved: No.	Miscellaneous: R. R. Crossings improved: Cost	Miscellaneous: Drainage assessments	Miscellaneous: Miscellaneous	Miscellaneous: Total miscellaneous
Jones	17	17	1,730.84				4,626.49	4,626.49
Keokuk	17	9	1,034.89				2,515.49	2,515.49
Kossuth	28	28	7,995.78			21,642.84	5,476.48	27,119.32
Lee	17	17	2,002.97				2,333.67	2,333.67
Linn	16	16	1,989.40				8,024.02	8,024.02
Louisa	12	12	615.70				5,078.53	5,078.53
Lucas	12	12	1,399.00				538.90	538.90
Lyon	18	18	3,640.50				1,906.05	1,906.05
Madison	16	16	1,100.00				1,600.00	1,600.00
Mahaska	19	19	1,821.29				11,199.22	11,199.22
Marion	15	15	1,516.16				1,787.02	1,787.02
Marshall	18	15	4,249.12				2,649.45	2,649.45
Mills	13	13	1,531.40				3,813.02	3,813.02
Mitchell	16	16	1,900.00					
Monona	19	0						
Monroe	12	10	472.33				730.44	730.44
Montgomery	12	12	845.87				2,309.07	2,309.07
Muscatine	15	15	4,438.73				1,678.95	1,678.95
O'Brien	17	17	3,507.59				1,476.90	1,476.90
Osceola	12	12	2,754.23				1,002.72	1,002.72
Page	16	16	2,622.65			234.12	4,655.17	4,889.29
Palo Alto	16	16	3,441.64				2,539.58	2,539.58
Plymouth	24	24	2,278.96					
Pocahontas	19	19	1,666.42			9,488.65	3,390.91	12,879.56
Polk	22	14						
Pottawattamie	28	0						
Poweshiek	16	16						
Ringgold	16	0						
Sac	16	16	964.15			480.00	2,450.19	2,930.19
Scott	16	16	2,621.04				3,308.02	3,308.02
Shelby	16	16	959.83				5,141.83	5,141.83
Sioux	23	0						
Story	16	0						
Tama	21	21	6,308.29				4,655.47	4,655.47
Taylor	17	17	1,822.48					
Union	14	0						
Van Buren	14	14						
Wapello	14	14	1,673.81				4,892.56	4,892.56
Warren	17	17	497.07				1,606.02	1,606.02
Washington	15	15	1,536.44				20.00	20.00
Wayne	16	16	2,026.60					
Webster	24	24	9,009.04			5,580.17	2,137.18	7,717.35
Winnebago	12	11	435.95			8,399.71		8,399.71
Winneshiek	20	0						
Woodbury	24	0						
Worth	13	11	892.43					
Wright	18	18	385.84				642.25	642.25
Total	1,645	1,300	$180,317.75		$552.00	$ 99,077.16	$213,810.41	$ 413,740.11

SUMMARY TABLE NO. 15.

Progress Report—County Road Surveys and Construction During 1916 —Annual Reports of County Engineers.

County	Surveys and Profiles				Construction			
	No. of miles surveyed	No. of miles platted	No. miles grade grade line approved by dist. engrs.	No. of miles profile approved by commission	Built to natural grade, standard width	Built to temporary grade, standard width	Built to permanent grade, standard width	Surfaced
Adair	4.30	3.00	1.00	1.00	28.00			
Adams	3.00				60.50	1.00		
Allamakee	2.13	2.13	2.13	2.13			2.14	
Appanoose	32.50	32.50	1.0	1.00	4.00			
Audubon	7.00				20.75			
Benton	.50	.50	.50	.50			.50	
Black Hawk	11.79	5.67	32.40	32.40	38.00		2.27	2.10
Boone	1.00	12.00	2.00	10.00	37.75	1.00		10.75
Bremer	10.00	8.50	7.10	6.11	40.75		4.70	.75
Buchanan	.25	.25	1.80		37.00		2.25	2.25
Buena Vista	166.00	58.00	58.00	15.00	5.00		54.70	25.70
Butler	15.00	6.00	4.50	4.50	127.00		1.50	
Calhoun	34.00	45.75	43.00	39.75	30.25	2.00	34.80	10.74
Carroll	11.79	7.75	13.50	12.00	24.62	.25	11.38	
Cass	3.75	1.25	2.25	2.25			1.25	
Cedar	7.25	6.50	5.50	5.50			3.47	.58
Cerro Gordo	31.00	22.50	35.70	22.00			21.70	
Cherokee	11.00	14.00	17.54	17.54	28.60		18.50	
Chickasaw	12.25	8.00	6.00	4.00	40.00			
Clarke					48.75	.50	9.00	3.12
Clay	103.44	80.44	57.30	57.30	53.00			
Clayton	4.75	1.50	1.25		2.00		50.22	12.80
Clinton	14.50	14.50	11.31	11.31				
Crawford	14.75	14.75	5.00		18.50	.50	4.61	1.25
Dallas	23.90	15.50	10.90	13.50			21.34	
Davis					92.15	.70	1.00	6.35
Decatur	1.00				60.50			
Delaware	10.25	10.25	12.00	12.00	60.00			
Des Moines	4.00	4.00	1.00	1.00	28.00		5.00	2.70
Dickinson	71.46	70.23		22.00	18.75		1.50	
Dubuque	19.00	19.00	15.00		14.77		19.80	22.87
Emmet	32.37	25.37	38.92	37.42			3.10	1.17
Fayette					20.00		25.80	23.60
Floyd	5.80	2.80		5.60	80.75			
Franklin	42.00	9.10	4.50	2.85	35.00			
Fremont	1.62	3.12	3.12	3.12	28.75		13.35	11.25
Greene	7.50	7.75	5.75	4.75	30.75	1.85		
Grundy	65.00	5.00		1.00	5.50		3.62	19.17
Guthrie	10.75				67.50			
Hamilton	27.50	18.00	8.50	20.00	45.45		15.80	11.50
Hancock	22.37	20.25	12.50	24.00	15.00	5.50	3.75	6.75
Hardin	17.25	48.22	43.22	40.72	25.75		20.80	8.45
Harrison	9.50	4.10	4.10	3.50	35.50		7.00	
Henry	1.00	4.00						
Howard	8.00	8.00			31.00		4.50	5.13
Humboldt	4.00	4.00	20.00	20.00	11.00		14.00	6.00
Ida	1.00	1.00			71.00	.90		
Iowa	1.00		7.80	13.32	39.75			
Jackson	8.50	8.50	6.25	6.25			2.00	
Jasper	6.50	2.00	9.00	9.00	61.25	.15	2.50	
Jefferson	9.32	9.22	1.50	3.00	39.75		.60	

SUMMARY TABLE No. 15—Continued

County	Surveys and Profiles				Construction			
	No. of miles surveyed	No. of miles platted	No. miles grade grade line approved by dist. engrs.	No. of miles profile approved by commission	Built to natural grade, standard width	Built to temporary grade, standard width	Built to permanent grade, standard width	Surfaced
Johnson	27.50	14.50	4.50	4.50	28.25		.60	
Jones		1.50		1.50	116.00		.75	
Keokuk	25.10	25.10	9.00	7.10	100.25		2.10	
Kossuth	1.00	3.00	2.50	2.50	62.00	.50	12.40	5.00
Lee	.75	.75	.75		.75			.75
Linn	5.50	5.50	3.80	3.80	5.50	.25	.50	
Louisa	4.80	4.80				.20	2.50	
Lucas	2.00	2.00			56.25	.50		
Lyon	6.00	6.00			92.00			
Madison	20.62				14.88	.50		
Mahaska	12.00	8.00	.75	1.75	7.25	42.50	1.00	
Marion	.90	4.68	5.68	5.68	81.00		1.74	
Marshall					56.00			
Mills	2.00	1.75	1.25	.75	8.00	18.75	1.00	
Mitchell	1.00	1.00						3.50
Monona	5.00	5.00	2.82	2.82	48.25		.90	
Monroe	1.00	1.00						
Montgomery	11.00	11.00	10.00	1.00	64.75	2.75	2.00	
Muscatine	17.00	8.84	7.00	7.00	39.05	.75	7.40	1.20
O'Brien	11.65	20.15	14.50	15.50	44.50	.25	15.25	
Osceola	11.50	11.50	10.00	10.00	50.00		8.50	1.00
Page	2.75	2.75	2.25	1.50	10.00		.50	
Palo Alto	45.20	24.25	25.10	24.25	23.75		19.05	1.11
Plymouth					190.00			
Pocahontas	64.00	64.20	29.50	42.85			20.25	13.80
Polk	29.04	36.50	5.55		98.00		1.93	2.50
Pottawattamie	19.50	19.50			245.00	2.00		
Poweshiek					50.00		.75	
Ringgold		4.00					.50	
Sac	47.12	48.72	20.50	20.50			20.33	6.67
Scott	8.50	6.00	7.00	7.00	6.12	.20	6.50	2.70
Shelby					11.00	.40	.90	
Sioux	2.00	2.00	1.00	1.00	80.00			
Story	40.00	35.40	34.00	34.00			37.75	10.75
Tama	19.13	21.15	26.15	26.53	60.00	1.00	13.00	
Taylor	.71	.71	.71	.71	47.75		.37	
Union		.50						
Van Buren					68.00			
Wapello	7.00	6.50	6.00	6.00	27.00	3.50	2.50	
Warren								
Washington	3.00	3.00	.50	.50	72.24			
Wayne	6.00	4.00	4.00	2.00	32.75	1.00		
Webster	4.00	4.00		31.00	51.50		10.25	2.00
Winnebago	60.50	12.00	.50	.50	39.00		.50	
Winneshiek	7.75				96.00			
Woodbury	17.00	11.72	1.50	1.50		4.25	1.50	
Worth								
Wright	18.00	13.00	13.00	13.00	39.75		7.00	34.00
Total	1,425.19	1,108.62	773.02	790.09	3,680.88	107.88	625.22	276.98

SUMMARY TABLE NO. 16.

Progress Report—County Road Surveys and Construction—Total Work Done to January 1, 1917—Annual Reports by County Engineers.

County	Surveys and Profiles				Construction			
	No. of miles surveyed	No. of miles platted	No. miles grade grade line approved by dist. eng'rs	No. of miles profile approved by commission	Built to natural grade, standard width	Built to temporary grade, standard width	Built to permanent grade, standard width	Surfaced
Adair	36.99	15.00	9.00	2.00	53.94	10.50	2.00	
Adams	5.00	2.00	2.00	2.00	107.50	2.00		
Allamakee	22.50	23.50	10.41	6.01			22.50	
Appanoose	22.50	22.50	1.00	1.00	20.00			
Audubon	7.50	.50	.50		141.65		6.50	
Benton	79.50	51.30	42.60	42.50	186.00	3.75	5.50	1.00
Black Hawk	86.10	73.98	72.78	32.40	127.75	.28	7.64	10.43
Boone	54.80	20.80	20.00	20.00	20.73	6.20	28.60	10.73
Bremer	30.27	18.77	26.35	22.30	71.02		7.66	2.34
Buchanan	39.50	20.00	15.21	4.30	39.70	2.40	14.11	11.21
Buena Vista	273.00	123.28	105.02	41.92	96.85		96.49	29.11
Butler	37.75	24.75	12.25	4.50	144.50		1.50	5.25
Calhoun	111.75	107.00	102.75	28.50	109.25	5.25	75.75	14.24
Carroll	42.50	28.25	24.00	16.00	24.62	2.00	22.63	.31
Cass	8.75	5.50	5.50	2.25	.75	4.25	1.25	
Cedar	16.20	15.41	12.17	11.17	20.10	.97	9.14	.58
Cerro Gordo	76.02	62.40	63.00	61.00	54.10	4.10	25.41	2.00
Cherokee	35.00	28.00	41.54	41.54	71.00		42.50	
Chickasaw	30.50	30.25	18.00	4.00	90.00	4.50	9.00	3.72
Clarke					81.75			
Clay	165.74	179.74	71.90	57.30	2.00		60.42	31.60
Clayton	69.75	19.50	6.55	2.00	1.00	2.75		1.60
Clinton	52.54	52.54	35.64	13.75	60.72	1.55	25.00	10.35
Crawford	58.00	58.00	17.30	41.28	.98		55.02	
Dallas	52.98	44.23	21.05	38.23	114.65	.70	36.00	7.60
Davis					97.00			
Decatur	1.00				60.00			
Delaware	39.12	21.87	18.10	12.00	63.75		13.88	9.30
Des Moines	35.78	35.35	11.01	8.00	18.75	1.54	7.38	
Dickinson	84.43	73.54	3.71	25.71	18.99		21.01	25.27
Dubuque	80.50	80.50	73.00	29.00	24.00		13.10	1.17
Emmet	86.38	84.74	72.63	47.57	47.68	2.80	37.11	35.73
Fayette	33.75	19.00	19.00		137.25		19.25	
Floyd	72.86	15.80	7.67	9.00	149.50		.80	1.21
Franklin	110.50	76.00	22.50	2.85	72.25		15.10	15.73
Fremont	8.72	10.22	4.12	3.12	20.75	4.88		
Greene	62.50	60.00	30.25	25.75	6.50	.50	26.87	22.12
Grundy	99.58	32.58		6.00	138.50	5.00	1.30	
Guthrie	18.12	5.87	3.99	.56	65.00	2.70	1.30	2.00
Hamilton	89.05	73.30	60.15	63.40	103.37	1.62	39.00	11.38
Hancock	77.14	66.86	54.88	60.00	28.77	24.16	11.60	14.80
Hardin	118.50	84.97	72.72	67.72	76.50		44.75	12.70
Harrison	37.25	21.85	15.85	11.25	96.75	10.00	2.00	
Henry	37.10	30.00	15.00	2.00	120.60		1.00	
Howard	25.91	23.91	15.25	10.25	45.50	2.25	7.87	6.25
Humboldt	52.85	52.85	46.25	26.25	97.15		20.10	17.60
Ida	9.75	9.75			92.00	1.25		
Iowa	25.80	24.20	32.00	13.22	148.65	22.90	.62	
Jackson	8.50	8.50	6.25	6.25			2.00	

SUMMARY TABLE No. 16—Continued

County	Surveys and Profiles				Construction			
	No. of miles surveyed	No. of miles platted	No. miles grade grade line approved by dist. eng'rs	No. of miles profile approved by commission	Built to natural grade, standard width	Built to temporary grade, standard width	Built to permanent grade, standard width	Surfaced
Jasper	37.50	24.00	21.50	13.75	69.25	22.50	4.00	
Jefferson	18.20	18.20	5.64	5.14	90.62		.60	
Johnson	147.04	134.04	75.97	5.50	82.47	.72	1.51	
Jones	21.00	22.80	9.38	6.25	116.00	1.54	4.64	.81
Keokuk	41.95	34.80	19.34	16.07	175.25		9.25	
Kossuth	79.76	39.76	43.66	42.16	154.00	.50	37.50	12.80
Lee	17.50	40.50	5.50	5.50	90.25		12.00	13.75
Linn	52.52	18.20	2.40		11.75	6.40	2.10	2.42
Louisa	22.58	22.08	13.52	13.52	92.37	.30	6.94	2.67
Lucas	2.00	2.00			56.25	.50		
Lyon	30.75	28.25	9.00	9.00	92.50		10.00	
Madison	31.35	3.08	2.73	2.08	20.13	2.15	1.45	
Mahaska	28.75	24.75	4.13	4.13	21.25	68.25	2.00	.25
Marion	13.22	13.21	14.21	14.21	217.00	1.29	3.28	
Marshall	146.44	137.74	8.00	1.25	208.82	3.50	4.25	
Mills	28.50	28.63	11.17	9.30	27.28	24.74	2.63	.27
Mitchell	1.00	1.00			115.87			2.50
Monona	18.07	17.27	7.59	7.83	48.25	2.92	.90	
Monroe	19.15	19.01	6.50	1.00		.71	1.00	
Montgomery	13.50	13.50	10.00	1.00	118.25	3.30	2.00	
Muscatine	65.62	35.00	50.02	12.01	103.09	.73	9.36	2.60
O'Brien	67.59	58.79	49.22	15.70	136.00	4.16	26.12	
Osceola	19.00	19.00	17.50	17.50	89.25		13.50	1.00
Page	25.57	19.49	3.25	1.50	10.00	9.05	.50	
Palo Alto	114.39	90.54	81.04	78.14	34.29	7.71	50.73	7.83
Plymouth	33.41	32.41			210.71	7.09		
Pocahontas	102.40	102.00	56.65	58.35	68.95	23.50	30.10	25.90
Polk	32.48	25.63	14.68	7.63	180.25	1.00	2.93	6.00
Pottawattamie	76.68	61.78	5.51	2.80	247.50	9.74	6.21	1.00
Poweshiek	10.75	9.25	8.50		77.00	9.00	6.50	
Ringgold		4.00					.50	
Sac	106.77	107.12	81.05	73.05	13.00		58.88	26.07
Scott	17.22	14.72	15.73	15.73	94.87	2.20	8.65	6.08
Shelby	20.77	20.77			11.00	4.00	.30	
Sioux	23.98	21.48	11.98	1.00	80.00		.53	
Story	132.40	108.40	107.40	107.40	56.75		92.50	15.25
Tama	55.00	47.40	29.65	23.30	60.00	1.75	20.75	
Taylor	10.71	8.71	2.71	.71	47.75	2.00	.37	
Union		.50						
Van Buren					68.00			
Wapello	20.50	20.00	14.70	11.50	38.75	5.25	2.50	
Warren	8.25	8.25	7.00	4.75		.25	2.50	
Washington	11.00	11.00	8.00	.50	175.14		7.79	
Wayne	17.02	10.02	4.00	2.00	128.62	1.00		
Webster	80.00	72.00	66.00	66.00	58.65	.25	44.14	3.00
Winnebago	128.80	58.25	26.75	26.75	40.00	29.25	25.75	
Winneshiek	7.75				204.30			
Woodbury	51.20	44.75	24.00	1.50	7.67	10.30	13.10	
Worth	97.75	97.75	60.75		80.25			
Wright	46.25	41.25	31.25	29.25	102.25		16.50	38.00
Total	4,897.64	4,835.26	2,368.65	1,801.92	7,530.66	396.91	1,415.55	401.64

SUMMARY TABLE NO. 17.

Gravel Pits Owned by County, January 1, 1917—Annual Report of County Engineers.

County	Number	Value	County	Number	Value
Allamakee	1	$ 1,500.00	Buchanan	2	....
Bremer	2	300.00	Butler	9	2,000.00
Buena Vista	8	4,000.00	Cerro Gordo	4	1,315.00
Calhoun	8	1,800.00	Clay	11	6,300.00
Chickasaw	8	700.00	Dubuque	1	300.00
Dallas	4	866.32	Floyd	2	730.00
Emmet	6	1,800.00	Greene	1	292.10
Franklin	5	1,750.00	Hardin	5	2,000.00
Hancock	6	1,300.00	Linn	4	2,300.00
Kossuth	5	1,000.00	Marion	1	1,000.00
Lyon	2	475.00	Mitchell	1	200.00
Marshall	2	373.90	Pocahontas	12	5,000.00
Palo Alto	1	206.80	Sac	1	50.00
Polk	1	125.00	Story	8	3,679.25
Scott	1	14,000.00	Wright	9	2,386.75
Worth	1	2,000.00			
Black Hawk	6	3,908.00	Total	120	$ 64,418.10

SUMMARY TABLE NO. 18.

Amount of Road and Bridge Work Planned or Constructed by County Engineers—Annual Reports by County Engineers.

County	Constructed			Planned		
	Road	Bridge	Total	Road	Bridge	Total
Adair	$ 46,727.07	$ 52,177.97	$ 99,905.04	$ 11,000.00	$ 45,414.68	$ 56,414.68
Adams	15,628.39	26,266.47	41,895.06	....	19,051.50	19,051.50
Allamakee	9,271.12	48,202.70	57,773.82	7,450.00	5,420.00	12,870.00
Appanoose	12,306.94	40,625.45	52,932.39	10,000.00	21,984.00	31,984.00
Audubon	3,535.19	52,066.07	55,601.26	....	19,018.50	19,018.50
Benton	17,361.07	84,044.69	101,405.75	3,411.24	82,465.41	85,876.65
Black Hawk	18,266.45	53,675.20	71,941.65	27,300.00	35,816.30	63,116.30
Boone	16,524.05	44,559.13	61,083.18	29,000.00	37,669.23	66,669.23
Bremer	17,445.38	42,346.89	59,792.27	26,320.00	19,700.18	46,020.18
Buchanan	43,588.77	60,664.07	104,252.84	4,500.00	60,980.69	65,480.69
Buena Vista	124,870.00	103,543.81	228,413.81	114,740.00	64,370.00	179,110.00
Butler	20,000.00	25,000.00	45,000.00	2,000.00	15,539.00	17,539.00
Calhoun	88,287.88	50,051.53	138,339.41	68,202.00	38,869.87	102,072.87
Carroll	25,960.00	39,794.66	65,754.66	10,500.00	29,130.93	39,630.93
Cass	2,288.58	75,523.98	77,812.56	4,500.00	25,561.58	30,061.58
Cedar	18,279.06	62,603.07	80,882.13	18,870.00	61,200.00	80,070.00
Cerro Gordo	78,691.50	28,400.00	107,091.50	55,190.00	34,616.24	89,806.24
Cherokee	33,547.14	98,087.89	131,635.03	26,514.64	92,322.32	118,836.96
Chickasaw	30,000.00	60,666.02	90,666.02	6,000.00	16,248.25	22,248.25
Clarke	25,000.00	30,000.00	55,000.00	....	17,392.00	17,392.00
Clay	112,365.00	88,207.00	200,572.00	67,265.00	32,468.00	99,733.00
Clayton	5,342.16	40,925.04	46,267.20	10,300.00	42,806.68	53,106.68
Clinton	50,965.33	29,330.30	80,295.63	35,000.00	76,189.61	111,189.61
Crawford	77,902.10	73,505.46	151,407.56	10,000.00	122,370.00	132,370.00
Dallas	40,472.64	122,613.78	163,086.42	19,400.00	140,302.00	159,702.00
Davis	7,093.07	21,720.93	28,814.00	....	8,709.38	8,709.38
Decatur	13,807.69	24,182.43	37,990.12	....	20,690.06	20,690.06
Delaware	34,016.99	43,284.25	77,301.24	18,470.00	30,920.65	49,390.65
Des Moines	10,250.00	28,000.00	38,250.00	10,000.00	18,341.35	28,341.35
Dickinson	55,569.66	38,429.11	93,998.77	....	....	....
Dubuque	....	98,132.30	98,132.30	20,000.00	92,970.80	112,970.80
Emmet	55,530.27	28,400.00	83,930.27	45,000.00	17,143.84	62,143.84
Fayette	20,000.00	105,695.44	125,695.44	3,000.00	149,972.50	152,972.50
Floyd	16,784.77	55,838.76	72,623.53	2,500.00	59,398.28	61,898.28

SUMMARY TABLE No. 18—Continued

County	Constructed			Planned		
	Road	Bridge	Total	Road	Bridge	Total
Franklin	50,000.00	45,007.00	95,000.00	13,000.00	20,389.00	33,389.00
Fremont	6,429.70	50,000.00	56,429.70	14,400.00	34,467.55	48,867.55
Greene	24,256.51	26,608.73	60,965.24	13,506.60	18,500.72	32,007.32
Grundy	17,372.90	46,626.90	64,199.82	6,066.10	24,084.51	30,150.61
Guthrie	3,670.27	18,623.67	22,293.94		18,052.71	18,052.71
Hamilton	43,655.15	75,104.51	118,759.66	31,385.30	73,592.27	105,087.57
Hancock	31,008.14	19,960.00	51,008.14	21,397.47	21,600.00	42,997.47
Hardin	36,794.63	37,325.81	94,320.46	55,000.00	62,382.94	118,382.94
Harrison	23,600.00	113,736.00	137,385.00	4,087.00	107,536.00	111,536.00
Henry		27,373.37	27,373.37	10,000.00	36,651.30	36,651.30
Howard	13,602.00	40,252.11	53,854.11	12,500.00	32,682.00	42,182.00
Humboldt	23,000.00	42,300.00	65,300.00	11,000.00	1,600.00	12,600.00
Ida	4,500.00	16,754.00	21,254.00	500.00	36,317.29	36,817.29
Iowa	23,000.00	50,000.00	73,000.00		31,414.00	31,414.00
Jackson	10,294.98	44,524.92	54,819.90	15,000.00	38,738.00	53,738.00
Jasper	47,405.31	74,347.81	121,753.12	8,000.00	31,977.40	39,977.40
Jefferson	13,900.00	39,624.23	53,524.23	15,000.00	26,391.39	41,391.39
Johnson	17,000.00	39,548.22	56,548.22	12,500.00	45,566.92	58,066.92
Jones	17,142.40	34,195.87	51,337.27	980.85	33,892.53	34,873.38
Keokuk	6,771.67	36,719.33	43,491.00		37,707.00	37,707.00
Kossuth	40,000.00	67,025.43	107,025.43	100,000.00	13,686.79	113,686.79
Lee	16,800.00	45,257.65	62,057.80	10,000.00	17,709.77	27,709.77
Linn	5,300.00	56,500.00	61,800.00		47,521.80	47,521.80
Louisa	25,411.00	57,642.00	83,053.00	7,000.00	41,328.62	48,328.62
Lucas	10,052.00	38,420.88	48,472.88	4,000.00	34,418.35	38,418.35
Lyon	35,000.00	38,367.20	73,367.20	13,246.50		13,246.50
Madison	15,733.32	7,464.38	23,197.90	10,000.00	44,445.67	54,445.67
Mahaska	25,000.00	56,250.00	80,250.00	15,000.00	62,942.00	78,962.00
Marion	35,000.00	146,000.00	181,000.00	5,000.00	108,215.00	113,215.00
Marshall	16,690.00	113,580.00	130,246.00	10,077.27	22,412.99	32,491.26
Mills	10,077.27	22,694.99	32,772.26	2,000.00	38,500.00	40,500.00
Mitchell	6,000.00	57,502.17	63,502.17	8,000.00	44,120.60	52,120.60
Monona	36,470.78	52,808.81	79,279.59	12,000.00	39,500.56	51,500.56
Monroe	9,486.00	612.38	9,898.38	12,000.00	1,830.99	13,830.99
Montgomery	18,000.00	32,000.00	50,000.00	23,455.00	24,796.32	48,240.32
Muscatine	34,735.60	33,506.87	68,241.87	79,420.00	35,802.62	114,272.62
O'Brien	42,016.64	51,982.50	94,000.14			
Osceola	30,000.00	32,988.00	62,988.00	17,000.00	37,062.00	54,062.00
Page	30,000.00	25,000.00	55,000.00	15,000.00	22,772.99	37,772.99
Palo Alto	22,000.00	70,611.32	92,611.32	18,300.00	34,017.61	52,317.61
Plymouth		67,041.32	67,041.32			
Pocahontas	51,100.00	60,000.00	111,100.00	37,450.00	11,327.00	48,777.00
Polk	33,740.41	86,602.12	120,342.53	8,970.38	35,271.87	44,250.25
Pottawattamie	41,065.10	139,800.00	180,865.10	73,800.00	162,610.00	236,410.00
Poweshiek	23,200.60	97,422.98	120,623.58		41,400.39	41,400.39
Ringgold	15,700.00	31,000.00	46,700.00		16,363.50	16,363.50
Sac	44,000.00	72,950.48	116,950.48	48,000.00	70,210.79	118,210.79
Scott	40,596.38	38,231.99	78,828.37	22,966.88	14,694.64	37,655.52
Shelby	4,671.98	62,000.00	66,671.98		22,868.13	22,868.13
Sioux	10,834.47	65,212.91	76,047.38	7,000.00	41,075.93	48,075.93
Story	56,000.00	68,713.17	124,713.17	32,000.00	40,085.00	72,085.00
Tama	48,307.00	161,415.00	209,722.00	74,250.00	45,805.00	120,055.00
Taylor	26,882.84	51,348.08	78,231.92	1,650.00	24,790.71	26,440.71
Union	8,000.00	32,514.00	40,514.00		30,000.00	30,000.00
Van Buren	46,275.17	70,365.06	116,640.23		17,742.16	17,742.16
Wapello	28,000.00	64,000.00	92,000.00	12,000.00	25,696.00	37,696.00
Warren	8,872.88	64,696.89	73,569.77		40,940.69	40,940.69
Washington	13,371.94	27,825.68	41,197.62	20,000.00	30,465.61	50,465.61
Wayne	1,000.00	43,000.00	44,000.00	8,000.00	17,360.40	25,360.40
Webster	25,300.00	31,988.09	57,288.09	2,800.00	33,341.21	36,141.21
Winnebago	16,500.00	7,200.00	23,700.00	15,000.00	4,012.00	19,012.00
Winneshiek	9,550.00	49,398.38	58,948.38		47,984.00	47,984.00
Woodbury	21,906.93	53,222.89	75,129.82	10,100.00	42,407.00	52,507.00
Worth	19,652.82	17,432.05	37,084.88		17,024.00	17,024.00
Wright	42,894.45	51,574.30	94,468.75	50,000.00	22,734.40	72,734.40
Totals	$ 2,504,217.59	$ 5,326,136.37	$ 7,930,353.96	$ 1,739,225.23	$ 3,736,466.76	$ 5,465,691.99

SUMMARY TABLE NO. 19.

Cost of Engineering—Annual Reports of County Engineers.

County	Roads: County Engineer's Salary and Expenses	Roads: Assistant Engineer's Salary and Expenses	Roads: Total	Bridges: County Engineer's Salary and Expenses	Bridges: Assistant Engineer's Salary and Expenses	Bridges: Total	Total Engineering Cost
Adair	$ 609.34	$ 803.35	$ 1,412.69	$ 1,074.93	$ 235.20	$ 1,310.13	$ 2,722.82
Adams	730.00	3.21	733.21	1,300.70	61.00	1,361.70	2,094.91
Allamakee	800.00	40.00	840.00	1,515.00	306.10	1,821.10	2,661.10
Appanoose	327.75	708.45	1,036.20	1,172.25	125.00	1,297.25	2,333.45
Audubon	1,034.39	118.88	1,153.27	1,034.39		1,034.39	2,187.66
Benton	497.39	20.00	517.39	1,989.59	19.45	2,009.04	2,526.43
Black Hawk	1,814.21	1,468.02	3,282.23	1,195.42	510.56	1,705.98	4,988.21
Boone	995.88	1,131.73	2,127.61	1,429.08	397.65	1,826.73	3,954.34
Bremer	821.68	623.13	1,444.81	1,142.86	1,015.41	2,158.27	3,603.08
Buchanan	908.12	206.28	1,114.40	986.07	346.40	1,332.47	2,446.87
Buena Vista	1,188.98	5,834.25	7,023.23	1,950.04	489.87	2,439.91	9,463.14
Butler	1,800.00	675.00	2,475.00	600.00	225.00	825.00	3,300.00
Calhoun	1,814.42	2,628.73	4,443.15	547.14	519.60	1,066.74	5,509.89
Carroll	1,021.00	2,166.62	3,187.62	1,337.40	1,365.20	2,702.60	5,890.22
Cass	853.11	46.35	899.46	1,421.85	77.91	1,499.76	2,399.22
Cedar	500.00	1,422.64	1,922.64	1,500.09	849.09	2,349.18	4,271.82
Cerro Gordo	1,300.00	1,300.00	2,600.00	1,380.87	1,000.55	2,381.42	4,981.42
Cherokee	820.18	1,701.32	2,521.50	1,037.25	755.60	1,792.85	4,314.35
Chickasaw	985.95	60.00	1,045.95	985.95	180.00	1,165.95	2,211.90
Clarke	462.30	20.17	482.47	1,656.70	20.20	1,676.90	2,159.37
Clay	1,115.50	4,888.73	6,004.23	1,019.00	858.87	1,877.87	7,882.10
Clayton	289.85	102.30	392.15	2,070.17	939.10	3,009.27	3,401.42
Clinton	1,344.40	1,401.21	2,745.61	917.80	1,097.28	2,015.08	4,760.69
Crawford	1,408.18	2,857.97	4,266.15	1,509.35	1,725.11	3,234.46	7,500.61
Dallas	557.36	1,868.50	2,425.86	1,148.00	824.45	1,972.45	4,398.31
Davis	500.00		500.00	790.00	296.98	1,086.98	1,586.98
Decatur	1,363.64	235.00	1,598.64	1,349.08	235.00	1,584.08	3,182.72
Delaware	792.34	238.20	1,030.54	782.14	374.51	1,156.65	2,187.19
Des Moines	1,020.00	854.86	1,874.86	607.00	307.35	914.35	2,789.21
Dickinson	1,376.65	1,828.00	3,204.65	748.39	157.35	905.74	4,110.39
Dubuque	625.32	772.56	1,397.88	1,873.09	2,317.49	4,188.98	5,591.07
Emmet	1,240.11	2,229.30	3,469.41	531.48	208.32	1,450.90	4,469.47
Fayette	462.35	117.85	580.20	1,402.04	336.94	1,738.98	2,319.18
Floyd	997.79	390.00	1,387.79	1,819.64	189.00	2,008.64	3,396.43
Franklin	966.65	2,080.93	3,047.58	958.65	1,235.75	2,194.40	5,241.98
Fremont	756.00	240.00	996.00	1,506.47	424.95	1,931.42	2,927.42
Greene	1,220.18	1,306.42	2,526.60	1,130.69	466.87	1,597.56	4,124.16
Grundy	796.50	822.80	1,619.30	1,512.80	1,110.00	2,622.80	4,242.10
Guthrie	994.47	582.73	1,577.20	1,526.08	85.20	1,612.28	3,189.48
Hamilton	1,420.94	2,779.30	4,200.24	1,270.77	902.44	2,173.21	6,373.45
Hancock	1,379.56	462.95	1,842.51	431.58	59.63	491.21	2,333.72
Hardin	1,165.63	3,664.89	4,830.52	755.92	814.47	1,570.39	6,400.91
Harrison	566.46	360.60	927.06	1,678.04	575.00	2,253.04	3,180.10
Henry	180.00	80.00	260.00	1,520.00	300.00	1,820.00	2,080.00
Howard	677.27	770.36	1,447.63	810.91	476.56	1,287.47	2,735.10
Humboldt	1,211.00	972.00	2,183.00	406.71	324.05	730.76	2,913.76
Ida	735.25	22.56	757.81	1,079.30		1,079.30	1,837.11
Iowa	1,109.66	471.59	1,581.25	1,467.35	468.17	1,935.52	3,516.77
Jackson	560.00	428.13	988.13	1,988.70	55.60	2,044.30	3,032.43
Jasper	894.80	601.99	1,496.79	999.33	514.59	1,513.92	3,010.71
Jefferson	479.00	633.00	1,112.00	1,525.00	494.91	2,019.91	3,131.91
Johnson	500.00	1,671.64	2,171.64	1,500.00	555.30	2,055.30	4,226.94
Jones	500.00	100.00	600.00	1,101.17	123.15	1,224.32	1,824.32
Keokuk	1,103.34	200.85	1,304.19	1,092.54	365.01	1,457.55	2,761.74
Kossuth	1,993.88	2,319.87	4,313.75	2,000.00	1,200.00	3,200.00	7,513.75
Lee	948.62	240.91	1,189.53	1,041.42	200.00	1,241.42	2,430.95
Linn	968.85	741.86	1,710.71	1,937.72	741.86	2,679.58	4,390.29
Louisa	712.34	329.73	1,042.07	1,053.00	509.37	1,562.37	2,604.44
Lucas	434.11	26.00	460.11	1,030.26	26.00	1,056.26	1,516.37
Lyon	250.00	1,489.68	1,739.68	250.00	1,489.67	1,739.67	3,479.35
Madison	684.40	332.10	1,016.50	1,038.75	504.40	1,543.15	2,559.65
Mahaska	633.60	216.75	850.35	934.96	203.70	1,138.66	1,989.01
Marion	772.63	356.23	1,128.86	1,365.41	274.10	1,639.51	2,768.37
Marshall	283.31	559.41	842.72	1,416.60	2,797.21	4,213.81	5,056.53
Mills	1,130.80		1,130.80	1,327.70		1,327.70	2,458.50
Mitchell	400.00	50.00	450.00	1,417.98	25.00	1,442.98	1,892.98
Monona	800.00	265.00	1,065.00	1,500.00	503.60	2,003.60	3,068.60
Monroe	413.51	160.00	573.51	980.08	220.00	1,200.08	1,773.59
Montgomery	800.00	300.00	1,100.00	1,200.00	222.00	1,422.00	2,522.00
Muscatine	988.64	1,535.47	2,524.11	818.65	367.10	1,185.75	3,709.86
O'Brien	852.55	975.06	1,827.61	732.25	265.50	997.75	2,825.36
Osceola	796.21	809.36	1,605.57	500.80	539.52	1,040.32	2,645.89
Page	1,046.39	402.50	1,448.89	1,127.74	402.70	1,530.44	2,979.33
Palo Alto	954.13	1,888.43	2,842.56	1,143.22	772.00	1,915.22	4,757.78
Plymouth	632.02		632.02	1,896.08		1,896.08	2,528.10
Pocahontas	1,399.00	5,823.77	7,222.77	776.82	979.25	1,756.07	8,978.84
Polk	1,400.25	3,206.64	4,606.89	1,030.25	2,120.42	3,150.67	7,757.56
Pottawattamie	1,119.89	1,105.97	2,225.86	2,239.79	2,211.94	4,451.73	6,677.59
Poweshiek	684.40	48.00	732.40	1,586.78	94.65	1,681.43	2,413.83

SUMMARY TABLE No. 19—Continued

County	Roads			Bridges			Total Engineering Cost
	County Engineer's Salary and Expenses	Assistant Engineer's Salary and Expenses	Total	County Engineer's Salary and Expenses	Assistant Engineer's Salary and Expenses	Total	
Ringgold	600.00	81.50	681.50	2,000.00		2,000.00	2,681.50
Sac	1,078.18	1,764.50	2,842.68	1,502.18	306.48	1,808.66	4,651.34
Scott	1,315.00	1,400.00	2,715.00	1,685.00	940.00	2,625.00	5,340.00
Shelby	537.75	24.45	562.18	1,668.37	24.45	1,692.82	2,255.00
Sioux	900.00	250.00	1,340.00	1,530.00	676.25	2,186.25	3,526.25
Story	1,948.30	1,592.20	3,500.50	1,131.02	202.36	1,393.38	4,893.88
Tama	500.00	1,800.00	2,350.00	2,000.00	2,030.02	4,036.02	6,386.02
Taylor	602.06	444.55	1,127.61	1,306.14	444.95	1,831.09	2,958.70
Union	440.00	300.00	740.00	1,200.00	300.00	1,500.00	2,300.00
Van Buren	570.43	6.27	576.70	1,140.85	16.54	1,157.39	1,734.09
Wapello	670.00	1,000.00	1,670.00	1,760.00	270.00	1,330.00	3,700.00
Warren	300.00	50.00	350.00	2,089.79	369.79	2,459.58	2,779.58
Washington	978.08	94.80	1,072.88	978.08		978.08	2,050.96
Wayne	900.00	267.98	1,247.98	1,380.79	993.69	2,314.48	3,562.46
Webster	1,554.31	934.91	2,489.22	1,379.35	565.70	1,945.05	4,434.27
Winnebago	475.50	373.25	848.75	164.39	145.00	309.39	1,158.14
Winneshiek	376.61	871.70	1,248.31	1,566.46	217.92	1,784.38	2,972.69
Woodbury	800.00	1,026.11	1,826.11	2,600.00	2,300.91	4,300.91	6,177.02
Worth	1,009.86	173.75	1,273.63	580.00	145.00	725.00	1,998.62
Wright	1,000.00	1,439.41	2,509.41	400.00	400.00	800.00	3,309.41
Total	$ 87,871.96	$ 94,555.57	$ 182,427.53	$ 124,972.53	$ 55,628.32	$ 180,601.26	$ 363,028.79

SUMMARY TABLE NO. 20.

Financial Statement—Annual Reports of County Engineers.

County	County Bridge Fund					County Motor Vehicle Road Fund				
	Balance of overdraft, Jan. 1, 1916	Receipts 1916	Total	Disbursements, 1916	Balance of overdraft, Jan. 1, 1917	Balance of overdraft, Jan. 1, 1916	Receipts 1916	Total	Disbursements, 1916	Balance of overdraft, Jan. 1, 1917
Adair	$ *9,324.46	$ 35,782.95	$ 26,458.49	$ 37,342.18	$*10,883.69		$ 17,044.66	$ 17,044.66	$ 17,692.16	$ *647.49
Adams	186.61	31,708.42	31,895.03	31,297.41	597.62		10,776.00	10,776.00	10,311.13	464.87
Allamakee	5,168.03	32,051.65	38,219.68	37,340.70	878.98	$ 4,602.24	16,164.00	20,856.24	13,472.90	7,383.34
Appanoose	*7,360.04	60,006.41	52,555.77	54,731.02	*2,185.25	**62.20	14,764.19	14,695.99	14,700.64	*4.65
Audubon	6,892.55	84,410.41	91,302.96	90,274.11	1,028.85	2,115.49	10,760.00	13,891.49	13,310.67	580.82
Benton	5,709.97	38,400.14	44,109.21	43,733.01	405.20		17,960.00	17,960.00	17,947.42	12.58
Black Hawk	421.72	43,271.61	43,693.34	42,875.90	817.33	747.54	16,164.00	16,911.54	17,060.03	*148.49
Boone	3,097.50	47,825.61	51,223.11	41,384.27	9,838.84	*1,144.65	15,411.00	14,266.35	13,467.81	809.14
Bremer	175.17	46,391.31	46,566.48	49,092.38	*2,435.90		12,572.00	12,572.00	12,572.00	
Buchanan	109.50	40,989.30	41,098.80	39,988.50	1,170.22	132.32	14,308.00	14,500.32	14,499.96	.36
Buena Vista	*2,313.45	80,412.24	78,098.79	80,082.77	*1,983.98		16,164.00	16,164.00	16,463.61	*299.61
Butler	378.72	49,544.22	49,922.94	49,854.53	68.41	423.35	16,830.74	17,254.09	16,372.02	882.07
Calhoun	1,404.14	56,800.00	58,354.23	57,106.84	1,247.39		15,266.00	15,266.00	11,134.14	4,131.86
Carroll	5,787.79	49,929.36	55,717.15	54,241.31	1,475.84		14,420.71	14,420.71	18,376.65	*3,955.94
Cass	*458.07	49,005.35	48,607.28	48,007.33	629.95	457.42	13,838.41	14,289.83	14,358.30	*68.47
Cedar	2,303.79	43,154.89	45,458.68	44,539.09	919.59		15,243.82	15,243.82	15,243.80	.02
Cerro Gordo	*6,183.38	40,511.35	34,327.97	42,281.31	*7,953.39		14,040.75	14,040.75	13,656.68	1,594.07
Cherokee	*3,226.84	79,744.35	74,517.51	76,368.53	*1,780.02	4,085.00	13,431.00	17,516.00	1,968.50	15,847.43
Chickasaw	*4,704.76	35,631.66	30,926.90	32,933.58	*2,006.68	19.75	10,776.00	10,795.75	9,470.56	1,325.19
Clarke	143.44	47,640.71	47,784.15	45,659.50	2,124.65	*32.99	10,776.00	10,743.01	8,872.34	1,870.67
Clay	1,751.48	85,013.92	86,765.40	85,706.85	1,058.55	945.50	14,388.00	15,333.50	15,617.43	*283.93
Clayton	*11,216.43	85,421.71	74,205.28	78,367.32	*4,162.04		18,904.90	18,904.90	17,743.01	1,251.89
Clinton	3,071.61	122,119.55	125,191.16	117,979.44	7,220.72	4,800.00	16,164.00	21,024.00	15,807.31	5,120.69
Crawford	960.09	64,608.04	65,468.13	61,203.72	4,264.41	5,670.00	16,977.45	22,647.45	8,080.16	14,567.29
Dallas	7,764.78	94,370.41	102,075.19	98,485.58	3,589.61		14,388.00	14,388.00	14,160.00	228.00
Davis	*21,137.30	25,574.09	4,376.76	6,447.76	*2,071.00		13,470.00	13,470.00	11,721.42	1,748.58
Decatur	967.62	43,947.17	44,914.79	44,544.26	370.53	2,957.77	13,551.53	13,009.30	15,587.12	*22.18
Delaware	988.38	43,294.84	43,883.34	43,784.20	99.14	622.95	14,380.75	14,983.70	14,962.75	20.97

SUMMARY TABLE No. 20—Continued

County	County Bridge Fund: Balance or overdraft, Jan. 1, 1916	Receipts 1916	Total	Disbursements, 1916	Balance or overdraft, Jan. 1, 1917	County Motor Vehicle Road Fund: Balance or overdraft, Jan. 1, 1916	Receipts 1916	Total	Disbursements, 1916	Balance or overdraft, Jan. 1, 1917
Des Moines	*274.51	19,411.65	19,087.14	23,668.42	*4,631.28	96.17	11,323.67	11,419.84	10,884.71	533.13
Dickinson	3,197.00	24,319.92	27,516.92	27,709.03	*192.11		10,776.00	10,776.00	818.45	9,957.55
Dubuque	1,045.23	40,487.06	41,532.29	34,545.15	6,987.14		13,797.61	13,797.61	1,221.06	12,576.55
Emmet	*851.81	24,874.79	24,022.98	23,330.20	692.78		10,776.00	10,776.00	10,776.00	
Fayette	10,501.27	100,950.98	111,452.25	112,783.48	*1,331.23		17,394.54	17,394.54	17,394.54	
Floyd	*825.02	42,736.66	41,911.64	39,354.09	2,557.55	2,954.45	10,506.60	13,461.05	10,998.71	2,462.34
Franklin	1,230.25	46,156.60	47,386.85	42,802.95	4,583.90		13,408.84	13,408.84	13,408.84	
Fremont	8,076.46	34,838.66	42,915.12	40,270.40	2,644.72		11,674.00	11,674.00	3,229.18	8,444.82
Greene	72.41	39,917.25	39,989.66	39,600.18	389.48		14,368.00	14,368.00	14,368.00	
Grundy	1,049.85	74,956.91	76,006.76	74,620.26	1,386.50	947.33	12,572.00	13,519.33	13,290.02	229.31
Guthrie	849.82	42,827.67	43,677.49	41,370.69	2,306.80	1,334.45	14,332.78	15,667.23	15,831.09	*163.86
Hamilton	698.15	47,000.00	47,698.15	48,448.15	*750.00		14,518.15	14,518.15	14,518.15	
Hancock	2,109.71	37,136.31	39,246.02	31,492.59	7,753.43	1,501.45	13,393.32	14,894.75	14,657.05	237.70
Hardin	2,655.51	52,797.47	55,452.98	53,400.35	2,052.63	1,151.08	15,281.26	16,432.34	6,797.18	9,636.06
Harrison	2,249.80	103,187.80	105,437.60	103,791.31	1,646.29	8,336.80	17,900.00	26,236.80	16,217.77	10,079.03
Henry	*1,319.27	55,044.88	53,725.61	42,871.48	10,854.13	9.25	10,776.00	10,785.25	7,143.32	3,641.93
Howard	*6,079.66	30,194.91	24,115.25	20,903.53	3,211.72	2,017.63	10,111.68	13,029.31	14,115.52	*1,086.21
Humboldt	4,600.19	35,418.28	40,018.47	34,400.82	5,617.65	3,397.07	12,572.00	15,969.07	2,443.31	13,485.76
Ida	*758.86	37,130.36	36,371.50	32,993.55	3,377.95	136.36	10,776.00	10,912.36	10,493.97	418.19
Iowa	*1,038.65	51,190.33	50,151.68	46,685.59	3,466.09		15,578.06	15,578.06	13,845.56	1,732.70
Jackson	725.84	42,379.50	43,105.34	40,743.56	2,361.78		16,164.00	16,164.00	13,185.01	2,978.99
Jasper	*4,568.50	64,829.93	60,261.43	58,527.02	1,734.41	5,130.00	17,062.00	22,192.00	22,192.00	
Jefferson	*8,395.67	34,764.48	26,368.81	26,232.78	136.03	82.90	10,776.00	10,858.90	10,817.49	41.41
Johnson	1,347.69	68,364.10	69,711.79	80,624.39	*10,912.60	3,652.04	18,927.60	22,579.64	20,125.22	2,454.42
Jones	350.12	45,305.78	45,655.90	43,775.25	1,880.65		15,506.02	15,506.02	12,730.84	2,775.18
Keokuk	*4,879.85	51,760.66	46,880.81	46,898.31	*17.50	166.27	15,266.00	15,432.27	7,441.60	7,990.67
Kossuth	1,513.03	92,858.47	94,371.50	96,222.90	*1,851.40	2,221.10	24,220.29	27,441.39	13,206.88	14,234.51
Lee	2,631.15	35,566.56	38,197.71	39,508.46	*1,311.75	*99.64	14,059.50	13,979.86	17,082.67	*2,595.64
Linn	2,398.98	54,666.60	57,065.58	55,706.90	1,358.68		36,327.40	36,327.40	36,327.40	
Louisa	528.65	58,713.41	59,242.06	65,906.96	*6,664.90		10,776.00	10,776.00	3,179.43	7,596.57
Lucas	1,956.91	25,658.16	27,615.07	26,270.25	1,344.82		10,936.00	10,936.00	10,936.00	
Lyon	1,797.17	91,181.93	92,989.10	47,787.25	5,103.80		15,140.16	15,140.16	15,140.16	
Madison	1,074.65	35,016.60	36,000.65	35,908.50	182.00		14,485.30	14,485.30	14,881.46	*266.16
Mahaska	142.93	36,720.63	36,863.56	36,970.65	*107.09	731.32	17,062.60	17,793.92	17,722.39	70.53
Marion	6,909.44	101,865.67	108,305.11	106,626.06	2,679.05		13,470.00	13,470.00	13,470.00	
Marshall	*2,990.33	59,710.88	56,720.55	57,218.39	*497.84	3,219.04	14,547.60	17,766.64	5,306.95	12,459.69
Mills	*5,473.46	58,366.21	52,892.75	56,972.03	*4,079.28		11,674.00	11,674.00	11,674.00	
Mitchell	1,256.20	62,362.78	63,618.04	63,536.10	81.94	212.50	15,749.80	15,962.30	17,151.92	*1,189.62
Monona	4.05	45,338.01	45,342.06	44,356.00	986.06	45.00	17,062.00	17,107.06	15,356.60	1,751.06
Monroe	*13,300.63	36,884.69	23,584.06	23,803.74	*219.08		10,776.00	10,776.00	10,695.43	80.57
Montgomery	1,200.73	69,305.55	70,506.28	66,648.42	3,947.86	7,312.58	10,776.00	18,288.58	13,008.43	5,280.15
Muscatine	7,324.54	38,476.45	45,800.99	44,504.32	1,296.67	2,032.25	13,256.71	15,308.96	10,056.61	5,252.35
O'Brien	*1,569.67	51,609.79	50,040.12	58,387.95	*8,337.83		14,708.32	14,708.32	14,342.74	365.78
Osceola	*460.61	31,477.00	31,016.39	34,761.47	*3,745.08	1,710.35	10,776.00	12,486.35	6,505.83	5,980.52
Page	10,975.05	93,336.39	104,311.44	100,952.67	3,358.77	4,048.20	14,765.14	18,813.34	10,793.46	8,019.88
Palo Alto	*20,103.98	70,723.66	50,619.68	38,162.83	12,456.85		14,368.00	14,368.00	11,500.00	2,868.00
Plymouth	*137.10	86,898.11	86,761.01	86,157.11	603.90		24,322.00	24,322.00	24,362.55	*40.55
Pocahontas	716.67	45,479.72	46,196.39	43,097.06	3,098.33		16,164.00	16,164.00	16,164.00	
Polk	*2,513.56	124,101.43	121,587.87	131,273.59	*9,685.72	1,259.00	19,764.30	21,023.30	18,569.21	2,453.89
Pottawattamie	*18,557.09	70,155.43	51,598.34	49,897.44	1,700.90		25,144.00	25,144.00	25,144.00	
Poweshiek	1,965.07	52,936.35	54,902.42	54,070.14	831.28	2,478.28	14,511.00	17,989.28	17,732.80	256.48
Ringgold	*514.56	45,472.95	44,958.39	49,528.44	*4,570.05	3,601.66	14,398.00	18,059.66	9,581.39	8,478.27
Sac	*8,901.12	62,666.60	53,765.48	67,969.15	*14,203.67		13,427.36	13,427.36	7,575.06	5,852.30
Scott	8,332.30	42,965.66	51,297.96	34,841.64	16,456.32	9,466.01	14,368.00	23,834.01	23,997.70	*163.69
Shelby	625.39	50,399.18	51,024.57	47,029.41	3,995.16	4,111.49	14,368.00	18,479.49	18,239.49	240.00
Sioux	*12,041.62	43,613.36	31,571.74	45,538.89	*13,967.15	*1,832.72	20,661.00	18,828.28	27,252.98	*8,424.70
Story	14,922.34	39,489.83	54,412.17	53,457.31	954.86		12,969.57	12,969.57	10,120.05	2,849.52
Tama	*7,049.56	104,714.98	97,665.42	97,158.74	506.68		17,949.44	17,949.44	17,949.44	
Taylor	*1,114.58	36,780.67	35,666.09	33,609.97	2,056.12		14,493.54	14,493.54	14,379.53	114.01
Union	*749.90	29,621.19	28,871.29	27,166.99	1,704.25		12,606.42	12,606.42	11,540.00	1,066.42
Van Buren	*36.65	27,651.22	27,697.87	27,244.77	453.10	1,480.47	12,810.62	14,291.09	14,205.70	85.39
Wapello	20,345.39	76,066.46	96,411.85	99,016.22	*2,604.37	3,780.00	12,572.00	16,352.00	16,018.40	333.60
Warren	1,510.18	40,915.45	42,425.63	42,535.75	*110.12		14,775.12	14,775.12	14,775.12	
Washington	*951.00	47,576.14	46,625.14	55,822.48	*9,197.34		12,676.56	12,676.56	11,021.49	1,655.07
Wayne	*4,308.32	34,429.24	30,120.92	30,993.68	*872.76	2,340.87	14,441.00	16,781.87	14,759.76	2,022.11
Webster	*12,281.98	38,638.16	26,356.18	25,895.59	460.59		21,392.00	21,392.00	14,560.73	7,031.27
Winnebago	*3,287.43	15,060.88	11,773.45	11,351.28	422.17	3,240.00	10,776.00	14,016.00	16,526.07	*2,510.07
Winneshiek	*15,125.95	42,480.51	27,354.56	27,457.29	*102.73	*1,804.05	18,081.02	16,276.97	17,380.70	*1,103.73
Woodbury	388.60	72,802.10	73,190.70	51,716.67	1,474.03	1,617.25	19,408.80	21,026.05	16,316.82	4,709.23
Worth	*4,147.61	20,136.05	15,988.44	19,096.18	*3,107.74		11,674.00	11,674.00		11,674.00
Wright	1,454.91	47,415.23	48,870.14	59,589.33	*10,719.19		15,266.00	15,266.00	15,266.00	
Total	$ 34,954.82	$5,209,706.96	$5,154,826.13	$5,135,851.24	$ 18,974.89	$111,922.38	$1,449,647.10	$1,561,580.48	$1,324,640.88	$ 236,939.60

SUMMARY TABLE NO. 21.

Financial Statement—Annual Reports of County Engineers.

County	County Road Cash Fund					Township Road, Drag and Drainage Funds				
	*Balance or overdraft, Jan. 1, 1916	Receipts, 1916	Total	Disbursements, 1916	Balance or overdraft, Jan. 1, 1917	Balance or overdraft, Jan. 1, 1916	Receipts, 1916	Total	Disbursements, 1916	Balance or overdraft, Jan. 1, 1917
Adair	$ *6,114.70	$ 15,675.79	$ 9,561.09	$ 17,847.92	$ *8,286.83					
Adams	539.92	24,556.32	25,096.24	21,652.12	3,444.12	$ 7,000.00	$ 19,535.16	$ 26,535.16	$ 24,251.52	$ *2,283.64
Allamakee	1,440.08	17,223.72	18,663.80	18,626.65	37.15	1,140.48	27,072.18	28,212.66	27,022.12	1,190.54
Appanoose	*1,872.10	17,456.48	15,584.38	17,800.02	*2,215.64	4,617.91	27,362.28	31,980.19	27,973.15	4,007.04
Audubon	1,764.59	20,224.76	21,989.35	21,417.50	571.85	487.97	28,477.89	28,965.86	28,412.16	553.70
Benton	858.54	32,209.46	33,068.00	32,907.53	160.47	306.66	61,356.13	61,662.79	59,752.00	1,910.79
Black Hawk	456.15	28,142.80	28,598.95	27,051.39	1,547.56	4,381.68	43,071.04	47,452.72	44,623.44	2,829.28
Boone	226.32	28,479.40	28,705.72	27,397.43	1,308.29	8,814.58	50,285.90	59,100.48	49,220.21	9,880.27
Bremer	609.23	28,186.22	28,795.45	26,258.21	2,537.24	7,332.14	25,568.03	32,900.17	32,501.44	398.73
Buchanan	330.29	21,573.78	21,904.07	16,702.69	5,201.38	2,708.53	27,037.38	29,745.91	28,802.23	943.68
Buena Vista	*3,327.09	58,181.87	54,854.78	56,206.63	*1,351.85	7,779.20	33,028.76	40,807.96	40,626.34	181.62
Butler	*2,573.76	28,888.24	26,314.48	27,948.35	*1,633.87	7,205.61	36,885.85	44,091.46	36,227.64	7,863.82
Calhoun	1,990.03	72,618.52	74,608.55	72,536.06	2,072.49	27,686.87	51,307.78	78,994.65	60,505.50	18,489.15
Carroll	*24.01	28,581.96	28,557.95	38,038.44	*9,480.49	9,871.89	36,596.66	46,468.55	42,547.81	3,920.74
Cass	*823.25	25,054.02	24,230.77	21,299.86	2,930.91	8,022.88	36,330.78	44,353.66	30,630.56	13,723.10
Cedar	54.24	50,100.16	50,154.40	48,681.24	1,473.16	14,298.15	40,622.95	54,921.10	44,999.65	9,921.45
Cerro Gordo	*3,021.96	39,056.27	36,034.31	40,647.49	*4,613.18	7,135.39	43,239.06	50,374.45	46,774.53	3,599.92
Cherokee	4,049.38	30,402.72	34,452.11	47,149.31	*12,697.20	12,369.89	26,829.33	39,199.22	32,021.88	7,177.34
Chickasaw	5,531.88	18,775.85	24,307.73	25,174.04	*866.31	808.01	35,107.82	35,915.83	35,232.07	683.76
Clarke	*131.14	14,222.81	14,091.67	13,949.23	142.44	5,680.22	20,195.15	25,875.27	23,529.93	2,345.44
Clay	*597.56	27,460.05	26,862.49	23,518.84	3,343.65	19,215.80	35,483.82	54,699.62	38,724.00	15,975.62
Clayton	281.35	28,412.66	28,694.01	25,122.42	3,571.59	12,550.02	27,865.00	40,415.02	32,345.91	8,069.11
Clinton	6,549.57	33,367.98	39,917.55	31,815.45	8,102.10	2,667.05	48,055.35	50,722.40	41,093.38	9,629.02
Crawford	2,690.38	37,207.91	39,898.29	36,518.67	3,379.62	12,757.68	46,214.91	58,972.59	54,040.65	4,931.94
Dallas	10,180.55	37,944.36	48,124.91	46,206.63	1,918.28	5,698.71	39,601.98	45,300.69	44,273.16	1,027.53
Davis	*5,072.02	19,176.96	14,104.94	12,480.56	1,624.38		22,288.25	22,288.25	22,480.43	*192.18
Decatur	1,634.18	26,967.07	28,601.25	28,502.04	99.21	5,680.00	25,793.32	31,473.32	28,613.22	2,816.00
Delaware	5,018.55	31,523.48	36,542.03	36,533.76	8.27	1,540.93	33,660.69	35,201.62	34,196.28	1,005.34
Des Moines	*531.86	17,824.36	17,292.50	15,312.72	1,979.78	2,728.56	26,000.00	28,728.56	26,500.00	2,228.56

Dickinson	*1,313.73	21,770.58	20,456.85	16,202.21	4,254.64	452.43	23,159.76	23,612.19	23,222.09	390.10
Dubuque	9,128.71	31,109.31	40,238.02	36,059.43	4,178.59	1,818.06	35,709.27	37,527.33	36,282.25	1,245.08
Emmet	*617.44	25,797.29	25,179.85	25,607.95	428.10	6,225.68	28,727.57	34,953.25	28,542.39	6,410.86
Fayette	2,781.78	46,697.03	49,478.81	36,879.48	12,599.33	12,757.68	46,214.91	58,972.59	54,040.65	4,931.91
Floyd	*3,575.93	19,337.00	15,761.07	15,342.83	418.24	2,534.08	38,468.39	41,002.47	38,634.46	2,368.01
Franklin	1,431.78	44,274.84	45,706.62	46,371.49	*664.87	6,096.96	48,081.69	54,178.65	45,634.85	8,543.82
Fremont	2,647.97	18,901.24	21,549.21	19,756.56	1,792.65	439.59	29,285.82	29,725.41	29,031.15	694.26
Greene	46.40	48,001.34	48,047.74	36,573.33	11,474.41	16,915.57	48,549.23	65,464.80	65,464.80	------
Grundy	259.67	25,955.64	26,215.31	26,677.92	*462.61	4,450.00	32,048.85	36,498.85	30,375.35	6,123.50
Guthrie	949.62	22,518.17	23,467.80	23,078.86	388.94	3,440.00	35,690.00	39,130.00	39,770.00	*640.00
Hamilton	14.50	78,783.89	78,798.39	84,023.87	5,225.88	16,573.26	34,135.67	50,708.93	36,523.78	14,185.15
Hancock	*1,701.21	26,917.45	25,216.24	26,584.82	*1,368.58	808.31	43,760.30	44,568.61	34,507.82	10,060.79
Hardin	*8.42	26,629.06	26,620.64	24,998.62	1,622.02	------	------	------	------	------
Harrison	1,131.49	26,035.48	27,166.97	31,342.17	*4,175.20	8,163.45	43,324.28	51,487.69	45,589.22	5,834.47
Henry	*895.08	20,927.89	20,032.81	23,555.37	*3,522.56	------	------	------	------	------
Howard	*1,472.02	15,875.29	14,403.27	11,985.39	2,417.88	------	------	------	------	------
Humboldt	5,314.96	25,656.72	30,971.68	27,391.34	3,580.34	17,166.60	42,806.64	59,973.24	51,705.96	8,267.28
Ida	2,186.37	17,350.04	19,536.41	19,021.68	514.73	6,392.36	27,509.23	33,901.59	29,669.44	4,232.15
Iowa	92.92	27,862.65	27,955.57	26,105.98	1,849.59	9,541.96	42,696.13	52,238.09	39,798.80	12,439.29
Jackson	136.93	21,479.43	21,616.36	21,487.05	129.31	6,398.48	31,795.73	38,194.21	31,824.56	6,369.65
Jasper	*12,283.39	34,058.28	21,774.89	22,244.37	*469.48	7,888.33	46,621.91	54,510.24	47,282.67	7,227.57
Jefferson	*15,861.49	17,921.25	2,059.76	3,456.59	*1,396.83	7,405.68	28,664.86	36,070.54	33,893.50	2,177.04
Johnson	605.47	34,472.79	35,078.26	24,049.46	11,028.80	1,041.99	26,335.25	27,377.24	25,313.59	2,063.65
Jones	277.09	23,395.27	23,672.36	23,197.10	475.26	909.67	32,020.96	32,930.63	32,001.10	929.53
Keokuk	315.26	26,894.69	27,209.95	27,210.12	*.17	6,456.55	20,922.61	27,379.16	23,228.38	4,150.78
Kossuth	3,571.95	43,260.87	46,832.82	41,226.15	5,606.67	27,895.16	85,407.94	113,303.10	85,362.80	27,940.30
Lee	*3,525.96	24,041.10	20,515.14	25,725.69	*5,210.55	15,344.65	31,118.80	46,463.45	34,444.85	12,018.60
Linn	1,052.39	56,520.51	57,572.90	56,607.93	964.97	4,171.85	37,669.89	41,841.74	35,690.72	6,151.02
Louisa	342.20	18,116.45	18,458.65	22,908.14	*4,449.49	------	------	------	------	------
Lucas	*66.82	25,300.22	25,233.40	17,560.15	7,673.25	4,839.36	21,148.21	25,987.57	22,153.30	3,834.27
Lyon	9,510.27	29,272.71	38,782.98	30,530.21	8,252.77	20,755.10	31,454.92	52,210.02	37,838.64	14,371.38
Madison	2,683.75	24,271.28	26,955.03	25,261.16	1,693.87	3,537.50	33,760.27	37,297.77	33,721.77	3,576.00
Mahaska	142.93	36,720.63	36,863.56	36,970.65	*107.09	4,112.46	44,801.06	48,913.52	47,812.82	1,100.70
Marion	723.06	64,100.31	64,823.37	63,619.97	1,203.40	2,306.79	35,302.52	37,609.31	35,598.72	2,010.59
Marshall	*2,669.19	28,022.92	25,353.73	25,358.42	*4.69	10,240.85	36,880.53	47,121.38	40,100.12	7,021.26
Mills	481.72	23,562.38	24,043.90	17,504.19	6,539.71	4,313.11	29,244.62	33,557.73	31,639.35	1,918.38
Mitchell	745.73	28,085.32	28,831.05	26,478.00	2,353.05	8,560.35	21,849.92	30,410.27	26,627.06	3,783.21
Monona	5,327.25	36,507.71	41,834.96	30,256.94	11,578.02	------	------	------	------	------
Monroe	*11,869.07	23,785.35	11,916.28	37,490.81	*25,574.53	3,323.48	21,864.28	25,187.76	16,934.95	8,252.81
Montgomery	129.42	60,114.63	60,244.05	60,096.70	147.35	1,813.87	27,796.36	29,610.23	861.37	28,748.86
Muscatine	6,105.63	21,490.89	27,596.52	26,514.38	1,082.14	12,599.07	27,030.56	39,629.63	31,296.50	8,333.13
O'Brien	*1,636.99	28,805.03	27,168.04	29,732.94	*2,564.90	19,256.22	34,045.34	53,301.56	39,894.83	13,406.73
Osceola	*1,411.38	15,249.00	13,837.62	16,607.72	*2,770.10	4,466.22	26,699.78	31,166.00	26,043.78	5,122.22
Page	255.65	57,465.80	57,721.45	69,746.71	*12,025.26	7,900.46	38,788.84	46,749.30	39,449.61	7,299.69
Palo Alto	5,787.92	35,186.30	40,947.22	31,634.42	9,359.80	30,203.66	44,962.28	75,165.94	51,582.08	23,583.86
Plymouth	4,430.55	27,251.81	31,682.36	30,909.52	772.84	20,880.89	41,881.20	62,762.09	42,051.21	20,710.88

SUMMARY TABLE No. 21—Continued

County	County Road Cash Fund: Balance or overdraft, Jan. 1, 1916	Receipts, 1916	Total	Disbursements, 1916	Balance or overdraft, Jan. 1, 1917	Township Road, Drag and Drainage Funds: Balance or overdraft, Jan. 1, 1916	Receipts, 1916	Total	Disbursements, 1916	Balance or overdraft, Jan. 1, 1917
Pocahontas	*4,821.60	51,175.27	46,353.67	46,508.75	*135.08	22,162.38	46,191.76	68,353.14	53,811.21	14,542.93
Polk	*3,796.91	42,650.66	38,853.75	40,711.72	*1,857.97					
Pottawattamie	*813.51	66,306.35	65,492.84	65,824.41	*331.57					
Poweshiek	*2,839.79	28,063.01	25,223.72	25,158.91	64.81	10,771.56	41,719.03	52,490.59	42,729.48	9,761.11
Ringgold	*573.39	15,910.97	15,337.58	15,272.90	64.48	1,000.59	22,769.04	22,767.24	21,826.01	940.23
Sac	*9,224.54	42,048.65	32,824.11	30,619.51	2,204.00	12,767.69	42,119.39	54,887.08	46,017.79	8,869.29
Scott	*6,629.12	18,141.77	11,512.65	17,315.64	*5,802.09	10,214.91	35,733.69	45,948.60	30,372.63	4,575.97
Shelby	1,085.65	26,177.39	27,263.04	24,181.56	3,081.48	8,319.60	35,545.30	43,864.90	37,734.76	6,130.14
Sioux	17,391.51	26,308.17	43,699.68	18,808.52	24,891.16	20,694.22	41,035.69	61,729.91	38,489.98	23,240.93
Story	14,975.49	32,453.53	47,529.02	43,297.81	4,231.21					
Tama	*12,949.38	49,847.76	36,898.38	41,763.64	*4,865.26	6,030.36	50,142.42	56,163.37	52,476.33	3,687.04
Taylor	*2,907.81	18,907.15	16,699.34	16,638.35	60.99	11,236.15	29,580.84	40,816.99	32,171.94	8,645.05
Union	*3,707.96	16,417.23	12,709.27	13,154.03	*444.76					
Van Buren	949.31	15,033.11	15,982.42	14,992.57	989.85	291.42	27,200.12	27,081.56	27,508.89	372.67
Wapello	*46.95	32,814.29	32,767.34	34,719.52	*1,952.18	4,723.92	30,115.74	34,839.66	31,503.20	3,336.46
Warren	241.67	39,515.63	39,757.30	38,679.65	1,077.65	6,032.53	33,903.82	39,936.35	34,031.46	5,904.89
Washington	2,639.36	27,617.47	24,508.11	30,231.96	*5,273.85	4,373.65	38,644.06	43,017.71	42,202.89	814.82
Wayne	*2,763.85	16,743.68	13,979.83	22,022.16	*8,042.33	8,547.15	23,042.69	31,589.84	26,334.77	5,255.07
Webster	*13,162.05	27,870.50	14,708.45	17,464.40	*2,755.95	19,706.52	53,132.86	72,839.38	56,066.47	16,772.91
Winnebago	*12,390.34	18,173.88	5,802.52	17,896.16	*12,042.64					
Winneshiek	*7,140.66	38,330.84	31,210.18	31,246.53	*36.35	2,728.42	19,162.12	21,890.54	22,819.97	*919.43
Woodbury	317.43	36,005.55	36,322.98	35,416.89	906.09					
Worth	4,105.37	13,535.90	17,641.47	21,177.75	*3,536.28	4,531.43	17,900.73	22,432.16	19,559.67	2,452.49
Wright	10,637.56	51,101.97	61,739.53	55,916.81	5,822.72	18,596.53	42,122.11	60,712.64	50,667.42	10,045.22
Totals	$ *7,113.92	$3,046,800.54	$3,032,686.62	$2,996,268.14	$ 43,418.48	$723,608.79	$3,071,461.21	$3,795,070.00	$3,255,899.42	$ 539,170.58

SUMMARY TABLE NO. 22.

Bonded Indebtedness of Counties—Annual Reports of County Engineers.

County	Road Funds: Bonds outstanding Jan. 1, 1916	Bonds issued in 1916	Bonds paid in 1916	Bonds outstanding Jan. 1, 1917	Bridge Funds: Bonds outstanding Jan. 1, 1916	Bonds issued in 1916	Bonds paid in 1916	Bonds outstanding Jan. 1, 1917	Total road and bridge bonds outstanding Jan. 1, 1917
Adair									
Adams					$ 7,000.00		$ 5,000.00	$ 2,000.00	$ 2,000.00
Allamakee					19,000.00		4,000.00	15,000.00	15,000.00
Appanoose						$ 25,000.00		25,000.00	25,000.00
Audubon					42,000.00	47,000.00		89,000.00	89,000.00
Benton					25,000.00			25,000.00	25,000.00
Black Hawk					13,000.00			13,000.00	13,000.00
Boone					53,450.00		8,000.00	45,450.00	45,450.00
Bremer									
Buchanan									
Buena Vista		$ 21,000.00		$ 21,000.00	40,000.00	30,000.00		70,000.00	91,000.00
Butler									
Calhoun		40,000.00		40,000.00	30,000.00	22,000.00	5,000.00	48,000.00	88,000.00
Carroll					95,000.00			95,000.00	95,000.00
Cass					80,000.00		6,000.00	74,000.00	74,000.00
Cedar					10,000.00		5,000.00	5,000.00	5,000.00
Cerro Gordo									
Cherokee						32,394.86		32,394.86	32,394.86
Chickasaw					28,000.00			28,000.00	28,000.00
Clarke						22,000.00		22,000.00	22,000.00
Clay	$ 7,000.00			7,000.00	102,000.00	44,000.00		146,000.00	153,000.00
Clayton	15,000.00	2,000.00		17,000.00	35,000.00	34,000.00		69,000.00	86,000.00
Clinton					52,000.00	65,000.00	5,000.00	112,000.00	112,000.00
Crawford					50,000.00		8,000.00	42,000.00	42,000.00
Dallas					30,000.00			30,000.00	30,000.00
Davis					31,500.00		5,000.00	26,500.00	26,500.00
Decatur		10,874.32		10,874.32	13,550.63	19,613.18		33,163.81	44,038.13
Delaware									
Des Moines	19,500.00		$ 2,000.00	17,500.00	29,500.00		5,000.00	24,500.00	42,000.00

SUMMARY TABLE No. 22—Continued

County	Road Funds				Bridge Funds				Total road and bridge bonds outstanding Jan. 1, 1917
	Bonds outstanding Jan. 1, 1916	Bonds issued in 1916	Bonds paid in 1916	Bonds outstanding Jan. 1, 1917	Bonds outstanding Jan. 1, 1916	Bonds issued in 1916	Bonds paid in 1916	Bonds outstanding Jan. 1, 1917	
Dickinson	3,306.81	9,000.00		12,306.81	18,000.00			18,000.00	30,306.81
Dubuque									
Emmet		11,450.00		11,450.00		8,500.00		8,560.00	20,070.00
Fayette					34,000.00	50,000.00	6,000.00	78,000.00	78,000.00
Floyd	17,486.49			17,486.49	66,224.14			66,224.14	83,720.63
Franklin									
Fremont					182,000.00		6,000.00	176,000.00	176,000.00
Greene									
Grundy		500.00		500.00		29,500.00		29,500.00	30,000.00
Guthrie					31,900.00			31,900.00	31,900.00
Hamilton		22,000.00		22,000.00					22,000.00
Hancock									
Hardin									
Harrison						51,857.00		51,857.00	51,857.00
Henry						16,500.00		16,500.00	16,500.00
Howard					30,000.00			30,000.00	30,000.00
Humboldt									
Ida									
Iowa					50,500.00		5,000.00	45,500.00	45,500.00
Jackson					125,000.00		7,000.00	118,000.00	118,000.00
Jasper									
Jefferson									
Johnson	8,000.00			8,000.00	67,000.00	20,283.88		87,283.88	95,283.88
Jones									
Keokuk									
Kossuth					142,000.00	34,000.00	5,000.00	171,000.00	171,000.00
Lee					25,000.00		5,000.00	20,000.00	20,000.00
Linn									
Louisa						33,500.00		33,500.00	33,500.00
Lucas					31,000.00			31,000.00	31,000.00
Lyon									
Madison					41,058.38		2,000.00	39,058.38	39,058.38
Mahaska	19,406.50	9,117.86		28,523.81	71,131.00	19,741.77		90,872.77	119,396.58
Marion		25,422.80		25,422.80	176,000.00	58,000.00		234,000.00	259,422.80
Marshall									
Mills	5,000.00			5,000.00	40,000.00	26,000.00	10,000.00	56,000.00	61,000.00
Mitchell		6,556.00		6,556.00		22,444.00		22,444.00	29,000.00
Monona									
Monroe		10,000.00		10,000.00		10,000.00		10,000.00	20,000.00
Montgomery		40,345.71		40,345.71		30,409.29		30,409.29	70,755.00
Muscatine									
O'Brien									
Osceola						23,000.00		23,000.00	23,000.00
Page		25,000.00		25,000.00	48,300.00	40,000.00		88,300.00	113,300.00
Palo Alto						35,500.00		35,500.00	35,500.00
Plymouth					2,839.14			2,839.14	2,839.14
Pocahontas					57,000.00		3,000.00	54,000.00	54,000.00
Polk					285,000.00	60,000.00	6,000.00	339,000.00	339,000.00
Pottawattamie	65,000.00			65,000.00	75,000.00			75,000.00	140,000.00
Poweshiek									
Ringgold						16,000.00		16,000.00	16,000.00
Sac		16,000.00		16,000.00		12,000.00		12,000.00	28,000.00
Scott									
Shelby									
Sioux									
Story									
Tama						40,500.00		40,500.00	40,500.00
Taylor									
Union					114,000.00		5,000.00	109,000.00	109,000.00
Van Buren									
Wapello	23,000.00	14,000.00		37,000.00	118,500.00	35,000.00	6,000.00	147,500.00	184,500.00
Warren					45,000.00			45,000.00	45,000.00
Washington									
Wayne									
Webster									
Winnebago									
Winneshiek					162,000.00			162,000.00	162,000.00
Woodbury					57,000.00		12,000.00	45,000.00	45,000.00
Worth									
Wright					106,000.00		5,000.00	101,000.00	101,000.00
Total	$182,859.86	$273,557.57	$ 2,000.00	$454,437.03	$2,907,033.29	$1,014,753.98	$139,000.00	$3,872,817.27	$ 4,327,274.30

SUMMARY TABLE NO. 23.

Total Indebtedness of Counties for Road and Bridge Work, January 1, 1917—Annual Reports of County Engineers.

County	Road Funds					Bridge Funds					Total indebtedness of county
	Outstanding bills	Warrants issued and stamped by treasurer	Warrants issued and not presented for payment	Bonds outstanding	Total	Outstanding bills	Warrants issued and stamped by treasurer	Warrants issued and not presented for payment	Bonds outstanding	Total	
Adair	$ 190.51	$ 4,151.47	$ 1,931.93		$ 6,273.91	$ 4,865.20	$ 4,576.36	$ 6,389.89		$ 15,841.45	$ 22,115.36
Adams	50.00		52.39		102.39	50.00	25,763.60	684.49	$ 2,000.00	28,498.09	28,600.48
Allamakee		8,450.85	200.00		8,650.85	2,062.75	68,250.88	200.00	15,000.00	85,513.63	94,164.48
Appanoose	325.45	4,840.12	58.24		5,223.81	2,196.09	10,082.69	79.39	25,000.00	37,358.17	42,581.98
Audubon									80,000.00	80,000.00	80,000.00
Benton	2,500.00	6,419.73			8,919.73	17,700.00	29,660.12		25,000.00	72,360.12	81,279.85
Black Hawk	141.52	1,438.63	1,092.75		2,672.90	2,678.60	1.00	534.59	13,000.00	16,214.19	18,887.09
Boone	3,067.92	3,534.09			6,602.01	1,840.11	22,987.93		45,450.00	70,278.04	76,880.05
Bremer	3,444.36				3,444.36	3,130.46				3,130.46	6,574.82
Buchanan	3,500.00	26,907.18	500.00		30,907.18	10,000.00	34,080.36	500.00		44,580.36	75,487.54
Buena Vista	1,500.00	57,648.85		$ 21,000.00	80,148.85	500.00	97,235.91		70,000.00	167,735.91	247,884.76
Butler	1,700.00	12,284.91	200.00		14,184.91	2,300.00	19,529.63	100.00		21,929.63	36,114.37
Calhoun		33,124.65		40,000.00	73,124.65		26,202.11		48,000.00	74,202.11	147,326.76
Carroll	500.00		3,446.40		3,946.40	500.00	12,929.20	1,635.42	95,000.00	110,064.62	114,011.02
Cass		4,329.78			4,329.78		4,534.86		74,000.00	78,534.86	82,864.64
Cedar		7,064.75	300.00		7,364.75	3,782.00	1,030.19	100.00	5,000.00	9,912.19	17,276.94
Cerro Gordo	583.65	12,327.12	320.91		13,231.68	5,388.86	4,434.93	330.31		10,154.10	23,385.78
Cherokee							64,084.66	645.86	32,394.88	97,125.40	97,125.40
Chickasaw	232.34				232.34	897.62	45,529.49		28,000.00	74,427.11	74,659.45
Clarke	100.00	11,822.78			11,922.78	600.00	13,700.92	49.71	22,000.00	36,350.63	48,273.41
Clay	79.62	22,659.28	1,878.81	7,000.00	31,617.71	45.45	51,061.73	502.32	146,000.00	197,609.50	229,227.21
Clayton	300.00		430.16	17,000.00	17,730.16	500.00	4,102.04	567.00	69,000.00	74,169.04	91,899.20
Clinton	9,000.00		1,259.65		10,259.65	7,000.00		5,566.45	112,000.00	124,566.45	134,826.10
Crawford	2,000.00	57,876.21	484.00		60,360.21	2,000.00	93,708.08	1,430.82	42,000.00	139,138.90	199,499.11
Dallas	1,000.00		1,874.74		2,874.74	2,500.00	68,045.06	6.77	30,000.00	100,551.83	103,426.57
Davis	1,022.68		607.11		1,629.79	1,001.01	27,328.50	7.23	36,500.00	64,836.74	66,466.53
Decatur	159.00	137.48	892.88	10,874.32	12,063.68	50.00	280.93	824.06	33,183.80	34,338.79	46,402.47
Delaware	7,309.17	4,188.79			11,497.96	7,061.00	6,019.92			13,080.92	24,578.88
Des Moines				17,300.00	17,300.00			4,167.32	24,700.00	28,867.32	46,167.32
Dickinson		46,334.04		12,526.81	58,860.85		7,755.11		18,000.00	25,755.11	84,615.96
Dubuque							162,466.21	29,814.49		192,280.70	192,280.70
Emmet	1,000.00	46,117.15		11,450.00	58,567.15	800.00	11,478.91		8,500.00	20,828.91	79,409.08
Fayette	400.00		7,296.58		7,696.58	13,000.00	62,328.52	309.40	78,000.00	153,807.10	161,504.51
Floyd	44.00	2,196.12	265.58	17,486.49	20,982.24	722.07	31,476.59		66,234.14	103,432.80	124,116.04
Franklin	3,374.18		603.93		3,978.11	533.90	15,018.32	2,208.00		17,760.28	21,738.39
Fremont	500.00		120.00		620.00	1,500.00	52,721.91	2,650.00	170,000.00	228,871.91	232,401.91
Greene	1,839.71				1,839.71	5,505.48				5,505.48	7,416.19
Grundy	350.00	3,349.25		500.00	4,199.25	300.00	7,432.13		29,500.00	37,232.13	41,431.38
Guthrie	100.00	14,697.01			15,167.01	300.00	11,906.54		31,900.00	44,116.54	59,361.55
Hamilton	1,500.00			32,000.00	33,500.00	11,500.00	46,000.00			47,500.00	81,000.00
Hancock	2,493.11	2,501.62	909.25		6,903.98	2,714.22				2,714.22	9,708.20
Hardin	800.00	18,143.84			18,942.84	678.63				678.63	19,652.47
Harrison	250.00		79.39		329.39	2,000.00	115,835.00	2,550.00	51,857.00	172,202.00	172,501.39
Henry	187.45		3,197.41		3,384.86	1,544.31		570.46	16,500.00	18,614.77	21,999.63
Howard		19,722.12			19,722.12		30,217.07		29,000.00	59,217.07	78,939.19
Humboldt						4,000.00	24,058.59			28,058.59	28,058.59
Ida	2,070.50				2,070.50	6,548.03	19,902.90	23.80		26,474.79	28,545.09
Iowa	980.33	18,127.69	701.82		19,809.84	1,500.00	21,744.90	4,478.33	45,500.00	73,223.23	93,033.07
Jackson	2,465.52	3,807.04	5,443.59		11,716.15	9,694.78	29,313.08	2,734.98	118,000.00	160,762.84	172,478.99
Jasper	1,400.00	24,884.32	775.72		27,030.04	1,000.00	65,031.98	86.35		66,118.33	93,178.37
Jefferson		41,158.87			41,158.87		42,648.54			42,648.54	83,807.41
Johnson	350.00			8,000.00	8,350.00	100.00			87,262.88	87,362.88	95,712.88
Jones	2,282.92		1,534.78		3,817.70	5,008.88	14,125.37	139.28		19,273.53	23,090.83
Keokuk	2,928.20	13,791.63			16,719.83	2,453.83	29,575.24			32,029.07	48,748.90
Kossuth	10,000.00		2,949.73		12,949.73	500.00	36,589.64		171,000.00	208,089.64	221,039.37
Lee		428.14	116.40		544.54		71.82	278.61	30,000.00	30,350.43	30,894.97
Linn	500.00	5,319.28	1,750.00		7,569.28	2,000.00	7,358.58	3,000.00		12,358.58	19,927.86
Louisa	193.91	91.50	90.55		375.96	2,035.85	248.44	68.20	33,500.00	35,852.49	36,228.45
Lucas	600.00				600.00	1,900.00	42,022.70	341.49	31,600.00	75,864.19	76,464.19
Lyon	131.42		201.00		332.42	530.85	19,909.72	728.80		21,169.37	21,501.79
Madison	1,808.90				1,808.90	52.45			39,068.38	39,121.83	40,930.73
Mahaska	1,122.46	3,774.18	30.50	28,523.81	33,450.95	10,805.96	23,804.79	24.75	90,872.77	125,508.19	158,959.14
Marion	1,200.00	16,454.04		25,423.89	43,077.93	2,200.00	79,435.48		234,000.00	315,635.48	358,713.41
Marshall	2,387.92				2,387.92	2,489.48	63,628.19			66,117.67	68,505.59
Mills	3,276.10		2,555.42	5,000.00	10,831.52	3,792.75	4,707.67		56,000.00	64,500.42	75,331.94
Mitchell	155.58		1,427.36	6,556.00	8,138.94	3,415.85	9,421.60	707.97	22,444.00	35,989.42	44,128.36
Monona	1,500.00				1,500.00	1,000.00	18,244.95			19,244.95	20,744.95
Monroe				10,000.00	10,000.00	1,219.09			10,000.00	11,219.09	21,219.09
Montgomery	37.13		782.74	40,546.71	41,366.58	2,929.98		1,750.43	30,409.29	35,089.70	76,456.28
Muscatine	1,206.97		155.15		1,362.12	1,415.72		4.45		1,420.17	2,782.29
O'Brien	1,084.09		84.80		1,168.89	2,656.32		162.45		2,818.77	3,987.66
Osceola	6,000.00	3,338.50	400.00		9,738.50	6,000.00	4,006.79	200.00	23,000.00	33,206.79	42,945.29
Page	347.62		361.70	25,000.00	25,709.32	2,013.97		1,244.87	88,260.00	91,518.84	117,228.16
Palo Alto	800.00		824.86		1,624.86	920.00	45,296.82	763.55	35,500.00	82,479.37	84,104.23

SUMMARY TABLE No. 21—Continued

County	Road Funds: Outstanding bills	Road Funds: Warrants issued and stamped by treasurer	Road Funds: Warrants issued and not presented for payment	Road Funds: Bonds outstanding	Road Funds: Total	Bridge Funds: Outstanding bills	Bridge Funds: Warrants issued and stamped by treasurer	Bridge Funds: Warrants issued and not presented for payment	Bridge Funds: Bonds outstanding	Bridge Funds: Total	Total indebtedness of county
Plymouth							2,828.73		2,839.14	5,667.87	5,667.87
Pocahontas	500.00	12,302.81			12,802.81	1,000.00	51,790.27		54,000.00	106,790.27	119,593.08
Polk	193.00		204.26		397.26	157.00	7,383.14	278.12	339,000.00	346,818.26	347,215.52
Pottawattamie	1,000.00	7,738.24		65,000.00	73,738.24	2,000.00	123,939.01		75,000.00	200,939.01	274,677.25
Poweshiek	1,000.00	13,567.22			14,567.22	1,000.00	49,215.18			50,215.18	64,782.40
Ringgold							2,247.37		16,000.00	18,247.37	18,247.37
Sac	300.00	11,813.85	3,622.80	16,000.00	31,736.65	75.00		8,536.70	12,000.00	20,611.70	52,348.35
Scott	664.79		231.49		896.28	877.33		69.07		946.40	1,842.68
Shelby	337.00	9,700.54			10,037.54	1,000.00	9,171.30			10,171.30	20,208.84
Sioux											
Story	6,200.00	25,224.90	307.95		31,732.85	6,900.00	4,581.93			11,481.93	43,215.76
Tama	10,990.73	7,955.95			18,946.68	1,914.45	66,502.97		40,500.00	108,917.42	127,864.10
Taylor	685.01	19,903.93			20,588.94	2,694.25	30,827.90			33,522.15	54,111.09
Union							6,931.10		109,000.00	115,931.10	115,931.10
Van Buren		36,848.62			36,848.62		6,949.20			6,949.20	43,797.82
Wapello	100.00	5,742.50	220.92	37,000.00	43,063.42	100.00	24,572.01	227.05	147,500.00	172,399.06	215,462.48
Warren	100.00		476.21		576.21	250.00	42,697.09	94.46	45,000.00	88,041.55	88,617.76
Washington		816.25			816.25		4,354.93			4,354.93	5,171.18
Wayne		15,979.30			15,979.30		22,910.93			22,910.93	38,890.23
Webster	1,787.10	8,217.38			10,004.48	3,109.54	9,343.03			12,452.57	22,457.05
Winnebago			2.12			2.12		631.49		633.61	635.73
Winneshiek	529.05	12,588.45			13,117.50	261.61	75,237.06		162,000.00	237,498.67	250,616.17
Woodbury	800.00	11,554.14			12,354.14	4,700.00	13,492.44		45,000.00	63,192.44	75,546.58
Worth	300.00				300.00	789.78				789.78	1,089.78
Wright	1,694.27		1,471.57		3,165.84	694.08	8,416.30	6,189.47	101,000.00	116,299.85	119,465.69
Total	$ 125,475.95	$ 754,788.09	$54,779.14	$ 434,437.03	$ 1,380,426.45	$ 216,352.16	$ 2,430,474.78	$60,985.32	$ 3,977,457.27	$ 6,645,530.43	$ 8,034,968.98

ILLUSTRATIONS

INDEX

PART ONE.

PART II

SUMMARY OF ANNUAL REPORTS OF COUNTY ENGINEERS

STATE OF IOWA

1915

REPORT OF THE

DAIRY AND FOOD DEPARTMENT

FOR THE

YEAR ENDED OCTOBER 31, 1915

W. B. BARNEY
STATE DAIRY AND FOOD COMMISSIONER

DES MOINES:
ROBERT HENDERSON, STATE PRINTER
J. M. JAMIESON, STATE BINDER
1915

LETTER OF TRANSMITTAL

To His Excellency, G. W. CLARKE, *Governor of Iowa:*

Sir: In compliance with the law, I have the honor to submit herewith the Twenty-ninth Annual Report of the Dairy and Food Commissioner.

W. B. BARNEY,
Dairy and Food Commissioner.

Des Moines, November 15, 1915.

DAIRY AND FOOD COMMISSION.

Office	Name	Legal Residence	Birthplace	Compensation
Commissioner	Wm. B. Barney	Des Moines	Vermont	$ 2,70
Deputy	B. C. Iliff	Des Moines	Iowa	1,80
Chief Insp. Wts. & Meas.	Edward C. Lytton	Des Moines	Iowa	1,80
Insp. Wts. & Measures	A. B. Briggs	Ottumwa	Missouri	1,80
Insp. Wts. & Measures	E. J. Nolan	Des Moines	Iowa	1,80
Asst. Commissioner	Paul W. Crowley	Des Moines	Iowa	1,80
Asst. Commissioner	Guy M. Lambert	Newton	Iowa	1,80
Asst. Commissioner	H. W. McElroy	Red Oak	Iowa	1,80
Asst. Commissioner	J. J. Ross	Iowa Falls	Iowa	1,80
Asst. Commissioner	T. A. Clarke	West Bend	Iowa	1,80
Chief Chemist	E. L. Redfern	Des Moines	Iowa	2,40
Asst. Chemist	Wm. H. Harrison	Des Moines	New York	1,80
Asst. Chemist	Geo. H. Chittick	Des Moines	Nebraska	1,80
Dairy Inspector	O. P. Thompson	Waterloo	Iowa	1,80
Dairy & Food Inspector	H. E. Forrester	Charles City	Kansas	1,80
Dairy & Food Inspector	L. L. Flickinger	Carroll	Iowa	1,80
Dairy & Food Inspector	L. P. Anderson	Spencer	Iowa	1,80
Dairy & Food Inspector	F. W. Stephenson	Oelwein	Illinois	1,80
Food Inspector	Chris. Ottosen	Ottosen	Iowa	1,60
Food Inspector	M. E. Flynn	Burlington	Iowa	1,60
Food Inspector	S. O. Van De Bogart	Des Moines	Iowa	1,60
Food Inspector	J. W. Milnes	Creston	Iowa	1,60
Food Inspector	J. S. Bittner	Cedar Rapids	Iowa	1,60
Food Inspector	C. S. Bogle	Des Moines	Iowa	1,60
Food Inspector	C. O. Frazer	Des Moines	Iowa	1,60
Chief clerk	A. W. Day	Des Moines	Iowa	1,80
City Milk Inspector & License Clerk	W. B. Barney, Jr.	Des Moines	Iowa	1,80
Stenographer	Olive A. Wasson	Des Moines	Iowa	90
Stenographer	Addie McQuiston	Des Moines	Iowa	90
Stenographer	Margie Garrity	Des Moines	Iowa	90

REPORT OF COMMISSIONER.

I shall deal as briefly as possible with part of the subjects taken up for, while this is primarily a report of the dairy work of the department, we think it well to take up a few other matters of general interest.

We are responsible for the enforcement of the following laws:
Dairy Law.
Pure Food Law.
Agricultural Seed Law.
Concentrated Feeding Stuffs Law.
Condimental Stock Food Law.
Paint and Linseed Oil Law.
Turpentine Law.
Weight and Measure Law.
Sanitary Law.
Cold Storage Law.
Commercial Fertilizer Law.
Calcium Carbide Law.

The sanitary law enacted by the 34th General Assembly might be termed part of our dairy law, as the regulations provided for in this act have helped materially to better the quality of our dairy products. Our last report showed that on account of the betterment in quality of our butter, several hundred thousand dollars more had been paid over to the producers last year, and we are showing a still further improvement this year. We have been doing more work among the producers and on the dairy farms than ever before and shall continue to give a good deal of attention to this line of work, as we believe it most important.

We are pleased to note the interest manifested in dairying in southern Iowa. By reference to a map shown on another page of this report you will notice that, out of the 473 creameries in the state less than one hundred are located in the southern third. There is no reason why they should not be as numerous in that section as in the northern part. In many ways southern Iowa has advantages over the northern section of the state. The winters

are several weeks shorter affording pasture earlier in the spring and later in the fall. Clover does as well and alfalfa is more easily grown, as the soil appears to be better adapted to this plant Land values range from $15 to $50 per acre less than in the northern section. We have maintained that, in a measure, this is due to the fact that the dairy cow has been slow in coming into her own and the fertility has gone from the soil to a greater extent than it would have, had there been more cows and less grain farming. The rough, hilly sections of southern Iowa are better suited to dairying than to any other purpose.

It is said that the man who makes two blades of grass grow where but one grew before is a benefactor. Following out this line of reasoning, we believe that the man, who by the use of the pure bred dairy sire increases the production of the herd from 30 to 50 per cent, becomes as much of a benefactor as the producer of an increased crop of grain or grass.

To begin with, the success or failure in dairy work depends entirely on the old cow. She is the keystone to the entire superstructure. We know from statistics that the average cow that is milked upon the average farm of our country is not yielding a profit to the farmer. That is, if she were charged with her feed and labor and credited with her product she would show little, if any profit. Better cows and more intelligent feeding would change all this. The dairy work over a great share of our state is considered too much as a side line and does not receive the attention that it should for its proper development. It is our observation that sections of this state that have given the dairy business the attention it deserves have been rewarded in that the people have better homes, more home comforts, better barns, and other farm improvements, larger bank accounts, and general indications of prosperity are evident.

We know from statistics already at hand that during the last ten years there has been a better showing made in the number of dairy cows as compared with the total number of cattle upon the farms throughout the country and we believe this condition has been brought about and is a direct evidence of the work done and the enthusiasm developed by this department assisted by the Iowa State College at Ames and the State Dairy Association.

A careful study of results covering a period of ten years would indicate that Iowa has a great future as a dairy state. Figures

obtained from twenty-one creameries in Fayette county indicate that the average butterfat production per cow has been increased 41 pounds within ten years, while 25 Bremer county creameries report figures showing an increase of 50 pounds per cow for the same period.

When we consider that these averages cover an entire county and keep in mind that a great many farmers have made little or no effort at improvement, these figures indicate a wonderful development in certain communities. As an example of what is a possibility for Iowa, let us consider the output of butter in Bremer county, which amounts to 3,393,278 pounds annually, making an average of 7,854 pounds per square mile. If the entire state of Iowa produced butter at this rate, our annual yield would be 420,710,650 pounds, worth $126,213,195.00 or more than four times our present output.

By the application of methods now in use by the best dairymen it would be easy to add fifty pounds to the average production of each cow in Bremer county, and on that basis the state of Iowa would produce each year 532,601,636 pounds of butter worth at 30 cents a pound $159,780,490.80. This situation is worthy of the attention of every farmer in Iowa, as it affords a means of producing wealth from land at such high values that other branches of agriculture cannot be carried on with profit, and this without reducing the fertility of the soil to any noticeable degree.

It has been demonstrated that success can be attained with grade cows using a pure bred dairy sire and grading up the herd, using the native cattle as a foundation. The scale and Babcock tester are of untold benefit to the farmer as a means of finding the good and poor producers and when once a poor producer is discovered, she should be sent to the block so that she may not reproduce her kind to be fed at a loss.

So much inquiry for grade cows of the dairy breeds has come to the department from the West and Southwest that we have offered our services as a sort of information bureau and now have a list of grades that are for sale in different parts of the state. One party has recently taken to New Mexico 75 or 100 head and will soon return for more, as one county alone expects to put in 400 to 500 head in the next six months. This affords a new source of revenue to our farmer, breeder and dairyman as it provides

a ready market for his surplus grades of the different dairy breeds at prices ranging from $75 to $125 per head for his cows, depending on their condition, breeding and quality.

We frequently find people who claim that the dairy business is going to be overdone, but there are several reasons why this may not happen. In the first place, there is just enough drudgery about it, so that many will not take it up on that account. We know that milk and dairy products are relatively cheaper than any other human food. (See another page in this report for "The Comparative Value of Milk as a Food.") The average citizen is not aware of this fact, and this department has been trying so far as possible to disseminate this knowledge. If the dairymen of this country had used one half of the money advertising their products that has been spent by the people putting cereal products on the market, the sale of dairy products would be increased 25 per cent. Dairying will never be overdone on the American farm.

Through the high class dairy cow, we have the best means of marketing the crops raised on high priced lands and at the same time, conserving the fertility of the soil, which is from now on going to be a most important factor especially in the older sections of our country. The following we clip from an address by Prof. C. Larsen, Brookings, S. D., before the 37th Annual Convention of the Iowa State Dairy Association:

The dairy cow as a worker is in a class by herself. She works day and night and year after year provided she is given the opportunity. Few of us stop to analyze the work of the dairy cow. When such is done her importance on the farm is perhaps more fully appreciated.

The average field crops such as hay, straw and grain, are bulky, heavy and expensive to market. Especially is this true for us who live in the central west and northwestern states a long distance from central markets, and for those whose farms are located a long distance from railroad stations. Many farmers are located from six to fifteen miles from a shipping point. Such farmers can not load and unload and make much more than one trip each day. To haul a load of hay to town will then cost the value of a day's wages of team and man. To haul one load of grain will cost about an equal sum.

When this grain is unloaded at the elevator it will cost about 1c per bushel or about $1 per wagon load to get it into the railroad car.

When it is loaded, then there is the expense of transportation to the central market, which for this territory is usually Chicago. From Sioux City, Iowa, to Chicago it costs 17c per 100 pounds to market corn. The transportation charge on hay from Sioux City, Iowa, to Chicago is 20c per 100 pounds.

During the winter months a dairy cow will eat about three tons of hay and one ton of grain. To get this feed for one cow from the farm to Chicago market will then cost:

Hauling from farm to shipping point three loads of hay @ $4	$ 12.00
Hauling from farm to shipping point one load of grain	4.00
Transportation or freight on three tons of hay from shipping point to Chicago @ 20c per hundredweight	12.00
Transportation or freight on one ton of grain @ 17c per hundredweight	3.40
Total cost of marketing feed for one cow per year	$ 31.40

This cost has been calculated on the basis of carload rate, and does not consider elevator charge, nor commission for handling and selling at central market place.

The work of the dairy cow is to reduce this marketing expense. A fairly good dairy cow should be able to change this feed into 200 pounds of butter. The cost of shipping 200 pounds of butter from Sioux City, Iowa, to Chicago is $1.35. Adding $2 for hauling it from farm to shipping point, the cost of marketing the 200 pounds of butter would therefore be about $3.35. The cost of marketing the feed necessary to produce this butter as shown above is $31.40. The dairy cow thus reduces the cost of marketing field crops from $31.40 to $3.35 or to about one-ninth as much.

In these days when there is so much discussion and even criticism of the high freight rates, farmers should permit the dairy cow to help solve this problem of high transportation.

WORK OF THE LABORATORY.

Chemical analyses made in the laboratory of the department from November 1, 1914, to November 1, 1915:

Cream and milk	1152
Ice cream	236
Paints and linseed oils	44
Miscellaneous food products	365
Stock foods	58
Bacteriological analyses	217
Samples for Board of Control	33
Samples for Attorney General	67
Samples for Commission of Pharmacy	26
Samples for County Attorneys	15
Samples of milk analyzed in co-operation with U. S. Department of Chemistry	500
Total number of analyses	2713

WORK FOR OTHER DEPARTMENTS.

The food law provides that the laboratory maintained in this department shall make such analyses for other departments as may be authorized by the Executive Council.

The Department of Justice, the Commission of Pharmacy, and Board of Control all avail themselves of this provision. Since the enactment of more drastic temperance legislation the work coming to us from the attorney general's office has increased so that with what we do for the other departments mentioned above, about one-third of the time of the chemists in this department is devoted to outside work and all of the expense of all kinds is borne

by this department. A conservative estimate makes this expense $2,150 for outside work.

In addition to the above the dairy law provides for appointment by the commissioner of a milk inspector in all cities of 10,000 or more people. This requires an outlay of $3,537.56, making a total of $5,687.56, paid out of our appropriation for what may be termed work outside of the department.

The object of the legislature in putting the provision in the law requiring the laboratory in this department to do this outside work was to save expense of maintaining and equipping one or more additional state laboratories.

We call attention to this in order that it may be well understood.

WEIGHTS AND MEASURES.

Of the various laws enforced by this department, none has called for as much increased activity during the year as the weight and measure law.

As the public becomes better informed as to the provisions of this law there is an increasing demand for the scale inspection service rendered by the department.

When the weight and measure law first became effective many dealers reluctantly permitted the inspection of their scales. As the work has proceeded and the attention of the owners called to the inaccuracies of their scale equipment, the advantages of periodical inspection are readily seen. With the present keen competition in the sale of most staple commodities, scales or weights, which cause weighings to be inaccurate to the extent of three to five per cent, have an important bearing on the returns of a business.

Only recently the manager of a chain of cream buying stations strenuously objected to paying this scale inspection fee charged for the testing of a platform scale at one of these stations. Inspection and testing of the scale in question disclosed the fact that they over-weighed each can of cream he purchased about three-quarters of a pound. A correction of the scale resulted in the saving of seventy-five pounds of cream in each one hundred cans weighed. Upon being notified of the circumstances, this same manager requested the inspection of all of the scales at the various stations as soon as the inspectors were in the territory. He now considers the scale inspection fee cheap insurance against his losses.

Numerous other instances of like nature could be cited, but this one will suffice to illustrate how periodical inspection of scales promotes fair dealing.

The accurate testing of scales necessitates trying out the instrument with loads of different weight. This requires the use of a large number of test weights for the purpose of determining whether or not the scale beams and levers respond with equal accuracy under a maximum and minimum load.

Many scale operators are inclined to believe that if a scale balances properly without a load and will weigh, say fifty or one hundred pounds accurately, that the scale needs no further attention. In general, nothing is farther from the truth, as is easily demonstrated every day by the inspectors. They frequently find scales which are accurate when loaded with one hundred pounds, but which may be from eighty to one hundred pounds "short" or "long" when a thousand pound load is weighed. The reasons for this are too technical to be included in this report, but practical demonstrations easily show why inspection by competent and experienced inspectors is necessary and why the inspectors are compelled to carry so many test weights to perform apparently simple inspections.

To handle the numerous heavy weights necessary to thoroughly test platform and wagon scales the department has purchased two automobile test cars. These cars which were especially constructed for the purpose are equipped to carry one thousand pounds of

test weights, which in addition to the weight of the car gives sufficient range of weights to perform accurate testing of these large scales.

There has been such a demand for the service rendered by these cars during the past season that we are now considering the advisibility of purchasing two more to meet the increased demand for this kind of work.

The fees charged for the inspection of scales have been given considerable attention by the department. Our recommendations to the last Legislature fairly adjust these fees so that scale owners bear a portion of the state's expense for the performance of this work. Fees charged for the inspection service are as follows:

"An inspection fee shall be charged the person owning or operating the scale so inspected in accordance with the following schedule, to-wit:

"Scales over 500 lbs. capacity up to and including 4,000 lbs. capacity, $1.00 each.

"Scales over 4,000 lbs. capacity, up to and including 21,000 lbs. capacity, $3.00 each.

"Scales over 21,000 lbs. capacity, not including railroad track scales, $5.00 each.

"Railroad track scales, $10.00 each.

"All hopper or automatic scales, $2.00 each.

"No person shall be required to pay more than two inspection fees for any one scale in any one year. When such inspection shall be made upon the complaint of any person, other than the owner of the scale, and upon examination the scale is found by the inspector to be accurate for weighing, the inspection fee for such inspection shall be paid by the person making the complaint.

"When special request is made for an inspection of a scale the actual expenses of the same shall be paid by the owner of said scale, or the one making complaint as herein provided."

During the past year the department has tested and inspected over two thousand scales, for which service fees aggregating $5,785.70 were collected.

No fee is charged for the testing and inspection of counter scales.

MARKET MILK INVESTIGATIONS.

During the summer season of this year, the department investigated the market milk supplies of our larger cities in a more comprehensive manner than we have been able to do heretofore.

The plans for this survey were formulated at a conference held early in the spring with the representatives of the United States Department of Agriculture. The Federal authorities being interested in shipments of milk to and from our state, installed temporary but complete chemical and bacteriological laboratories at Dubuque, Davenport, Keokuk and Omaha, Nebraska. The facilities of these laboratories were placed at our disposal enabling us to test the milk supply of these and neighboring cities both chemically and bacteriologically with practically no expense to the state.

The plan followed in the various cities varied to meet the local conditions, but in general the plans were substantially the same. The milk was sampled from the individual delivery wagons throughout a period of from three to five days; from two to five samples being taken each day from each dealer known or suspected to be selling milk of low quality.

Working in this manner, the average quality of the milk being sold by these dealers was soon known, making it possible to pass by those dealers whose product was well above the legal requirements and to devote our time and attention to those dealers whose product was of an inferior quality.

The quality of the milk from a sanitary standpoint was ascertained by determining the total number of bacteria and also the number of bacteria of the colon group present. As the name indicates, the colon bacteria are the organisms present in the colon, of man and other warm blooded animals. A determination of the number of these bacteria present indicates the degree of contamination with fecal matter and other forms of sewage. While the test for colon bacteria cannot be considered a test for bacteria causing typhoid fever, still at the same time the test is a valuable one as indicating the possible presence of the latter organism. Direct tests for typhoid bacteria were not made as at the present time it is not practicable to perform this test in the ordinary routine analysis of field work.

Sediment tests were made on all samples. This test shows the amount of insoluble dirt present in the milk, and, as the results of these tests can be demonstrated optically to the producers, the test is quite valuable in showing them the relative amount of foreign matter present in their milk.

In several instances it was found that the milk delivered by the producers to the milk plants or to retail milk dealers did not

comply with the legal requirements for butter fat and solids. In such cases the farms producing the sub-standard milk were visited by one of the inspectors shortly before the time of the morning or evening milking. Samples of the milk of each individual cow were taken separately and tested at the laboratory. A record of the production and butter fat tests of the individual cows was then turned over to the owner of the herd in order that the cows responsible for the low test milk could be eliminated. Such cows not only produce milk of low food value but frequently the value of their product does not equal the cost of the feed. In but one or two instances was it found that similar herd tests had been performed by the dairy themselves. However, the value of such tests was easily demonstrated to all, it being readily seen that by means of these herd tests the dairyman can tll which of his cows produce sub-standard milk, and by disposing of the cows whose milk is of low quality he can improve the quality of his output, at the same time lower the cost of production and increase the returns for his labor.

That there is a greater variation in the product of the individual cows in a community than is commonly supposed may be seen from the following data collected from the herd tests made at Dubuque and Davenport:

Limits of butter fat, solids and solids not fat found during herd tests at Dubuque and Davenport:

	% Fat		%Solids		% Solids Not Fat	
	Max.	Min.	Max.	Min.	Max.	Min.
Dubuque	8.9	1.9	17.8	10.7	10.06	7.73
Davenport	7.4	1.9	16.25	10.26	10.26	7.36

In addition to the examination of the samples each dairy farm selling milk was visited by a representative of this department, the farm and dairy equipment were scored and inspected to determine its sanitary condition. A record of these inspections together with a copy of these score-cards, is filed at our office and will be used for future reference in order to note improvements in equipment and methods at future inspections.

As soon as the work of inspection was completed the proprietors of the various dairies needing attention were invited to hearings held at the various cities. At these hearings the dairymen were

presented with the records of their herd tests and the tests made upon the samples of their milk supply, together with copy of the score card. The hearings were informal, affording the dairyman an opportunity to ask questions and to talk over his own problems with our representative and with those of the United States Department of Agriculture.

The department has also made a survey of the market milk supplies of Des Moines, Fort Dodge, Marshalltown, Ottumwa, Oskaloosa, Mason City, Waterloo and Grinnell, the samples from these cities being analyzed at our laboratory here. We expect to complete this survey by taking in the rest of our cities as soon as the season will again permit. To facilitate this work we have inereased the equipment of our bacteriological laboratory and are now in a position to handle this work at our own laboratory.

While the purpose of these investigations was to determine the exact quality both as to food value and wholesomeness of the milk being sold and to assist the dairymen in improving the quality of their products, there were several cases of flagrant violations of the dairy law coming to our attention which necessitated prosecution. The department secured convictions in each case.

The summer's work is now being followed up to see that the recommendations made by the inspectors are being carried out. Recent reinspections made at Dubuque, Davenport and Keokuk show gratifying results. While it is true that not all the instructions have been carried out as we would have them, marked improvements were to be noticed.

The following table shows the average maximum and minimum bacterial counts obtained in the cities visited:

TABLE NO. 1—BACTERIA IN MILK.

Average Maximum and Minimum Bacterial Counts of Samples of milk obtained during the summer of 1915.

City	No. of Samples	Total Bacteria per Cubic Centimeter			Per cent with more than 100,000 bacteria per c. c.
		Maximum	Minimum	Average	
Dubuque	180	200,000,000	100,000*	600,000	16
Davenport	735	90,000,000	100,000*	400,000	9
Des Moines	647	56,000,000	72,000	4,000,000	49
Council Bluffs	107	6,150,000	5,000	1,000,000	27
Fort Dodge	14	1,000,000	1,000	120,000	0
Ottumwa	19	1,125,000	20,000	400,000	0
Oskaloosa	19	8,800,000	62,000	1,865,000	0
Grinnell	8	800,000	5,000	105,000	0
Mason City	13	4,000,000	11,000	1,000,000	16
Waterloo		20,500,000	7,000	2,750,000	8

*Less than.

TABLE NO. 2—CITY MILK LICENSES.

Table showing the number of milk licenses issued to city milk dealers for each year from 1908 to 1915. In each case the year ends on July 4th.

Year	1908	1909	1910	1911	1912	1913	1914	1915
Number	1078	1149	1109	1310	1408	2038	2189	2360

Cities	Population	Inspectors
Boone	12,296	M. Healy, M. D.
Burlington	24,057	W. F. Schroeder
Cedar Rapids	40,500	Phil Pray
Clinton	26,016	J. H. Spence, D. V. S.
Council Bluffs	31,908	G. G. Miller, D. V. S.
Davenport	48,154	H. J. High
Des Moines	105,538	W. B. Barney, Jr.
Dubuque	41,494	F. J. Kennedy, D. V. S.
Fort Dodge	19,310	Francis Lodgate, M. D.
Keokuk	15,173	W. P. Sherlock, M. D.
Iowa City	12,043	C. S. Chase, M. D.
Marshalltown	15,807	C. A. Noggle, D. V. S.
Mason City	17,066	A. L. Wheeler, M. D.
Muscatine	15,629	C. J. Hackett, D. V. S.
Oskaloosa	10,414	A. L. Washburn, M. D.
Ottumwa	25,407	B. W. Van Der Vier
Sioux City	61,787	E. C. Pape
Waterloo	22,908	W. W. Wyant

COST OF MAINTAINING THE DEPARTMENT

It is rather hard to determine whether the legislature expects this department to be self supporting or not. The federal government appropriates many hundred thousands of dollars yearly for the enforcement of the dairy and food laws.

It has been our experience that the license feature or provision in many of the laws is most helpful in bettering conditions. This is especially true since the Commissioner has been given authority to withhold or revoke these licenses. With this feature in the law the person not complying is given notice or a letter of warning and very generally if his place is not sanitary he will clean up without further trouble. We believe if it were not for this feature in the sanitary law we would be obliged to make a third more prosecutions than we have and the same is substantially true of many of our other laws.

We have always been extremely careful and have only used this power where we felt it was absolutely unavoidable. It is certainly a "big stick" with which to line up the willful offender. It may easily be seen that the pecuniary gain coming to the state is not the only advantage to the people and the department on account of what may be termed, "the license clause" of the several laws we have for enforcement. Where we have been consulted as to the size of these fees or licenses we have always recommended a moderate fee and the increased revenue coming to the department is partly due to the growth of the state but a greater share of the gain can be attributed to the rapid growth of the department in the last five years. Where we had the enforcement of five or six laws five years ago, we have twelve to look after at this time. None of these require so much attention as the weight and measure law. This additional work has required more help and necessarily greater expense. Therefore, we thought it wise to make a fee or license to cover at least part of this expense. Many appear to think the department should be made self supporting, yet we are some times criticized on account of this policy as many overlook the fact that this is the only way we have of deriving funds for maintenance of the Department. We wish it understood that the law requires that these fees be turned over to the State Treasury. The Department is supported by appropriations made by the Legislature.

As a servant of the commonwealth my desire is to submit this short summary of the matter for your consideration. It is my opinion that the policy we have been following out of assessing a moderate license fee and thereby relieving the tax payer of a portion of these burdens is sound and defendable even if it were not for the reasons set forth as to other advantages of this plan.

In 1909 the annual revenue for licenses, tax tags, etc., amounted to $9,593.24; for 1910, the amount turned over to the state treasurer was $17,435.30; for 1911, $20,892.97; for 1912, $22,049.02; for 1913, $36,504.52; for 1914, $43,842.40; and for the year ending Nov. 1, 1915, $50,244.10.

As all fines under the various laws go into the county funds where cases are prosecuted, this should be added to the earnings. At a conservative estimate this amount would reach $5,500.00, making a total of $55,744.10.

From the above one is able to get something of an idea of the growth and increase in the work of the department in the last five years.

THE BUTTER TRADEMARK.

During the last session of the legislature, the dairy law was amended so as to permit the use of a trade-mark for Iowa butter, the purpose of which was defined as "Insuring a higher standard of excellence and quality, a more uniform butter market, a higher market value for the butter manufactured in the state, and to

insure a more healthful product for consumption at home and abroad."

As a means of placing this trademark in effective operation, the law named an executive committee composed of the President of the Iowa State Dairy Association, the President of the Iowa State Buttermakers' Association, the Dean of the Division of Agriculture of the Iowa State College, the Professor of Dairying of the same institution, and the State Dairy and Food Commissioner. The function of the executive committee is to formulate rules and regulations for the use of the trade-mark.

Owing to the far reaching effect, which it is believed this trade-mark will have on Iowa butter, the Executive Committee has been compelled to proceed slowly and so far has devoted its time and attention to a study of the best methods of using the mark and to securing a copyright for the same from the United States Bureau of Patents.

Owing to the fact that many unforeseen technicalities have arisen in connection with the copyright of the mark, the Executive Committee has been unavoidably delayed. All difficulties now seem cleared away and the granting of the copyright is daily expected. As soon as it is received the committee can proceed with placing its use in operation.

There is an ever increasing demand for a uniform supply of first quality butter, produced under strict sanitary conditions. While there is probably more butter of this quality produced in Iowa than in any other state in the union, even the best grades of Iowa butter often sell at a price below its real value for the reason that the

products of the various creameries are not of uniform quality, and the purchaser has no means of readily differentiating between them. It is believed that the use of the trade-mark will adjust this difficulty for the reason that the packages bearing the mark will be distinctive and the mark significant of quality.

Much work will have to be done with the commission men to whom the butter is consigned as well as with the consumer. Their confidence in the product must be obtained; they must be educated to the fact that the product of the various creameries entitled to the use of the mark is of the same uniform good quality; that it is manufactured under rules and regulations necessitating a high standard for cleanliness, and that the creameries are periodically inspected by the state dairy inspectors. It is only by establishing such confidence in the trade-marked product that it will receive the increase in price which it will deserve.

A trade-mark common to a large number of creameries should be of inestimable value in advertising the product for the reason that any money expended for such purposes could be applied to the advertising of trade-marked butter as a whole and thereby secure for it an increased market value at a minimum cost to the individual creameries. Such advertising would be most effective when undertaken by a group of from seventy-five to one hundred or more creameries. It is this kind of advertising that has increased the sales of California oranges 71 per cent in ten years and has sold 130,000 tons of California raisins in one year.

While the trade-mark was designed primarily as a means of promoting the sale and increasing the market value of the wholesale package, the same mark could be used for giving similar protection to prints packed for eastern shipment or designed for sale on the Iowa market.

For too long, the superior Iowa butter, the fine flavored, wholesome and healthful product of our best creameries has been compelled to compete in price with inferior products sold under fanciful but well advertised brands.

The Executive Committee in charge of the trade-mark whose work it is to complete the details for the plan must have the hearty co-operation and assistance of the creamerymen. It is only by this co-operation that the plan will meet with a full measure of success and the first quality Iowa product receive the recognition which it merits.

FARM INSPECTION AND EDUCATIONAL WORK AMONG CREAM PRODUCERS.

The work of the dairy department of the Dairy and Food Commission was primarily to inspect and compel the operators of creameries, cheese factories, and dairies to maintain their premises in a sanitary condition.

Later on through the assistant commissioners, the buttermakers received information in regard to up-to-date methods of testing and handling of the cream for buttermaking. This idea led up to the policy of the department not only seeing to it that the sanitary regulations were complied with but that of rendering such assisance and advice to buttermakers and creamery managers, as wolud make for the building up of the dairy business and rendering that of the local institution more profitable.

This combination of police power and educational privilege has rendered the work of the department more effective and acceptable than would that of police power alone.

We believe that the conditions existing in the Iowa creamery today are very acceptable with the exception of a few old creameries which are rapidly being replaced with new and modern ones and, as a general rule, the buttermakers are experts in their line. But in spite of the fact that most of the creameries are in good condition and are operated by competent buttermakers, there is some butter in Iowa which is not what it should be.

Buttermakers, dairy instructors and officials are coming to realize that there is one step which has been sadly neglected in the system of dairy inspection and education. That step is farm inspection or that of giving personal attention to the producer of milk and cream. We do not know of a single instance where special attention has been given to going out among the patrons of a creamery, advising them as to the methods of handling milk and cream under their own particular farm conditions and various other phases of the production work, where this sort of work has not built up interest in dairying with the result that dairy herds have been improved and the owners have practiced more economical methods of feeding. We are convinced that this sort of work will do more than any other one thing towards building up dairy communities on a permanent basis.

We have, up to this time, been handicapped in doing this kind of work by the fact that territories covered by the assistant commissioners have been too large. Now, with the extra men recently put on the force, the territories have been sufficiently reduced so that part of their time can be devoted to farm inspection.

Each inspector will select a creamery or two in his territory at which to do this special work. In selecting the creamery the idea uppermost will be that of rendering service to the creamery in greatest need and so situated that large localities can observe the benefit to be derived by proper methods.

Before starting out to help develop a locality, we expect the inspector to secure the cooperation of the board of directors and the men directly in charge of the creamery and desire to have it understood that in rendering these services, he wants to work with the management and not for it.

Furthermore, any creamery securing this help will be expected to send butter regularly to the educational scoring contests held within the state. We believe that this is not unreasonable as the butter is paid for and in this way those in charge will have an unprejudiced opinion as to the quality of the butter and the progress that is being made at the creamery can be determined.

We wish to make it plain that although the assistant commissioners expect to be doing special work in a few localities their services are still available to any creamery which may desire to have farm inspection work done among their patrons.

DAIRYING IN SOUTHERN IOWA.

The extent to which dairying is practiced in southeastern Iowa is, at times a question that calls forth more or less discussion. The attention of a traveler is usually attracted by the scarcity of dairy barns, the small number of special dairy cattle and the small number of cows in the herd. To a casual observer this seems sufficient evidence that dairying is carried on in a minor way in this tract of country, but closer observation reveals the fact that almost every community has one or two special dairymen who are alive to the advantages of a herd on expensive farm land and are pushing ahead in this particular line, even if community dairying is rare.

If a straight line were drawn across Iowa from the Mississippi river to the Missouri river, passing through Des Moines, it would be found that about 8,473,200 pounds of creamery butter are produced in southern Iowa in one year. Approximately ten per cent of all dairying is done south of this line.

This shows the marked contrast between northern and southern production. With the relatively small number of special dairymen found in the latter, one would naturally expect fewer creameries also. This scarcity of creameries is very marked, for the majority of those which exist are what are known as central plants, receiving the bulk of their raw material by rail. Technically speaking, very few local creameries exist. Ever so many are scattered over this territory but they have been abandoned. There is little doubt but that these abandoned creameries and what they represent form one of the greatest drawbacks to dairying in this section. Their general history is all very similar.

Several years ago these cooperative creameries were organized by professional and unscrupulous creamery promoters. Very often the building was located in a community that did not have enough cows to supply the necessary cream to run them. Dairying received an unhealthy impetus, for hundreds of farmers, awakened to the interests of dairying and better farming, lost money when the creameries were closed. They lost more than money and so did the State of Iowa, as each new creamery closed its doors.

There are several states in the Union now that have communities of Iowa farmers who left Iowa at that time, left heart sick and discouraged to try their luck in new land. More than one state inspector in Wyoming, Nebraska, Oklahoma has met his Waterloo in these Iowa communities in sister states when he tried to revive the interest in dairying. The memory of their losses stays with them and years of work will be needed to convince many of these men that dairying pays and that their land, dairying and success can be made compatible.

This department has always maintained a rigid policy in regard to the establishment of local plants. It has always held that it is imperative that the entire product of at least 600 to 800 good cows be pledged before a creamery should be built. We firmly believe that a local creamery is the greatest incentive for more and better dairying and is a strong influence for permanent agriculture. We are continually and persistently encouraging the milking of more cows in southern Iowa.

Through the local plants, local clubs, public schools, inspection, public meetings and the press we are ever encouraging more dairying. During the past two or three years the results were a little slow, but a growing and an enthusiastic confidence has been established. At the present time there is every indication that a general awakening for real dairying is now on foot. We predict that southern Iowa has a brighter future for dairying than any other section in the middle west. Inspired by faith in the dairy cow and impressed by the increase of soil fertility and greater profits to be gained through her, the progressive farmer is looking for more cows. Southern Iowa is behind her aspirations with considerable enthusiasm and while pursuing a slower course, she gives promise of surer, saner creamery and dairy progress. This department is willing and anxious at all times to furnish whatever assistance it can to encourage dairying in this section. We are also prepared to furnish information in regard to local conditions and local markets.

As far as we can find out there is not a single drawback to dairying in southern Iowa. Good land at moderate prices, an abundance of all kinds of grain and forage crops, pasture and good water, all combined with excellent market facilities form a combination for ideal dairying that is seldom duplicated.

There seems to be a growing tendency on the part of some creameries to pay extremely high prices for butterfat. During the past summer these creameries have been paying not less than 1 cent per pound butterfat above Elgin quotations, plus the express. The express amounts to from one-half cent to two cents per pound butterfat. By the time the expense of manufacture is added the cost of the finished butter should be almost prohibitive considering the price received for the butter.

The quality of cream that is purchased under this method is usually from two to six days old before it reaches the creamery. By that time it is decidedly second grade and it is not reasonable to believe that first grade butter can be manufactured from it. Of course, certain amounts of this butter are put up in prints and sold to advantage, but competition and poor quality tend to keep the selling price at or below normal.

Creameries that follow the practice of paying the extreme for second grade cream and selling their butter at market prices generally fail in a short time, but if the creameries continue to flourish under their conditions it is evident that a loss has been sustained by someone else.

ICE CREAM.

The weather conditions during the past year have been decidedly unfavorable for the ice cream manufacturers of the state. The up-to-date manufacturer in any line is continually striving to conduct his business in such a manner that on and off seasons will not effect materially his output. To be able to stimulate the demand for ice cream during cold weather to such an extent that the factory will not have to be operated at a loss has been the dream of the ice cream manufacturers since the manufacture of ice cream by the factory system began.

We are glad to state that this year it seems that the ice cream manufacturers have nearly accomplished this. Our reports from eighty-five per cent of the 420 factories show that during the past year 2,421,387 gallons of ice cream were manufactured. This is about 80,000 gallons less than last year of those reporting and goes to show that the ice cream in this state is manufactured by a class of men who are able to meet any and all adverse conditions. This year having been the coldest within the memory of the oldest residents of the state we believe the showing made in the ice cream output is very good.

From our reports we find that over 25 of the manufacturers keep no account and have no idea whatever of the amount of ice cream they manufacture and we must say that this is very poor policy. Any manufacturer who does not keep track of his output is very apt to be slack in his other accounts and methods. We wish to take this opportunity of urging every ice cream manufacturer to keep strict account of his output and costs of production, for by so doing we believe that a number of ice cream men can put their business on a more profitable basis. We have been continually urging upon the ice cream men the importance of the butterfat basis in buying their sweet cream. We have spoken of this so often that we hesitate to mention it again and yet this matter is of sufficient importance that it should only become an obsolete topic in Iowa when every dealer in cream and milk for manufacturing or distribution purposes buys these products on a butter fat basis. When we started to urge the buying of cream for ice cream making purposes on the butter fat basis, some considered the producers of sweet cream too independent to consent to having their cream bought by this method. Our first reports indicated about sixty to seventy per cent of the manufacturers

purchased their cream by the gallon. Last year about fifty per cent used this method, while this year we find that only forty per cent of those reporting are still buying their sweet cream on the gallon basis. Of those reporting as not knowing the amount of ice cream manufactured the past year, sixty-six per cent were buying by the gallon. To our minds this goes to corroborate the statement made in the second paragraph of our report that those who do not keep proper accounts of their business, are apt to be slack in their other methods. To illustrate, the saving to the man buying his cream on the butter fat basis, the average price paid for butter fat was 32.3c up to 5.8c over the New York market. In some instances where cream was bought by the gallon, the cream could still have complied with the state standard and the buyer have been paying from 91c to $1.05 per pound and in any number of individual cases manufacturers paid 43c and 46c per pound for butter fat. We hope that in time to come the system of buying cream by the gallon will be a thing of the past for we are thoroughly convinced that paying for it on the butter fat basis is the only fair method both for the producer and consumer. It eliminates more controversy between buyer and seller thus making for a greater satisfaction to all concerned.

We are pleased to note that there has been fewer prosecutions for violations of the ice cream standard than there was the year preceding. We attribute this to several reasons, the principal one being that we believe the ice cream makers are coming to realize that the standard and complying with the same works to their own advantage. There has also been an abundance of sweet cream during the past year (very few reporting any difficulty in securing their supply) and with the demand for ice cream not up to the preceding year, there has been less temptation to make up their product with a deficiency of butter fat and again the knowledge of the fact that there is a standard for ice cream in this state which has been upheld by the supreme court of Iowa has carried more reverence for it by deliberate violators.

We believe it is a credit to the department to be able to report that from nearly every ice cream manufacturer reports come that the condition of the returned empty containers is much improved and that the securing of this has been done without the necessity of a single prosecution. We also believe that the same is true of the conditions in the ice cream factory.

THE INDEPENDENT BUYER.

During the past year the system of buying cream through agents has changed somewhat. Formerly these agents were simply commission agents or salaried buyers, but at present a large portion of the cream that is being bought in stations is purchased outright by the agent. He has become what is known as an independent buyer. The cream is sold to the highest bidder. In other words these cream agents are now cream speculators. There is no doubt but these speculators are partly responsible for the extremely high prices being offered for cream.

Perhaps such a plan has its advantage to the creameries but the manner in which it is being conducted certainly is detrimental to the creamery industry as a whole. A great amount of dissatisfaction is aroused because one creamery will be compelled to send out several different quotations for butterfat. The direct shipper, the commission buyer, the salaried buyer and the independent buyer each receive a different price quotation. When these differences become generally known dissatisfaction exists and distrust is a natural result.

Our attention was called a short time ago to two letters that were sent out to a certain community each letter bearing the same date and signed by the same man. One letter was to the commission buyer advising him that the butter market was weak and that he must get his price down at once. The other letter was sent direct to a farmer (who happened to be a patron of the station buyer). The farmer was advised that the butter market was stronger and that he could receive the benefit of the highest price if he would ship his cream direct. When these two letters were compared, suspicion of the creamery methods were aroused. The station closed its doors and the farmer is now churning butter. The dairy industry has received a set back in this particular section.

This department has been called upon many times to make investigations of this matter. Any number of cans of cream have been weighed and sampled, and the samples tested by our chemists. Now there has usually been more or less difference between our results and those of the paying creamery.

It has always been argued that in testing cream a reasonable variation must be allowed and that two testers working in different places under different conditions and using different equipment

will seldom check out exactly. This little chance for a difference has been talked about for so long a time that it is now generally accepted as a fact. If this variation exists, and we question that it should, it seems unreasonable to us that the difference should always be in favor of the buyer.

In checking over our records we fail to find a case of where the difference ever favored the seller. This department has always been willing to recognize a reasonable tolerance in all cases, but on several occasions prosecutions have been made against testers for reading the tests too low. Only a few weeks ago 15 cans of cream were weighed and sampled by one of our inspectors. The samples were tested and the results were compared with those returned by the creamery. Our results showed 319 pounds of butterfat while the creamery paid for only 296 pounds. The loss sustained by the shipper was 23 pounds of butterfat which at 28.5 cents amounted to $6.56.

This department feels that the policy of paying extremely high prices for butterfat encourages the under reading of tests and should be discouraged. We mention this fact at this time with the idea of discouraging the practice, because it is a detriment to the dairy industry. We are ready to assist any shipper who is experieneing similar difficulties.

In checking up the different cream stations we have observed that the greatest loss in butterfat is found in the independent buyer stations. Frankly we do not understand why this should be so.

This department is interested in doing all that it can to encourage dairying and is not prejudiced in any way toward any one system. But when one system is being practiced in a way that does not appear to be legitimate, we will surely use our influence to have the system changed.

MILK AS A FOOD.

The value of milk as a food is not appreciated as it should be. Many adults consider it a beverage rather than an easily digestible and highly nutritious article of food. They do not realize that a glass of milk contains approximately the same amount of nutritive material as a good slice of beef, a quarter of a loaf of bread, or two large eggs.

It has been truthfully stated that we live not upon what we eat, but upon what we digest. Milk is more completely digested

and utilized than any other article of food. Far more easily digested than such animal foods as meat, fish, etc., in place of which milk and milk products find their logical place in the diet.

Not only is milk more readily and completely digested, but the same amount of nutritive material can be obtained for less money in milk than in other animal foods.

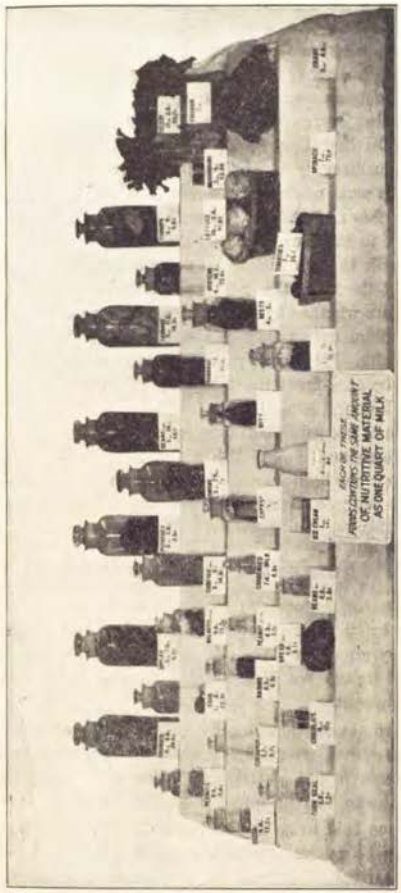
The table below shows the relative values of a number of common foods as compared with milk. In the quantities stated in first column each contains the same amount of nutritive material as one quart of milk.

TABLE NO. 3—RELATIVE VALUE FOODS.

	Weight lbs.	Weight oz.	Approximate Weight Gms.	Cost per pound, cents	Total cost cents
Milk, whole	2	2.36	975	----	8.
Cheese, full cream	--	5.6	160	22	7.7
Condensed milk, sweetened	1	4.53	210	13.3	12.7
Eggs	1	.02	470	35 (doz.)	22.3
Beef, round	--	11.85	335	20	14.8
Codfish, salt	2	.48	920	7	14.2
Crabs	3	4.8	1500	----	----
Oysters	4	14.21	2217	15	72.6
Cornmeal	--	6.43	180	3	1.8
Bread, white	--	8.8	250	7.5	4.1
Beans, dry	--	6.9	195	6.5	2.82
Beans, canned, baked	1	2.	660	10	11.9
Beans, string	3	14.	1760	9	25.
Potatoes	2	2.79	1010	1½	3.05
Beets	4	2.	1870	----	----
Cabbage	5	11.8	2900	2.5	14.3
Celery	10	2.4	4600	5	50.7
Lettuce	10	2.4	4600	10	101.
Spinach	7	----	3175	10	70.
Squash	7	----	3175	----	----
Tomatoes	7	----	3175	5	35.
Turnips	5	8.	2495	1	5.5
Onions	3	7.3	1575	2	7.
Mushrooms	3	8.1	1620	75	225.
Raisins	--	8.3	225	12	6.3
Oranges	4	6.4	1995	6	23.4
Bananas	2	8.6	1150	6	15.
Apples	3	7.5	1575	1.5	5.2
Walnuts, "English"	--	8.45	240	25	12.3
Peanuts, whole	--	5.95	170	15	5.6
Peanut butter	--	4.50	120	18	4.1
Cocoanut, prepared	--	3.7	105	25	5.7
Chocolate	--	4.	115	40	10.
Cocoa	--	4.9	140	40	12.2

The above table is based on 1 quart of milk of (2.147 lbs.) equals 600 calories.

The cereal products are, in the raw state, the cheapest food stuffs we can buy, but many of the products manufactured from these cereals would not be so generally used were their cost compared with milk. Consider, for example, the widely advertised prepared breakfast foods. It takes from six to nine large helpings (approximately one package) of many of these prepared foods



to contain as much nourishment as one quart of milk or three quarters of a pint of cream with which they are served at the breakfast table. The quart of milk costs the housewife about eight cents, whereas the breakfast food requires the expenditure of from ten to twenty cents for a package. While the raw cereal products such as cornmeal, flour, etc., are indeed cheap foods for furnishing energy they do not contain appreciable amounts of protein. On the other hand, more than twenty-five per cent of the food constituents of whole milk consists of this necessary material in its most useful form—casein. Protein the most costly of food materials and the one generally lacking in inexpensive foods is required to build up our body structure.

Skim milk is even richer in protein than whole milk for the reason that the fat is the only food material removed by the skimming of milk whether by means of the separator or by the gravity method. Skim milk possesses about one-half the total food value of whole milk. More of it should be used in the home.

It will be seen from the foregoing table that cheese at twenty-two cents a pound is as cheap a food as milk at eight cents a quart. The public is becoming better acquainted as to the economy of the use of cheese and cheese dishes and as a result, the per capita consumption has been increased to about three and one-half to four pounds a year; a figure still too low in comparison with the amounts of meat consumed.

USE OF HYPOCHLORITE OF LIME.

The value of hypochlorites of various forms has long been appreciated by the practitioners of medicine and surgery and also by sanitary engineers, but it is only during the past two or three years that its use has been applied for the purpose of sterilizing dairy equipment.

While we cannot consider hypochlorites as efficient or as economical as steam, we realize there are often conditions where the use of steam is not practicable. For such conditions solutions of hypochlorite will be found a good substitute.

A solution said to be hypochlorite of soda prepared electrolytically, may be purchased on the market. The packages of this product bear full directions for its dilution and use. A product of high antiseptic properties may, however, be prepared at a much lower cost from chloride of lime which is obtainable from any

druggist. This solution is made by dissolving a heaping teaspoonful of fresh chloride of lime, more properly chlorinated lime, to one gallon of water. The water should be cold, or not hotter than the hand can bear.

Chloride of lime may be purchased in sealed cans (do not purchase in bulk) for ten cents a pound. A one pound can will make about 125 gallons of the solution. Chloride of lime should contain so much chlorine that it cannot be held near the face without irritating the eyes. It should be fresh and should the entire contents of the package not be dissolved at one time, the remainder should be transferred to a tight fruit jar and kept there until used, as it becomes valueless if kept in a moist place or in the open air. For this reason, chloride of lime should be purchased in small (one-half pound) cans.

On the dairy farm the solution, prepared as above, should be placed in a tank in which the utensils should be rinsed, after having first been rinsed with cold water, and then washed with a brush in hot alkaline solution (Wyandotte or Sal-Soda). After the utensils have been rinsed in chloride of lime solution, they should be inverted to drain, they must not be wiped. Where strainer cloths are used they may be washed after milking and then kept in a chloride of lime solution until again required.

Chloride of lime solution is also useful for wetting the cloth with which the hind quarters, tail, flanks and udders are wiped before milking and for spraying the barn floors and walls.

If milk and cream cans are rinsed with chloride of lime solution immediately before filling, the results will be surprising. Experiments have been conducted which show that the chloride of lime solution has little or no action upon the cans. Cans in which the solution has stood five days showed no evidence of any corrosion or discoloration.

Chloride of lime solution may be used freely on the farm and in the creamery as a general antiseptic and disinfectant for the disinfection of closets, manure pits, sinks, grease traps, barrels, buckets, tanks, etc. It is highly efficient as a germicide agent.

Chloride of lime in dilute solution is harmless. It is used in most of our cities for the purification of the water supply.

IOWA CHEESE FACTORIES.

Iowa cheese factories during the year ending June 30, 1915, furnished a market for 6,747,344 lbs. of milk, the figures being received from eleven plants. From this milk was made 704,463 lbs. of

cheese having a wholesale value of $77,097.73. This shows quite a perceptible increase in the amount made over the previous year, but the total amount produced is only a small per cent of that consumed within the state. We find about half of the factories are located in the south half of the state, and in our opinion it would be easier to develop the cheese industry in the southern counties than farther north where the manufacture of butter has already received attention on such a large scale. In our work in the southern part of the state, we may be able to assist in the location of cheese factories in communities where a sufficient amount of butter fat could not be obtained to make the operation of a creamery profitable.

CONDENSED MILK FACTORIES.

The manufacture of condensed milk has never claimed the attention of Iowa dairymen in anything like a general way, but we find within the borders of the state three factories that are producing evaporated milk. The three plants received, for the year ending June 30, 1915, 16,886,400 lbs. of milk which, if entirely consumed within the state would supply only a small percentage of the local demand. The state of Iowa should not only supply the home market with condensed milk, but should market annually many millions of pounds of evaporated milk in other states. As land advances in value, we expect to see many condenseries established, but we do not believe the time is at hand when this work can be begun.

CONDITION OF BUTTER MARKET.

The table of butter prices given in connection herewith shows that the average price for creamery butter for the year ending October 1, 1915, is somewhat higher than for the previous year, although the market for the past three months has shown a decided falling off as compared with the same months of 1914. This is accounted for to some degree by the unusual production of butter throughout the summer which has tended to overstock the markets. Excessive rainfall, while a serious damage to grain crops, produced an abundance of fine pasture during the months of July, August and September at which season dry weather usually reduces the output of butter to quite a degree. The increase referred to does not show in the present report for the reason that the figures received from the creameries cover the year ending June 30th, while a market quotation is given for a year ending three months later. A study of the New York quotations for extra butter shows that the lowest price quoted was 25 cents while the top price was 36½ cents showing quite a range of prices for the same grade. With the abundance of coarse feed produced the past season the dairymen of the state are well prepared to winter dairy cows in good condition and indications are that the market will be well supplied with butter for several months to come. Lower prices always tend toward an increase in consumption and this fact will insure a reasonable compensation for every pound of butter that can be produced which is good enough to be sold as table butter.

The variation in prices quoted for the best butter and undergrades is quite pronounced and only emphasizes the necessity for producers waking up to the fact that there is little demand for butter of poor quality. The number of creameries that are buying raw material on grade is on the increase. The Iowa creameries report having manufactured 89,834,005 lbs. of butter for the year ending June 30, 1915, for which they received $25,559,714.60. This amount is somewhat lower than that produced in the twelve months previous which is partially accounted for by the extremely dry weather prevailing in the last half of the year 1914.

TABLE NO. 4—PRICE OF BUTTER.

SHOWING AVERAGE MONTHLY PRICE, IN CENTS AND FRACTIONS THEREOF, OF EXTRA CREAMERY BUTTER IN NEW YORK MARKET, THE PAST TWELVE YEARS, EACH YEAR ENDING WITH OCTOBER 1.

Month	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915
October	21.09	25.93	25.84	26.11	29.15	30.73	30.64	29.96	30.44	31.29	31.46	31.69
November	25.17	24.81	25.50	27.62	27.25	29.57	30.95	31.17	33.91	31.46	32.82	34.79
December	24.23	26.88	24.89	31.64	28.87	31.21	34.90	29.66	30.79	27.27	30.12	33.98
January	25.70	29.13	28.50	30.89	30.69	31.52	33.44	30.28	28.10	25.18	32.69	33.50
February	25.17	32.18	27.09	29.54	32.23	30.09	29.64	26.11	31.14	26.29	29.24	32.31
March	24.59	28.97	27.40	30.61	28.49	29.53	32.62	28.91	30.64	26.77	27.74	29.70
April	22.84	30.06	27.89	30.69	28.55	27.06	31.19	31.11	29.35	24.59	25.40	30.77
May	20.19	23.71	25.17	25.01	23.69	26.58	28.43	27.87	30.43	28.61	26.16	28.86
June	18.69	20.40	20.22	23.60	23.29	25.81	27.95	24.90	27.31	27.81	27.22	28.29
July	17.67	20.56	20.62	24.81	22.43	26.23	28.31	25.10	27.13	27.62	27.90	27.62
August	17.50	21.11	22.57	24.88	22.87	27.19	29.38	26.31	26.63	27.96	30.43	25.92
September	19.47	20.69	24.02	27.81	23.88	30.13	29.89	26.55	29.76	31.07	31.43	26.63
Av. value per lb. per year	21.46	24.80	25.40	27.98	27.62	28.48	30.60	26.60	31.21	28.41	29.97	30.29

TABLE NO. 5—CREAMERY BUSINESS.

SHOWING POUNDS OF MILK AND CREAM RECEIVED, POUNDS OF BUTTER MADE AND DISPOSITION OF SAME, SO FAR AS REPORTED.

Counties	Number reporting	Pounds of milk received	Pounds of cream received	Pounds of butter manufactured	Pounds sold to patrons	Pounds sold in Iowa	Pounds sold outside the state
Adair	2	502,180	1,601,069	628,914	28,686	31,448	568,780
Adams	1		398,114	108,197	6,128	23,321	78,748
Allamakee	7		7,190,684	1,974,043	47,575	127,471	1,798,997
Appanoose							
Audubon	8	76,255	2,761,109	1,066,121	71,155	39,822	955,144
Benton	6	74,792	1,500,811	405,028	9,654	163,812	231,562
Black Hawk	13	23,402,606	4,538,050	2,059,235	143,665	406,321	1,502,369
Boone	3	382,500	943,820	304,619	11,729	118,700	174,190
Bremer	24	59,484,162	978,886	2,837,355	232,043	131,979	2,473,482
Buchanan	8	13,701,201	2,571,447	1,400,705	112,787	116,492	1,177,780
Buena Vista	6	65,133	1,804,021	659,285	26,505	10,159	501,271
Butler	11	8,372,378	3,291,128	1,332,307	101,605	121,937	1,109,955
Calhoun	4	12,359	1,380,154	426,304	29,120	40,085	357,179
Carroll	7	211,468	1,951,119	690,909	27,023	102,229	561,558
Cass	2		1,704,927	677,650	759	21,043	485,808
Cedar	4		1,914,617	649,828	22,870	250,568	371,392
Cerro Gordo	20	1,597,308	8,219,591	1,766,035	46,530	338,224	1,306,281
Cherokee	2		73,000	29,480	520	10,000	18,960
Chickasaw	11	15,973,160	6,928,611	2,347,644	188,074	118,485	2,041,285
Clarke							
Clay	7	136,000	1,928,053	586,309	49,739	45,285	486,373
Clayton	14	15,779,766	8,816,074	3,256,359	136,875	136,768	3,002,126
Clinton	6	1,751,004	2,270,529	804,379	16,970	91,658	666,952
Crawford	1	13,948	258,424	121,644		59,288	62,356
Dallas	2	170,140	602,552	169,362	29,847	18,490	121,028
Davis							
Decatur	1						
Delaware	10	19,003,291	6,924,798	2,827,982	180,002	519,250	2,104,798
Des Moines							
Dickinson	5	539,867	2,286,730	813,390	18,293	158,118	637,063
Dubuque	17	2,123,429	6,796,574	2,457,307	92,659	482,394	1,882,314
Emmet	2	467,680	1,042,613	325,017	20,601	20,112	278,304
Fayette	21	31,906,208	8,387,941	3,641,702	298,688	315,432	3,027,379
Floyd	4	16,710	2,609,174	722,290	72,617	180,012	469,361
Franklin	8	10,379	3,623,519	1,041,217	54,437	112,653	874,727
Fremont	1		7,200	2,000			2,000
Greene	2	102,847	405,420	151,299	9,450	70,851	70,998
Grundy	5	797,366	2,590,282	749,685	49,709	10,144	691,077
Guthrie	5	57,575	1,726,150	577,561	56,096	85,817	435,648
Hamilton	5	1,438,741	951,187	290,419	34,056	36,083	220,280
Hancock	8		4,162,434	1,241,520	58,951	81,273	1,101,298
Hardin	11	382,766	4,844,790	1,491,810	96,209	130,197	1,265,404
Harrison							
Henry							
Howard	9	174,340	6,160,495	1,774,264	53,704	79,802	1,640,758
Humboldt	6	49,169	2,696,455	732,500	44,129	41,631	646,740
Ida	2		424,972	107,743	2,000	45,000	60,742
Iowa	6		1,340,653	424,490	38,547	77,912	308,031
Jackson	12	417,022	4,486,169	1,563,864	36,611	76,742	1,450,511
Jasper	1		305,784	98,597	8,570	36,074	53,953
Jefferson	2	14,400	682,728	195,623	11,845	57,000	126,797
Johnson							
Jones	7	1,508,398	7,149,287	2,140,778	117,912	142,640	1,877,306
Keokuk	2		797,462	295,973	260	65,900	229,813
Kossuth	17	506,499	5,507,363	1,607,329	171,429	158,468	1,277,431
Lee	1		2,620,169	766,746		65,608	701,138
Linn	8	879,687	9,767,586	2,789,315	73,022	306,881	2,430,412
Louisa							
Lucas	1		116,792	29,908	25	15,271	14,792
Lyon	3		1,947,515	572,302	4,148	57,984	511,170
Madison							
Mahaska	1		771,856	213,628			213,628
Marion	1	115,348	225,955	81,852		852	81,000

TABLE NO. 11—Continued.

Counties	Number reporting	Pounds of milk received	Pounds of cream received	Pounds of butter manufactured	Pounds sold to patrons	Pounds sold in Iowa	Pounds sold outside the state
Marshall	3	30,105	1,908,571	650,567	20,063	223,622	406,872
Mills	1		210,334	57,584	1,440	38,972	17,172
Mitchell	8	700,320	4,406,002	1,294,625	98,566	55,968	1,140,084
Monona	1		77,540	20,585	623	966	18,970
Monroe	1		312,000	100,000	5,000	70,000	25,000
Montgomery	1		284,264	71,046		17,759	53,287
Muscatine	1						
O'Brien	5	198,433	1,798,737	653,903	65,806	88,025	501,071
Osceola	4		767,144	197,229	8,550	22,066	166,195
Page	1		1,909,115	464,969	160,991	45,022	419,057
Palo Alto	11	2,466,090	4,098,012	1,372,107		114,117	1,097,059
Plymouth	7	171,726	464,230	146,946	4,021	51,049	91,897
Pocahontas	4	9,448	648,135	209,856	5,005	42,450	161,501
Polk	4	387,800	14,684,039	4,851,409		1,063,433	2,888,056
Pottawattamie	1		2,911,485	970,495		305,448	665,047
Poweshiek	2	62,441	672,976	240,288	6,672	176,073	57,543
Ringgold	1	31,034	1,320,600	41,241	550	12,238	28,452
Sac	4	31,517	1,204,015	321,712	13,861	79,308	228,493
Scott	8	4,850	2,335,756	722,314	200	180,565	541,549
Shelby	4		749,132	230,151	18,529	11,861	200,761
Sioux	9	219,514	4,521,002	1,569,909	42,940	99,220	1,447,800
Story	8	155,329	2,130,527	702,377	85,642	121,402	477,333
Tama	4		1,222,698	374,732	1,546	112,309	260,817
Taylor	2		2,694,568	691,522	15,000	47,000	629,522
Union	2	317,705	2,358,806	642,619	4,209	87,650	550,627
Van Buren	1		184,888	66,016	775	450	64,791
Wapello	3	297,534	5,085,615	1,682,984	628	335,170	1,347,178
Warren							
Washington							
Wayne	2		2,306,501	784,994	4,163	94,454	686,377
Webster	4	182,500	1,820,343	478,383	2,980	394,754	80,639
Winnebago	8	2,783,386	4,665,161	1,509,585	132,101	88,581	1,329,843
Winneshiek	9		8,683,432	2,353,233	38,198	131,067	2,163,978
Woodbury	3		27,371,837	10,394,186	2,000	733,484	1,781,502
Worth	8	203,609	4,613,739	1,281,208	82,361	76,067	1,122,870
Wright	5	65,467	1,732,444	495,260	28,354	80,744	386,172
Total	479	298,149,017	274,813,792	89,834,065	3,782,286	12,059,833	73,991,586

TABLE NO. 6—HAND SEPARATORS.

SHOWING NUMBER OF CREAMERIES REPORTING USE OF HAND SEPARATORS, NUMBER SO REPORTED, NUMBER OF CREAMERY PATRONS AND NUMBER OF COWS.

Counties	Received cream by rail	No. of creameries reporting hand separators	Hand separators reported	No. of patrons reported	No. of cows reported
Adair	1	2	602	609	3,386
Adams		1	122	136	903
Allamakee		7	1,570	1,586	12,000
Appanoose					
Audubon		8	1,196	1,206	7,561
Benton		6	685	727	5,008
Black Hawk	1	11	1,059	1,849	14,714
Boone		5	481	504	2,689
Bremer		7	302	1,718	17,562
Buchanan		7	1,031	1,093	11,270
Buena Vista		6	1,051	1,060	6,715
Butler	1	11	994	1,421	10,543
Calhoun	1	4	691	691	3,000
Carroll	1	7	909	959	5,301
Cass	1	2	717	737	3,430
Cedar		4	709	858	4,500
Cerro Gordo	2	9	974	2,108	12,374
Cherokee		1	100	100	700
Chickasaw		10	1,512	1,589	16,979
Clarke					
Clay		6	790	796	3,981
Clayton	1	13	4,416	2,782	24,271
Clinton	1	5	1,022	1,078	5,391
Crawford	1	1	130	135	850
Dallas	1	2	356	369	1,520
Davis					
Decatur					
Delaware	1	13	1,804	2,613	14,371
Des Moines	1	4	900	922	5,370
Dickinson	3	15	2,835	3,121	17,610
Dubuque		3	142	227	1,004
Emmet		14	1,803	2,916	22,710
Fayette		4	690	846	4,295
Floyd	1	8	1,137	1,160	8,138
Franklin					
Fremont		2	311	316	1,700
Greene		5	606	621	5,569
Grundy		3	661	678	4,115
Guthrie		5	476	534	2,966
Hamilton	1	8	1,302	1,271	9,071
Hancock	1	10	1,732	1,755	9,884
Hardin					
Harrison					
Henry		9	1,643	1,765	12,100
Howard	1	6	805	823	5,052
Humboldt		1	150	150	950
Ida	2	6	615	632	3,670
Iowa	1	10	1,758	1,817	11,703
Jackson		1	175	175	1,225
Jasper	2	1	200	230	1,440
Jefferson		1	10		
Johnson		7	1,595	1,709	14,027
Jones	1	2	495	600	2,550
Keokuk		17	1,303	2,277	13,000
Kossuth	1	1	1,000	1,100	5,500
Lee	2	8	3,223	3,507	20,000
Linn					
Louisa		1	35	35	190
Lucas	1	3	675	705	4,020
Lyon					
Madison	1	1	30	300	1,500
Mahaska		1	180	313	1,564
Marion	1	3	870	907	5,100
Marshall					

TABLE NO. III—Continued.

Counties	Received cream by rail	No. of creameries reporting hand separators	Hand separators reported	No. of patrons reported	No. of cows reported
Mills		1	90	96	420
Mitchell		8	1,200	1,261	10,017
Monona		1	34	34	200
Monroe		1	100	100	1,200
Montgomery		1	90	90	625
Muscatine		1		129	
O'Brien		5	882	882	5,125
Osceola		2	151	543	1,720
Page	1	1	1,000	1,100	6,000
Palo Alto		11	1,251	1,367	9,902
Plymouth		1	150	150	700
Pocahontas		3	305	310	1,870
Polk	4	4	6,350	6,070	30,770
Pottawattamie	1	1	1,200	1,230	7,380
Poweshiek	1	2	341	418	2,450
Ringgold		1	87	88	620
Sac		4	541	550	3,125
Scott	2	3	920	970	5,095
Shelby		4	357	362	2,780
Sioux		9	2,139	2,148	11,416
Story		7	795	891	5,403
Tama	1	3	380	390	2,210
Taylor		2	1,515	1,516	10,600
Union	1	2	948	995	4,720
Van Buren		1	140	140	900
Wapello	3	3	2,170	2,350	13,550
Warren					
Washington					
Wayne	1	2	895	1,020	6,300
Webster	2	3	620	695	3,370
Winnebago		8	1,347	1,446	10,092
Winneshiek		9	1,602	2,152	16,385
Woodbury		2	2,252	14,002	82,140
Worth		9	1,000	1,011	7,017
Wright		5	678	683	6,413
Total	53	429	83,008	104,418	679,541

DEPARTMENT FINANCES.

Fees Earned Year Ending Nov. 1, 1915.

Babcock Test Licenses	$ 6,217.50
Milk Licenses	2,832.00
Scale Tag Fees	1,945.60
Scale Inspection Fees	5,785.70
Sanitary Law Licenses	13,451.00
Stock Food Licenses	2,400.00
Seed Analyses	53.50
Feeding Stuffs Analyses	19.00
Fertilizer Licenses	140.00
Cold Storage Licenses	475.00
Inspection Fee Tags	14,924.40
Total	$50,244.10

Fines for violation of the Dairy and Food Laws are paid into the school fund of the county where prosecution is brought and do not appear in the above statement. At a conservative estimate, the amount of fines would reach $5,500.00 annually.

Expenses Year Ending Nov. 1, 1915.

	Salary.	Expense.	Total.
W. B. Barney	$ 2,700.00	$ 267.79	$ 2,967.79
B. C. Iliff	1,800.00	51.51	1,851.51
*E. L. Redfern	2,047.30	18.82	2,066.12
*J. R. Chittick	400.00	10.00	410.00
J. J. Ross	1,400.00	947.89	2,347.89
T. A. Clarke	1,400.00	912.34	2,312.34
*G. H. Tellier	495.21	243.25	738.46
P. W. Crowley	1,600.00	890.33	2,490.33
*G. M. Lambert	1,099.98	694.56	1,794.54
*F. W. Stephenson	700.00	397.95	1,097.95
*H. W. McElroy	700.00	556.27	1,256.27
H. E. Forrester	1,600.00	1,028.64	2,628.64
L. L. Flickinger	1,600.00	961.16	2,561.16
L. P. Anderson	1,600.00	865.78	2,465.78
O. P. Thompson	1,600.00	1,297.91	2,897.91
E. W. Van Duyn	1,800.00	898.20	2,698.20
M. E. Flynn	1,600.00	799.95	2,399.95
J. W. Milnes	1,600.00	795.57	2,395.57
S. O. Van De Bogart	1,600.00	334.71	1,934.71
C. Ottosen	1,600.00	982.09	2,582.09
J. S. Bittner	1,600.00	773.30	2,373.30
C. S. Bogle	1,600.00	941.95	2,541.95
C. O. Frazer	1,600.00	995.58	2,595.58
*E. J. Nolan	822.20	936.59	1,758.79
*A. B. Briggs	750.00	542.12	1,292.12
*Wm. H. Harrison	1,166.62	332.55	1,499.17
G. H. Chittick	1,400.00	173.33	1,573.33
*W. S. Frisbie	250.00	9.63	259.63
*W. B. Barney, Jr.	259.21	63.23	322.44
A. W. Day	1,170.00	.....	1,170.00
*Ethel Whittle	562.50	.....	562.50
Olive Wasson	900.00	.....	900.00
*Addie McQuiston	800.82	.....	800.82

DEPARTMENT FINANCES—Continued.

	Salary.	Expense.	Total.
*Margie Garrity	342.50	.....	342.50
J. W. Lytton	780.00	.....	780.00
H. W. Dahl (Extra Help)	26.62	.....	26.62
Mrs. H. W. McElroy (Extra Help)	79.86	.....	79.86
Mary Belle Talcott (Extra Help)	.....	11.48	11.48
Tags	.....	1,036.90	1,036.90
Laboratory Expense	.....	1,009.09	1,009.09
Weight and Measure	.....	3,307.58	3,307.58
Milk Agents' Fees	.....	3,435.97	3,435.97
Milk Agents' Expense	.....	101.59	101.59
Office Expense, Miscellaneous	.....	741.58	741.58
Telephone	.....	84.17	84.17
Telegraph	.....	27.98	27.98
Drayage	.....	89.16	89.16
Express	.....	136.22	136.22
Total	$43,052.82	$27,704.72	$70,757.54

*Employed less than a year.

CHEESE FACTORY LIST.

*Central Churning Plant. c—Co-operative. s—Stock. i—Individual.

Number	Name of Factory	Located at or Near	Name of Proprietor, Secretary or Manager	P. O. Address of Proprietor Secretary or Manager	Name of Cheesemaker	P. O. Address of Cheesemaker
	Adams County—					
1	Nodaway Cheese Factory..... i	Nodaway	P. M. Estlack.....	Nodaway	P. M. Estlack.....	Nodaway
	Bremer County—					
2	Janesville Cheese Factory..... s	Janesville	Geo. V. Fowler.....	Waterloo	Chas. Bye	Janesville
	Cass County—					
3	Lewis Cheese Factory..... i	Lewis	M. E. Delean	Lewis	M. E. Delean.....	Lewis
	Chickasaw County—					
4	Ionia Cheese Factory..... i	Ionia	H. W. Kann.....	Ionia	Alfred Kann	Ionia
	Howard County—					
5	Clover Leaf Cheese Factory..... i	Cresco	Carl Aegler	Cresco	Carl Aegler	Cresco
6	Jamestown Cheese Factory..... i	Riceville	Anton Fluder	Riceville R 3.....	Anton Fluder	Riceville, R 3
	Humboldt County—					
7	Pioneer Cheese Factory..... i	Renwick	Badger Cheese Co..	Monroe, Wis.....	Willie Keller	Renwick
8	Ehner Cheese Factory..... s	Renwick	Badger Cheese Co..	Monroe, Wis.....	Albert Keller	Renwick
	Muscatine County—					
9	Muscatine French Cheese Co..... s	Wilton Junction	P. A. Schmidt.....	Wilton Jct.	P. A. Schmidt.....	Wilton Jct.
	Washington County					
10	Dublin Cheese Factory..... i	Dublin	J. S. Mangold.....	Washington, R3.	J. S. Mangold.....	Washington
11	Clay Cheese Factory..... i	Richland	E. S. Wolcott.....	Richland	Fred Rynor	Pleasant Plain

CONDENSED MILK FACTORIES—

	Bremer County—					
1	Mohawk Condensed Milk Co..... s	Waverly	Frank Gibble, Pres.	1228 Granite Bldg Rochester, N. Y.	W. E. Bock, Mgr....	Waverly
	Dallas County—					
2	Perry Packing Co..... s	Perry	Tom Walpole, Secy..	1617 Howard St. Omaha, Nebr.....	C. T. Thornton, Manager	Perry
	Washington County—					
3	Hawkeye Condensed Milk Co..... i	Brighton	T. Thompson	Brighton		

CREAMERY LIST

*Central Churning Plant. c—Co-operative. s—Stock. i—Individual.

Number	Name of Creamery	Located at or Near	Name of Proprietor, Secretary or Manager	P. O. Address of Proprietor Secretary or Manager	Name of Buttermaker	P. O. Address of Buttermaker
	Adair County—					
1	Adair Co-op. Cry..... c	Adair	D. J. Cowden.....	Adair	J. T. Ryan.....	Adair
2	Greenfield Cry. Co..... c	Greenfield	Jas. F. Laude.....	Greenfield	Chris. Lundhoy	Greenfield
	Adams County—					
3	Fars. Mutual Co-op. Cry. Asn.... c	Prescott	O. M. Green.....	Prescott	A. H. Ady.....	Prescott
	Allamakee County—					
4	New Albin Co-op. Cry. Co..... c	New Albin	R. G. May.....	New Albin	E. Rice	New Albin
5	Fars. Waukon Co-op. Cry. Co..... c	Waukon	H. E. Thompson.....	Waukon	A. H. Hansmeier.....	Waukon
6	Arctic Spring Cry. Assn..... c	Quandahl (7 mi. s).....	O. C. Flatberg.....	Spring Grove, Minn.	Olaf Goodno	Spring Grove, Minn.
7	Ludlow Co-op. Cry. Co..... c	Waukon (8 mi. sw).....	Ben Ludeking	Waukon, R 1.....	W. P. Muth.....	Waukon, R 1
8	Fars. Co-op. Cry. Co..... c	Waterville	Fred Mortensen	Waterville	J. B. Frisble.....	Waterville
9	Postville Fars. Co-op. Cry..... c	Postville	Geo. W. Fay.....	Postville	E. L. Forrester.....	Postville
10	Calhoun Cry. Co..... c	Church	O. J. Riser.....	Church	K. V. Perris.....	Church
10½	Harpers Ferry Cry..... i	Harpers Ferry	Kruger & Pearson....	Harpers Ferry....	H. R. Kruger.....	Harpers Ferry
	Audubon County—					
11	Liberty Cry. Co..... c	Manning	G. E. Bobenmoyer..	Manning, R1	J. M. Gertsen.....	Manning, R 1
12	Danish Sep. Cry. Co..... c	Kimballton	Geo. Marcusen	Kimballton	Peter Thorsen	Kimballton
13	Blue Grass Cry. Co..... c	Hamlin	John Slayton	Exira, R3.....	Marinus Nelson	Hamlin
14	Exira Cry. Co..... c	Exira	A. S. Stone.....	Exira	C. B. Petersen.....	Exira
15	West Hamlin Cry. Co..... c	Exira (6 mi. e.).....	Martin Nelson	Exira, R2.....	Johannes Johansen....	Exira, R 2
16	Audubon Twp. Cry. Co..... c	Exira (6 mi. e.).....	L. P. Nelsen.....	Exira, R3.....	L. P. Nelsen.....	Exira, R 3
17	Oakfield Twp. Cry. Co..... c	Brayton (3 mi. w).....	Christian Hansen	Brayton	M. Anderson	Atlantic, R 6
18	Sharon Sep. Cry. Co..... c	Audubon (7 mi. w).....	N. C. Molgaard.....	Audubon, R4.....	Peter Windfeldt	Audubon, R 4
	Benton County—					
19	Blairstown Cry. Co..... i	Blairstown	Chas. Hanbold	Blairstown	Chas. Hanbold	Blairstown
20	Norway Cry. Co..... i	Norway	J. W. Derflinger....	Cedar Rapids .... 384 S 16th St.	E. E. Switzer.....	Norway
21	Fars. Cry. Co..... c	Belle Plaine	C. A. Sweet.....	Belle Plaine.....	J. I. Lovestrom.....	Belle Plaine
22	Shellsburg Cry. Co..... i	Shellsburg	J. A. Moeller.....	Shellsburg	Rob. A. Moeller.....	Shellsburg
23	Model Cry. Co..... i	Newhall	Gardemann & Jungclaus	Newhall	P. L. Francisco.....	Newhall
24	Vinton Cry. Co..... i	Vinton	Pyburn & Daniels....	Vinton	John Lilya	Vinton

Creamery List—Continued.

Number	Name of Creamery	Located at or Near	Name of Proprietor, Secretary or Manager	P. O. Address of Proprietor Secretary or Manager	Name of Buttermaker	P. O. Address of Buttermaker
	Black Hawk County—					
25	Benson Dairy Co. c	Benson	J. R. Dumond	Cedar Falls, R2	J. F. Lorenzen	Cedar Falls
26	Cedar Falls Cry. Co. i	Cedar Falls	F. A. Riedel	Cedar Falls	L. H. Olsson	Cedar Falls
27	Orange Dairy Assn. c	Waterloo (5 mi. s)	C. Bechtelheimer	Waterloo, R1	R. W. Chadwick	Waterloo, R 1
28	Gilbertville Dairy Assn. c	Gilbertville	J. B. Kascht	Waterloo	N. Nelson	Gilbertville
29	Co-op. Cry. Co. of Jubilee c	Jesup (7 mi. sw)	F. J. Orth	Jesup	A. J. Widdell	Jesup
30	Mt. Vernon Cry. Co. c	Boies (1½ mi. w)	Geo. H. Moeller	Denver	I. R. Moon	Cedar Falls
31	Hudson Co-op. Dairy Assn. c	Hudson	A. H. Brandhorst	Hudson	Wm. Mcfarlane	Hudson
32	Union Cry. Co. c	Finchford	G. A. Evenson	Winslow	Wm. Dilley	Janesville, R 2
33	East Lester Cry. Co. c	Fairbank (6 mi. sw)	Ira Finch	Fairbank	W. P. Hughes	Fairbank
34	Fars. Cry. Co. c	Dunkerton	G. S. Kleckner	Dunkerton	O. G. Alexander	Dunkerton
35	Crain Creek Cry. Co. i	Denver (6 mi. se)	Wm. Meier	Denver, R1	Wm. Meier	Denver, R 1
36	La Porte City Cry. Co. c	LaPorte City	L. A. Benson	LaPorte City	O. A. Miller	LaPorte City
37*	Swift & Co. #	Waterloo	F. S. Hayward	Union Stock yards, Chicago	W. D. Wenthe	Waterloo
	Boone County—					
38	Flynn Dairy Co. Cry. #	Madrid	Guy S. Brewer	Des Moines	Nels Hansen	Madrid
39	Boone Cry. Co. i	Boone	P. J. Saverald	Boone		Boone
40	Rosendale Co-op. Cry. Co. c	Boone (6 mi. w)	L. C. Peterson	Story City	L. C. Peterson A	Story City
	Bremer County—					
41	Knittel Cry. Co. c	Readlyn (2½ mi. nw)	J. Strottmann	Readlyn, R1	F. H. Wehling	Readlyn, R 1
42	Fremont Cry. Co. c	Tripoli (3½ mi. se)	J. P. Snelling	Tripoli	G. C. Koeneke	Tripoli
43	Gilt Edge Cry Co. i	Plainfield	H. C. Ladage	Plainfield	H. C. Ladage	Plainfield
44	Dayton Cry. Co. c	Sumner (4 mi. s)	J. H. Kasemeier	Sumner	C. W. Zeil	Sumner
45	Janesville Cry. Assn. c	Janesville	H. W. Stine	Cedar Falls	B. O. Squires	Janesville
46	Readlyn Co-op. Cry. Co. c	Readlyn	E. A. Griese	Readlyn	E. A. Griese	Readlyn
47	Spring Fountain Cry. Co. c	Sumner (5 mi. sw)	Wm. Zeil	Sumner	F. W. Bremer	Sumner, R 6
48	Denver Cry. Co. i	Denver	C. A. Fosselman	Waverly	A. W. Mooney	Denver
49	Grove Hill Cry. Co. c	Fairbank	Frank Kane	Fairbank	O. J. Meier	Fairbank
50	Seigel Cry. Co. c	Tripoli (6 mi. nw)	Aug. Winzenburg	Waverly	P. H. Harms	Waverly
51	Washington Cry. Co. c	Waverly (3 mi. e)	J. D. Monaghan	Waverly, R5	Fred Wills	Waverly
52	Lafayette Cry. Co. c	Waverly (4 mi. n)	Ed. Albright	Waverly	J. O. Nicols	Waverly
53	Artesian Cry. Co. c	Denver (4 mi. n)	C. C. Traetow	Waverly	J. Wehling	Waverly
54	Tripoli Cry. Co. c	Tripoli	B. B. Bennett	Tripoli	Wm. Ambrose	Tripoli
55	Fodders Siding Cry. Co. c	Tripoli	Wm. Hildebrandt	Waverly, R5	E. M. Gidney	Tripoli, R 1
56	Sumner Cry. Co. c	Sumner	S. A. Munger	Sumner	E. B. Olds	Sumner
57	Excelsior Cry. Co. c	Sumner (6 mi. nw)	Geo. Rockdaschel	Sumner	Robt. Wagner	Sumner
58	Climax Cry. Co. c	Sumner (6 mi. sw)	H. W. Schmidt	Sumner, R6	L. L. Zbornik	Sumner, R 6
59	Klinger Cry. Co. i	Readlyn (3 mi. s)	C. H. Rohrssen	Fairbank, R2	E. H. Rohrssen	Fairbank, R 3
60	Frederika Cry. Assn. c	Frederika	H. H. McDonald	Denver	John Ambrose	Frederika
61	First Maxfield Cry. Co. c	Denver (2 mi. s)	H. C. Griese	Denver, R7	Henry Piegors	Denver, R 7
62	Little Valley Cry. Co. c	Sumner (6 mi. s)	Chas. Krunger	Sumner, R7	G. O. Miller	Sumner, R 7
63	Western Douglas Cry. Co. #	Waverly	Chas. Oberhen	Plainfield, R1	Ernest Haase	Waverly, R 1
64	Bremer Creamery Co. c	Bremer	F. W. Nolte	Waverly, R2	J. W. Weiemeier	Waverly, R 2
	Buchanan County—					
65*	Wapsie Valley Cry. Co. #	Independence	C. V. Rosenberger	Independence	Watson Shick	Independence
66	Aurora Cry. Co. i	Aurora	E. H. Flicklinger	Aurora	Geo. L. Weeks	Aurora
67	Lamont Cry. Assn. c	Lamont	O. C. Gladwin	Lamont	E. A. Cole	Lamont
68	Jesup Cry. Co. c	Jesup	C. L. Bright	Jesup	E. M. McMurray	Jesup
69	Hazleton Fars. Co.-op. Cry. Co. c	Hazleton	J. W. Basham	Hazelton	Matt McDowall	Hazleton
70	Fairbank Pars. Cfy. Co. c	Fairbank	A. J. Langley	Fairbank	C. E. Brant	Fairbank
71	Stanley Cry. Co. i	Stanley	W. W. Halsted	Stanley	W. W. Halsted	Stanley
71½	Winthrop Cry. i	Winthrop	E. C. Capper	Winthrop	E. C. Capper	Winthrop
	Buena Vista County—					
72	Fars. Co-op. Cry. Co. c	Alta	Arleigh M. Acker	Alta	A. M. Acker	Alta
73	Linn Grove Cry. Co. i	Linn Grove	Peterson & Jensen	Linn Grove	Peter Peterson	Linn Grove
74	Pars. Cry. & Prod. Co. c	Newell	J. C. Aroe	Newell	N. C. Olson	Newell
75	Sioux Rapids Cry. Co. i	Sioux Rapids	F. R. Ballantyne	Sioux Rapids	Rush Williams	Sioux Rapids
76	Fars. Creamery Co. c	Albert City	J. E. Lauridsen	Albert City	J. E. Lauridsen	Albert City
77*	Plain View Creamery Co. i	Storm Lake	McCreery & Hussey	Storm Lake	L. W. McCreery	Storm Lake
	Butler County—					
78	Eleanor Cry. Co. i	Eleanor	C. J. Rohde	Aplington	C. J. Rohde	Aplington
79	Clarksville Cry. Co. i	Clarksville	M. J. Johnson	Clarksville	M. A. Jones	Clarksville
80	New Hartford Fars. Mut Co.-op. Cry. Co. c	New Hartford	R. L. Farnsworth	New Hartford	P. W. Peterson	New Hartford
81	Albion Co-op. Cry. Co. c	Parkersburg	Fred L. Brown	Parkersburg	J. F. Sharp	Parkersburg
82	Courbat Cry. Co. i	Shell Rock	O. F. Courbat	Shell Rock	O. F. Courbat	Shell Rock
83	Shell Rock Cry. Assn. #	Shell Rock	D. A. Austin	Shell Rock	P. D. Daniels	Shell Rock
84	Beaver Co-op. Cry. Assn. c	New Hartford (3 mi. sw)	J. J. Bergman	New Hartford	W. H. Chapman	New Hartford
85	Fars. Co-op. Cry. Co. c	Allison	Geo. W. Rarsty	Allison	R. D. Sweet	Allison
86	Fars. Co-op. Cry. Co. c	Greene	A. S. Shook	Greene	J. Jacobsen	Greene
87	White Rose Cry. Co. i	Austinville	S. L. Patterson	Austinville	Paul F. Anderson	Austinville
88	Dumont Cry. Co. i	Dumont	J. A. McAdams	Dumont	J. A. McAdams	Dumont
	Calhoun County—					
89	Cedar Creek Cry. Co. i	Somers	S. P. Petersen	Somers	S. P. Peterson	Somers
90	Pomeroy Cry. Co. i	Pomeroy	H. A. Albrecht	Pomeroy	Geo. F. Allard	Pomeroy
91	Moon Bros. Cry. i	Manson	Chas. G. Moon	Manson	Chas. G. Moon	Manson
92	A. Baird & Co. #	Lohrville	Hugh Baird	Lohrville	John J. Stamen	Lohrville

CREAMERY LIST—Continued.

Number	Name of Creamery	Located at or Near	Name of Proprietor, Secretary or Manager	P. O. Address of Proprietor Secretary or Manager	Name of Buttermaker	P. O. Address of Buttermaker
	Carroll County—					
93	Willey Cry. Co.....s	Willey	H. Lauridsen	Carroll, R5	Carl Petersen	Carroll, R 5
94	Halbur Cry. Co.....s	Halbur	M. J. Wagner	Halbur	M. J. Wagner	Halbur
95	Templeton Cry. Co.....c	Templeton	Henry Langel	Templeton	C. C. Bomberger	Templeton
96	Rose Valley Cry. Co.....s	Roselle	O. Kohorst	Carroll, R4	O. Kohorst	Carroll, R 4
97	Manning Cry. Co.....s	Manning	H. A. Sweger	Manning	J. A. Bruck	Manning
98	Fars. Co-op. Cry. Co.....c	Breda	A. J. Polking	Breda	H. E. Fowler	Breda
99	Sehzr Pure Food Prod. Co.....s	Carroll	Jno. Sehzr	Carroll	Harry Brodkin	Carroll
99½	The Jensen Cry.....s	Coon Rapids	Jens Jensen	Coon Rapids	Julius Suhr	Coon Rapids
	Cass County—					
100*	Atlantic Prod. Co.....s	Atlantic	G. G. Jeck	Atlantic	Wm. Haenke	Atlantic
101	Fars. Cry. Co.....c	Cumberland	E. Euken	Cumberland	Albert Heyn	Cumberland
	Cedar County—					
102	Golden Star Cry. Co.....s	Bennett	M. Kroeger	Bennett	W. H. Kroeger	Bennett
103	Tipton Cry. Co.....s	Tipton	A. J. Barth	Cedar Rapids	C. C. McCue	Tipton
104	Lowden Fars. Mut. Co.-op. Cry....c	Lowden	Kossuth Pauls	Lowden	W. L. Sloan	Lowden
105	Massillon Co-op. Cry. Co.....c	Massillon	P. H. Schneider	Massillon	Peter White	Massillon
	Cerro Gordo County—					
106	Fars. Co-op. Cry. Co. Inc.....c	Swaledale	E. E. Mason	Swaledale	H. H. Shrader	Swaledale
107*	F. J. Mumm Co.....s	Mason City	F. J. Mumm	St. Paul, Minn.	Otto Van Wey	Mason City
108	Sunnyside Cry. Co.....s	Thornton	J. C. Mortensen	Thornton	J. C. Mortensen	Thornton
109	Ventura Fars. Cry. Co.....c	Ventura	J. E. Sawyer	Clear Lake	W. H. Eichelt	Ventura
110	Rockwell Co-op. Cry. Co.....c	Rockwell	P. C. Siegfried	Rockwell	Fred D. Ford	Rockwell
111	Plymouth Co-op. Cry. Co.....c	Plymouth	N. F. Ward	Plymouth	Peter Refsdahl	Plymouth
112	Fars. Mut. Co-op. Cry. Co.....c	Clear Lake	H. E. Palmeter	Clear Lake	Guy Thomas	Clear Lake
113*	E. B. Higley Co.....s	Mason City	C. O'Keefe	Mason City	C. H. Cleveland	Mason City
114	Dougherty Co-op. Cry. Co.....c	Dougherty	R. H. Fontz	Dougherty	R. H. Fontz	Dougherty
	Cherokee County—					
115	Cherokee Cry. & Bottling Wks.....s	Cherokee	Goeb Bros.	Cherokee	Leonard Lowell	Cherokee
	Chickasaw County—					
117	Sauds Co-op. Cry. Assn.....c	Sauds	H. O. Natvig	Cresco	J. P. Mogle	Lawler
118	Jewico Cry. Assn.....c	Jewico	T. W. Munson	New Hampton Rl	J. P. Kelly	New Hampton
119	Fars. Co-op. Cry. Co.....c	Nashua	S. W. Bilton	Nashua	Hugh Bullis	Nashua
120	The New Hampton Fars. Cry. Assn.c	New Hampton	J. W. Krieger	New Hampton	D. W. Mohler	New Hampton
121	Lawler Cry. Assn.....c	Lawler	F. J. Murphy	Lawler	Alton Brannon	Lawler
122	Ionia Fars. Cry. Assn.....c	Ionia	W. J. Heinmiller	Ionia	F. W. Stickman	Ionia
123	Fredericksburg Butter Factory.....c	Fredericksburg	C. L. Whitcomb	Fredericksburg	Chris Russler	Fredericksburg
124	Alta Vista Cry. Assn.....c	Alta Vista	Albert Tietjen	Alta Vista	R. Jorgenson	Alta Vista
125	Boyd Co-op. Fars. Cry. Assn.....c	Boyd	Wm. Deitner	New Hampton R5	Fred Bachouse	New Hampton, R 5
126	Williamstown Cry. Assn.....c	New Hampton (6½ ml. s)	C. M. Burmaster	Fredericksburg	Roy Scoles	New Hampton
127	Deerfield Cry. Co.....s	Bassett (7 ml. sw)	G. E. Johnstone	Bassett	Chas. Zierath	Bassett
	Clay County—					
128	Gillett Grove Cry. Co.....c	Gillett Grove	E. E. Higgins	Gillett Grove	J. M. Peterson	Gillett Grove
129	Langdon Mut. Co-op. Cry. Co.....c	Langdon	N. C. Nielsen	Langdon	N. C. Nielsen	Langdon
130	Royal Cry. Co.....s	Royal	L. Larsen	Royal	L. Larsen	Royal
131	Fostoria Cry. Co.....s	Fostoria	Olaf Hofstad	Fostoria	Edgar Chadwick	Fostoria
132	Fars. Co-op. Cry. Co.....c	Dickens	John J. Lawler	Dickens	W. A. Thayer	Dickens
133	Spencer Dairy Prod. Co.....s	Spencer	C. W. Peterson	Spencer	H. L. Peterson	Spencer
	Clayton County—					
134	Fars. Cry. Co.....s	Osterlock	H. A. Mallory	Osterlock	W. P. Hammel	Osterlock
135	Garber Fars. Co-op. Cry. Co.....c	Garber	R. F. Smith	Garber	O. H. Pinch	Garber
136	Union Fars. Cry. Co.....c	Monona	J. H. English	Monona	P. A. Jordahl	Monona
137*	Northern Iowa Butter & Egg Co.....s	McGregor	T. H. Allan	McGregor	J. S. Watson	McGregor
138	Crown Brand Cry. Co.....s	Elkader	J. T. Leonard	Elkader	C. C. Clough	Elkader
139	Millville Cry. Co.....c	Millville	Fred Mueller	Guttenberg, R2	Carl Loomis	Turkey River
140	Volga Fars. Cry. Assn.....c	Volga City	L. J. Tenney	Strawberry Pt	Wm. McGuinness	Volga
141	Strawberry Pt. Fars. Cry. Assn.....c	Strawberry Point	C. D. Wolcott	Strawberry Pt	J. J. Brunner	Strawberry Point
142	Farmersburg & St. Olaf Co.-op. Cry. Co.....c	St. Olaf	A. Larson	St. Olaf	Herbert Olson	St. Olaf
143	Littleport Fars. Co-op. Cry. Co.....c	Littleport	G. C. Regnitz, Jr.	Elkport	Earl Batchelder	Littleport
144	Luana Fars. Co-op. Cry. Co.....c	Luana	W. J. Splies	Luana	S. Peterson	Luana
145	Garnavillo Fars. Cry. Co.....c	Garnavillo	A. J. Kregel	Garnavillo	J. F. Fisher	Garnavillo
146	Fidelity Cry. Co.....s	Edgewood	H. F. Beyer	Edgewood	Royal Firman	Edgewood
147	Fars. Co-op. Cry. Co.....c	Edgewood	W. A. Robinson	Edgewood	Harley Evert	Edgewood
	Clinton County—					
148	Clinton County Central Cry.....s	De Witt	A. E. Banta	DeWitt	H. S. Sample	DeWitt
149*	Swift & Co. Prod. Dept.....s	Clinton	F. S. Hayward	Chicago, Ill	J. W. Freed	Clinton
150	Fars. Co-op Cry. Co.....c	Toronto	Edw. Hart, Jr.	Toronto	W. F. Schurke	Toronto
151	Fars. Co-op. Cry. Co.....c	Wheatland	Earl V. Wilmarth	Wheatland	R. E. Long	Wheatland
152	Charlotte Cry. Co.....c	Charlotte	Martin Nielsen	Charlotte	Frank Bartels	Charlotte
	Crawford County—					
153	Nicholson Produce Co.....c	Denison	C. S. Nicholson	Denison	Chas. Trimble	Denison
	Dallas County—					
154	Fars. Co-op. Cry. Assn.....c	Dexter	Jas. L. Keachie	Dexter	Jas. L. Keachie	Dexter
155	Woodward Cry. Co.....s	Woodward	H. P. Calonkey	Woodward	C. H. Ramsey	Woodward

CREAMERY LIST—Continued.

Number	Name of Creamery	Located at or Near	Name of Proprietor, Secretary or Manager	P. O. Address of Proprietor Secretary or Manager	Name of Buttermaker	P. O. Address of Buttermaker
	Delaware County—					
156	Manchester Co-op. Cry. Co.....c	Manchester	M. S. VanAuken.....	Manchester	E. J. Reed.....	Manchester
157	Pars. Co-op. Cry. Co.....c	Thorpe	M. E. Blair.....	Manchester	G. Steussle	Manchester
158	Hazel Green Cry. Co.....c	Ryan (9 mi. e.).....	Daniel King	Delhi	A. Graham	Manchester
159	Silver Spring Cry. Co.....s	Delhi	E. B. Porter.....	Delhi	H. P. Bancroft.....	Delhi
160	Masonville Co-op Cry. Co.....c	Masonville	Hiram J. New.....	Manchester	O. A. Sullivan.....	Masonville
161*	Dairy City Cry. Co.....s	Manchester	G. L. Siddell.....	Manchester	R. R. Stewart.....	Manchester
162	Delaware Cry. Co.....c	Delaware	A. E. Larson.....	Delaware	J. T. Dawson.....	Delaware
163	Bear Grove Cry. Co.....c	Dyersville	John T. Goedken...	Earlville, R 2 ...	Jas. Killeas	Dyersville, R 2
164	Hopkinton Co-op. Cry. Co.....c	Hopkinton	I. T. Wilson.....	Hopkinton	T. F. Shipton.....	Hopkinton
165	Colesburg Co-op. Cry. Co.....c	Colesburg	Robt A. Gull.....	Colesburg	A. L. Landis.....	Colesburg
166	Greeley Pars. Co-op. Cry. Co.....c	Greeley	J. E. Tracy.....	Greeley	W. R. Crabb.....	Greeley
167	Sand Springs Cry. Co.....c	Sand Springs	R. E. Frist.....	Hopkinton	J. L. Batchelder....	Sand Springs
168	Ryan Cry. Co.....i	Ryan	A. J. Barth.....	Cedar Rapids	W. I. Dilger.....	Ryan
169	Earlville Cry. Co.....i	Earlville	I. S. Hutton.....	Earlville	A. L. Binning.....	Earlville
	Dickinson County—					
170	Lake Park Co-op. Cry. Co.....c	Lake Park	J. G. Chrysler.....	Lake Park.....	E. E. Starr.....	Lake Park
171	Milford Pars. Butter & Cheese Association .....s	Milford	Fred W. Born.....	Milford	Fred W. Born.....	Milford
172	Terril Co-op. Cry. Assn.....c	Terril	L. A. Koen.....	Terril	P. S. Flaskegaard..	Terril
173*	Western Packing Co.....s	Spirit Lake	H. E. Miller.....	Spirit Lake	Victor Welter.....	Spirit Lake
	Dubuque County—					
174	Holy Cross Cry. Co.....c	N. Buena Vista.....	Tony J. Maiers.....	N. Buena Vista.	Jas. McCool	N. Buena Vista
175	Hague Cry. Co.....i	Zwingle	H. S. Hague.....	Zwingle	H. S. Hague.....	Zwingle
176	Sherrill Mut. Co-op. Cry. Assn.....c	Sherrill	J. C. Boleyn.....	Dubuque	Fred Koeller	Durango, R 34
177	Worthington Cry. Co.....i	Worthington	C. Baehler	Worthington	C. Baehler	Worthington
178	New Vienna Cent. Cry. Co.....s	New Vienna	H. F. Smith.....	New Vienna		New Vienna
179	Globe Cry. Co.....c	Luxemburg	Geo. Friedmann	N. Buena Vista..	A. P. Matson.....	New Vienna, R 23
180	Farley Cry. Co.....s	Farley	G. W. Cropp.....	Farley	P. E. Landis.....	Farley
181*	Beatrice Cry. Co.....s	Dubuque	A. F. Ulrich.....	Dubuque	Tony Norskow.....	Dubuque
182*	Iowa Dairy Co.....c	Dubuque	Andrew Fluetsch ...	Dubuque	H. E. Williamson....	Dubuque
183	Pars. Golden Star Cry. Co.....c	Dyersville	Albert J. Kern.....	Dyersville	Wm. Cornell	Dyersville
184	Hickory Valley Cry. Co.....c	Dyersville	John Ramm	Farley	Peter Goetzinger	Dyersville, R 21
185	Cascade Co-op. Cry. Co.....c	Cascade	F. J. Conlin.....	Cascade	Albert Pay	Cascade
186	Columbia Creamery Co.....i	Dubuque (9 mi. s)...	Henry W. Laude....	Dubuque, Rt.	Lafe Case	Dubuque, R 4
187	Baltown Pars. Co-op. Cry.....c	Waupeton (3 mi. se)....	L. J. Sigwarth.....	Waupeton	A. C. Barker.....	Waupeton
188*	Swift & Co.....s	Dubuque	P. S. Hayward.....	Chicago, Ill.....	Fred Goodnow	Dubuque
	Emmet County—					
189	Pars. Co-op. Cry. Co.....c	Armstrong	Peter H. Burt.....	Armstrong	Chris Back	Armstrong
190	Pars. Cry. Co.....c	Wallingford	O. O. Refsell.....	Wallingford	J. C. Jensen.....	Wallingford
	Fayette County—					
191	Oran Cry. Co.....c	Oran	J. N. Getz.....	Oran	B. F. Bentley.....	Oran
192	German Cry. Co.....c	Westgate (4 mi. ne)....	Wm. Seegers	Westgate, Rt....	L. O. Barnes.....	Westgate, R 1
193	Maple Grove Cry. Co.....c	Oelwein	Thos. Sadler	Oelwein	Thos. Sadler	Oelwein
194	Alpha Pars. Cry. Co.....c	Alpha	H. A. Goodnow.....	Alpha	W. A. Rizer.....	Alpha
195	Richfield Cry. Co.....c	Sumner (5 mi. sw).....	F. F. Wittenburg...	Sumner	C. A. Day.....	Sumner
196	Pars. Mut. Co-op. Cry. Assn.....c	Stanley (6 mi. n).....	L. G. Gleim.....	Arlington	D. T. Broers.....	Stanley
197	Wauconma Pars. Co-op. Assn.....c	Wauconma	Joe Lynch	Wauconma	F. J. Muller.....	Wauconma
198	Riverside Cry. Co.....i	Wadena	F. J. Schroeder.....	Wadena	L. O. Popenhagen....	Wadena
199	Westgate Co-op. Cry. Co.....c	Westgate	P. S. Coleman.....	Westgate	E. H. Hoseman.....	Westgate
200	The Pars. Co-op. Cry.....c	St. Lucas	G. H. Hackman.....	St. Lucas	Ben H. Kuennen.....	St. Lucas
201	Center Valley Cry. Co.....c	Randalia (6 mi. sw)....	P. J. Messerer.....	Sumner	Fred Zell	Sumner
202	Randalia Cry. Co.....c	Randalia	Geo. Mort	Randalia	Ralph Portor	Randalia
203	Jefferson Co-op. Cry. Co.....c	Oelwein (4 mi. nw).....	H. H. Meyer.....	Independence	A. L. Nickols.....	Oelwein
204	Harlan Pars. Mut. Co-op. Cry.....c	Maynard	J. C. Lewis.....	Maynard	C. B. Bracy.....	Maynard
205	Hawkeye Co-op. Cry. Co.....c	Hawkeye	Frank Ostrander	Hawkeye	Frank Bowdish	Hawkeye
206	Fayette Co-op. Cry. Assn.....c	Fayette	Peter E. Jubb.....	Fayette	Mart Cronk	Fayette
207	Elgin Pars. Dairy Co.....c	Elgin	Melchr Luchsinger...	Elgin	Robt. C. Gehring....	Elgin
208	Clermont Valley Cry. Co.....c	Clermont	Frank Fay	Clermont	Amon Erickson	Clermont
209	Pars. Cry. Co.....c	Arlington	Floyd Finney	Arlington	E. E. Mittlestadt....	Arlington
210	Oelwein Pars. Cry. Co.....c	Oelwein	L. C. Harwood.....	Oelwein	G. A. Hanson.....	Oelwein
211	West Union Pars. Cry. Co.....c	West Union	F. C. Billings.....	West Union	B. F. Schultz.....	West Union
	Floyd County—					
212	Rockford Co-op. Dairy Assn.....c	Rockford	L. O. Rausch.....	Rockford	J. C. Farnham.....	Rockford
213	Niles Cry. Co.....i	Charles City	Frank Brunner	Charles City.....	Frank Brunner	Charles City
214	Charles City Cry. Co.....i	Charles City	N. H. Nelson.....	Charles City.....	J. O. Nell.....	Charles City
215	Nora Springs Cry. & Prod. Co.....i	Nora Springs	W. F. Miner.....	Nora Springs	C. Erickson	Nora Springs
	Franklin County—					
216	Sheffield Cry. Co.....i	Sheffield	A. E. Adams & Co.	Sheffield	A. E. Adams.....	Sheffield
217	Pars. Co-op. Cry. Co.....c	Popejoy	J. G. Freeze.....	Dows	H. J. Binger.....	Popejoy
218*	W. F. Priebe Co.....s	Hampton	J. C. Phillips.....	Hampton	C. H. Caswell.....	Hampton
219	Pars. Co-op. Cry. Co.....c	Dows	J. H. Iverson.....	Dows	Frank L. Larson.....	Dows
220	Latimer Co-op. Cry. Co.....c	Latimer	Chas. Johnson	Latimer	Rasmus Nelson.....	Latimer
221	Hamilton Cty. Co-op. Co.....c	Coulter	Geo. Dohrmann	Hampton	Herbert Soballe	Coulter
222	Pars. Cry. Co.....s	Alexander	J. J. Welk.....	Alexander	P. T. Christiansen....	Alexander
223	Bradford Cry. Co.....i	Bradford	Geo. Freese	Bradford	H. Brokaw	Bradford

CREAMERY LIST—Continued.

Number	Name of Creamery	Located at or Near	Name of Proprietor, Secretary or Manager	P. O. Address of Proprietor Secretary or Manager	Name of Buttermaker	P. O. Address of Buttermaker
	Greene County—					
224	G. W. Nicholson Co. #	Grand Junction	W. W. Wertz	Grand Junction	C. W. Larson	Grand Junction
225	Jefferson Creamery Co. f	Jefferson	C. E. Mills	Jefferson	Karl Anderson	Jefferson
	Grundy County—					
226	Buck Grove Cry. Co. #	Parkersburg	T. M. Bergman	Aplington	H. P. Chapman	Aplington
227	Fredsville Co-op. Cry. Co. c	Dike (4 mi. nw)	N. C. Syndergaard	Cedar Falls, R3	Hartman Andersen	Cedar Falls, R 3
228	Beaver Center Cry. Co. c	Stout (2 mi. sw)	Andrew J. Meyer	Stout	T. E. Dilger	Stout
229	Fern Cry. Co. c	Parkersburg	W. H. Henning	Parkersburg	B. T. Soles	Stout
230	German Township Cry. Co. f	Ackley (6 mi. se)	Frank J. Martin	Ackley	Henry Schutjer	Ackley
	Guthrie County—					
231	Panora Co-op. Cry. Co. c	Panora	A. R. Taff	Panora	Alex Johnson	Panora
232	Menlo Cry. Co. #	Menlo	P. L. P. Hitchcock	Menlo	H. H. Colbert	Menlo
233	Guthrie Center Co-op. Cry. Co. c	Guthrie Center	J. A. McLaughlin	Guthrie Center	A. W. Hanks	Guthrie Center
234	Casey Creamery Co. c	Casey	Harlie E. Smith	Casey	Joe F. Oddy	Casey
235	Bayard Co-op. Cry. Co. c	Bayard	Hugh Carothers	Bayard	F. P. Wilcox	Bayard
	Hamilton County—					
236	Jewell Butter & Ice Cr. Fac. f	Jewell	M. J. Mansager	Jewell	M. J. Mansager	Jewell
237	Fars. Co-op. Cry. Co. c	Stratford	Ed. Peterson	Stratford	John Klerson	Stratford
238	Ellsworth Co-op. Cry. c	Ellsworth	S. Stenberg	Ellsworth	O. B. Stenberg	Ellsworth
239	Randall Fars. Cry. Co. c	Randall	M. G. Olson	Randall	M. G. Olson	Randall
240	Ellingson-Mathre & Co. f	Webster City	Ellingson-Mathre Co.	Webster City	C. L. Best	Webster City
	Hancock County—					
241	Kanawha Fars. Mut. Co-op. Cry. Co. c	Kanawha	Geo. McNeish	Kanawha	B. O. Brownlee	Kanawha
242	Woden Fars. Cry. Co. c	Woden	Adolf Orthel	Woden	John Paradeen	Woden
243	Concord Cry. Co. c	Garner	Albert Penger	Garner	Albert Penger	Garner
244	Fars. Co-op. Cry. Co. c	Garner	J. Kiesel	Garner	C. R. Conway	Garner
245	Goodell Cry. Co. f	Goodell	E. P. Conway	Goodell	E. P. Conway	Goodell
246	Crystal Cry. Co. c	Crystal Lake	H. P. Stahr	Crystal Lake	Hans P. Engen	Crystal Lake
247	Britt Co-op. Cry. Co. c	Britt	H. A. Schapers	Britt	Geo. G. Kolthoff	Britt
248	Klemme Co-op. Cry. Co. c	Klemme	N. L. Palmer	Klemme	A. D. Gilmer	Klemme
	Hardin County—					
249	Fars. Co-op. Cry. Co. #	Buckeye	H. M. Seehoff	Buckeye	M. F. Williams	Buckeye
250	Alden Co-op. Cry. Co. c	Alden	E. O. Edwards	Alden	Floyd Kidd	Alden
251	Eldora Cry. Co. f	Eldora	Peter Jensen	Eldora	D. F. Aylesworth	Eldora
252	Hubbard Co-op. Cry. Co. c	Hubbard	H. K. Gramer	Hubbard	Fred Herzog	Hubbard
253	Iowa Falls Cry. Co. c	Iowa Falls	E. E. Benedict	Iowa Falls	W. E. Mittelstadt	Iowa Falls
254	Concord & Scott Cry. Co. c	Radcliffe	Leroy Anderson	Radcliffe	D. H. Bobb	Radcliffe
255	Owasa Co-op. Cry. Co. c	Owasa	W. S. McLennon	Owasa	G. J. Gudknecht	Owasa
256*	Swift & Co. #	Iowa Falls	F. B. Hayward	Swift & Co., Chicago	J. D. Fiete	Iowa Falls
257	Cleves Cry. Co. f	Cleves	A. J. Stenberg	Cleves	A. J. Stenberg	Cleves
258	Ackley Cry. Co. f	Ackley	R. R. Hadley	Ackley	C. R. Ball	Ackley
	Harrison County—					
259	Community Cry. Co. c	Woodbine	Floyd Elston	Woodbine	E. A. Maxwell	Woodbine
	Howard County—					
260	Maple Leaf Cry. Co. c	Elma	D. Lace	Elma, Rl	N. W. Graf	Elma, R 1
261	Fars. Co-op. Cry. Co. c	Protivin	J. A. Bostal	Protivin	J. A. Bostal	Protivin
262	Saratoga Co-op. Cry. Assn. c	Saratoga	Henry Foss	Saratoga	Henry Foss	Saratoga
263	Elma Co-op. Cry. Co. c	Elma	J. F. Whelan	Elma	J. F. Whelan	Elma
264	Cresco Cry. Co. f	Cresco	Palmer & Nelson	Cresco	D. A. Palmer	Cresco
265	Schley Cry. Co. f	Cresco (10 mi. sw)	C. A. Fosse	Cresco	O. A. Fosse	Cresco
266	Fars. Co-op. Cry. Assn. c	Chester	A. G. Eggerichs	Chester	C. C. Plummer	Chester
267	Fars. Cry. Co. #	Lime Springs	D. H. Thomas	Lime Springs	E. Z. Carr	Lime Springs
268	Cresco Milk Co. #	Cresco	F. B. Hulls	Cresco	F. B. Hulls	Cresco
	Humboldt County—					
269	Thor Cry. Co. c	Thor	J. E. Lonning	Thor	B. E. Lonning	Thor
270	Rutland Cry. Assn. c	Rutland	Michael Gregersen	Rutland	Joe Boeh	Rutland
271	Wacousta Cry. Assn. c	Ottosen	A. O. Clave	Ottosen	L. J. Bremson	Ottosen
272*	Humboldt Cry. Co. #	Humboldt	B. R. Gray	Humboldt	A. H. Bertelson	Humboldt
273	Bode Cry. Assn. c	Bode	H. C. Olson	Bode	P. W. Johnson	Bode
274	Bradgate Cry. Co. f	Bradgate	E. H. Avery	Bradgate	D. A. O'Neill	Bradgate
	Ida County—					
275	Holstein Co-op. Cry. Co. c	Holstein	Gus Wehde	Holstein	John D. Suiter	Holstein
276	Farmers Cry. Co. c	Galva	Wm. Zwenke	Galva	R. D. Ewing	Galva
	Iowa County—					
277	Shimer Cry. Co. f	Conroy	Thos. Thomsen	Conroy	Thos. Thomsen	Conroy
278	Genoa Bluff Cry. Co. c	Ladora (9 mi. se)	Adam Keil	Marengo	R. O. Rae	Genoa Bluff
279	Marengo Fars. Mut. Co-op. Cry. Co. c	Marengo	Dennis Sullivan	Marengo	W. H. Sampson	Marengo
280	Victor Co-op. Cry. Co. #	Victor	I. E. Brown	Victor	Wm. Boyle	Victor
281	Troy Cry. Co. c	Williamsburg	Geo. C. House	Williamsburg	W. R. Edwards	Williamsburg
282	York Cry. Co. c	Williamsburg	H. W. Hudepohl	S. Amana, Rl	G. E. Steinke	Williamsburg
	Jackson County—					
283	Monmouth Cry. Co. f	Monmouth	P. G. Irons	Monmouth	P. G. Irons	Monmouth
284*	Hansen Prod. Co. f	Maquoketa	E. D. Hansen	Maquoketa	G. S. Wing	Maquoketa

CREAMERY LIST—Continued.

Number	Name of Creamery	Located at or Near	Name of Proprietor, Secretary or Manager	P. O. Address of Proprietor Secretary or Manager	Name of Buttermaker	P. O. Address of Buttermaker
285	St. Donatus Cry. Co. i	St. Donatus	J. L. Heinrig	St. Donatus	L. C. Larsen	St. Donatus
286	Sterling Cry. Co. i	Lamotte	Hoffman Cry. Co.	Lamotte	John M. Hoffman	Lamotte
287	Jno. Gonner's Cry. i	Spring Brook	John Gonner	Spring Brook	Lawrence Gonner	Spring Brook
288	Springbrook Cry. Co. s	Preston	John Newman Co.	Elgin, Ill.	A. J. Negus	Preston
289	Preston Cry. Assn. c	Preston	Sam'l McNeil	Preston	B. E. Bragg	Preston
290	Furs. Union Co-op. Cry. Co. c	Maquoketa (6 mi. w)	M. W. Joiner	Maquoketa, Rt.	H. C. Thompson	Maquoketa
291	Fulton Cry. Co. i	Fulton	John Sundlin	Fulton		
292	Furs. Cry. Co. i	Sabula	F. O. White	Sabula	W. J. Kroeger	Sabula
293	Bellevue Cry. Co. i	Bellevue	J. F. Runkle	Bellevue	Boyd Homan	Bellevue
	Jasper County—					
294	Newburg Cry. Co. c	Newburg	C. P. Devore	Newburg	H. W. Spencer	Newburg
294½	Dairyland Dairy i	Newton	Guy M. Lambert	Newton	Walter H. Anderson	Newton
	Jefferson County—					
295*	Fairfield Pure Butter Co. i	Fairfield	U. B. Rogers	Fairfield	John McClane	Fairfield
	Johnson County—					
296	Iowa City Cry. & Ice Cream Co. i	Iowa City	Virgo V. Kehlet	Iowa City		
297	Iowa City Prod. Co. i	Iowa City	Kemmerle & Feeney	Iowa City	R. J. Saveraid	Iowa City
	Jones County—					
298	Furs. Co-op. Cry. Co. c	Monticello	O. W. Braselton	Monticello	Fred Lehman	Monticello
299	Scotch Grove Co-op. Cry. Co. c	Scotch Grove	H. R. Jacobs	Scotch Grove	Harry Johnson	Scotch Grove
300	Langworthy Co-op. Cry. Co. c	Langworthy	J. H. Batchelder	Langworthy	J. H. Batchelder	Langworthy
301	Amber Co-op. Cry. Co. c	Amber	P. B. Daly	Anamosa	P. S. Nickels	Amber
302	Furs. Co-op. Cry. Co. c	Center Junction	C. A. Burmeister	Center Jct.	F. E. Craig	Center Junction
303	Anamosa Cry. Co. i	Anamosa	H. M. Derleth	Anamosa	P. A. Derleth	Anamosa
304*	Iowa Cry. Co. s	Oxford Junction	S. L. Murphy	Oxford Jct.	E. W. Owen	Oxford Junction
	Keokuk County—					
305	Geo. M. Griffis Cry. Co. i	Sigourney	A. Oscar Jones	Sigourney	A. Oscar Jones	Sigourney
306	S. E. Relsman Prod. Co. i	What Cheer	S. E. Relsman	What Cheer	L. W. Thomas	What Cheer
	Kossuth County—					
307	Ledyard Co-op. Cry. Assn. s	Ledyard	F. S. Jenks	Ledyard	H. M. Dyer	Ledyard
308	Hahn Bros. Cry. Co. i	St. Benedict	E. F. Hahn	St. Benedict	T. P. Klein	St. Benedict
309	Whittemore Cry. Co. c	Whittemore	Thos. Carmody	Whittemore	D. L. Driver	Whittemore
310	Lotts Creek Co-op. Cry. Co. c	Lone Rock (6 mi. sw)	Otto Wichtendahl	Lone Rock	Fred Kucker	Lone Rock
311	Swea City Co-op. Cry. Co. c	Swea City	Miss Ella Christensen	Swea City	Carl Nelson	Swea City
312	Sexton Co-op. Cry. Co. c	Sexton	O. A. Little	Sexton	L. H. Larsen	Sexton
313	Seneca Co-op. Cry. Co. c	Ringsted	M. Jenson	Fenton	W. H. Anderson	Fenton
314	Lone Rock Co-op. Cry. Co. c	Lone Rock	Robert Jacob	Lone Rock	Wm. Helgason	Lone Rock
315	Furs. Co-op. Cry. Co. c	Hobart	F. L. Boals	Algona	Joel Blomster	Algona
316	Germania Co-op. Cry. Co. c	Germania	H. F. Gutknecht	Germania	H. W. Jarchow	Germania
317	Fenton Cry. Co. c	Fenton	C. F. C. Laage	Fenton	C. F. Bollig	Fenton
318	Bancroft Co-op. Cry. Co. c	Bancroft	Chas. P. Hanson	Bancroft	M. J. Dyer	Bancroft
319	Burt Co-op. Cry. Co. c	Burt	M. E. Warner	Burt		Burt
320	Plum Creek Co-op. Cry. Co. c	Algona	Elmer E. Zeigler	Algona	Bernhard Swanson	Algona
	Kossuth County—Continued.					
321	Algona Co-op. Cry. Co. c	Algona	D. A. Wallace	Algona	L. S. Edwards	Algona
322	Wesley Cry. Co. i	Wesley	N. Oscar Nelson	Wesley	N. O. Nelson	Wesley
323	Titonka Co-op. Cry. Co. c	Titonka	J. C. Newville	Titonka	S. S. Hudson	Titonka
	Lee County—					
324*	Swift & Co. #	Keokuk	P. S. Hayward	Union Stock Yards, Chicago	Frank A. Payne	Hamilton, Ill.
	Linn County—					
325*	Blue Valley Cry. Co. #	Cedar Rapids	C. J. Walker	Chicago, Ill.	G. L. Matteson	Cedar Rapids
326	Walker, Iowa, Cry. Co. i	Walker	H. J. Nietert	Walker	S. W. Laird	Walker
327	Springville Cry. Co. i	Springville	E. E. Batchelder	Springville	Chas. Huettner	Springville
328	Center Point Cry. Co. i	Center Point	Pollock & Homme	Center Point	C. N. Pollock	Center Point
329	Valley Farm Cry. Co. i	Central City	Henderson & Henderson	Central City	Irwin George	Central City
330	Central City Cry. Co. i	Central City	E. E. Henderson	Central City	Earl George	Central City
331*	Gurler Company i	Cedar Rapids	C. H. Wilson	Cedar Rapids	J. J. Bork	Cedar Rapids
332	Coggon Cry. Co. i	Coggon	O. O. Capper	Coggon	Earl McCain	Coggon
	Lucas County—					
333	Douglas Ice Cream Co. i	Chariton	L. B. Douglas	Chariton	W. C. Miller	Chariton
	Lyon County—					
334	Furs. Co-op. Cry. Assn. c	Inwood	L. B. Holland	Inwood	H. C. Nelson	Inwood
335	George Cry. Co. #	George	C. A. Rasmussen	George	Ed. Wilson	George
336	Rock Rapids Cry. Co. i	Rock Rapids	W. J. Purchas	Rock Rapids	A. E. Robertson	Rock Rapids
	Mahaska County—					
337*	Oskaloosa Cry. Co. c	Oskaloosa	J. C. Belsman	Oskaloosa	Jas. Love	Oskaloosa
	Marion County—					
338	Pella Cry. Co. c	Pella	D. Van Sittert	Pella	T. Smorenburg	Pella
	Marshall County—					
339*	Marshalltown Cry. Co. i	Marshalltown	H. W. Logsdon	Marshalltown	Geo. L. Richardson	Marshalltown
340	Furs. Cry. Assn. c	State Center	Ray Stouffer	State Center	G. T. Shaunce	State Center
341	Minerva Valley Cry. Co. c	Clemons	L. H. Armbrecht	Clemons	E. M. Frederickson	Clemons

CREAMERY LIST—Continued.

Number	Name of Creamery	Located at or Near	Name of Proprietor, Secretary or Manager	P. O. Address of Proprietor Secretary or Manager	Name of Buttermaker	P. O. Address of Buttermaker
	Mills County—					
342	Glenwood Cry. Co.	Glenwood	J. G. MacKellar	Glenwood	J. G. MacKellar	Glenwood
	Mitchell County—					
343	New Haven Cry. Co.	New Haven	Julius Brunner	Osage, Rt.	Julius Brunner	Osage, R 4
344	Little Cedar Cry. Co.	Little Cedar	G. L. Helfter	Little Cedar	G. L. Helfter	Little Cedar
345	Osage Co-op. Cry. Assn.	Osage	C. L. Hanson	Osage	G. Burdett	Osage
346	St. Ansgar Cry. Co.	St. Ansgar	M. A. Tollefson	St. Ansgar	H. R. Bullis	St. Ansgar
347	Pars. Co-op. Cry. Co.	Orchard	E. O. Clapper	Orchard	Albert Tieman	Orchard
348	Rock Creek Co-op. Cry. Assn.	Osage (10 mi. sw)	H. L. Johnson	Rudd	J. E. McCaffrey	Osage, R 2
349	Stacyville Cry. Co.	Stacyville	Jos. Heus	Stacyville	Wm. Heus	Stacyville
350	Rieeville Cry. Co.	Rieeville	Hauss & Christiansen	Rieeville	John Christensen	Rieeville
	Monona County—					
351	Moorhead Cry. Co.	Moorhead	P. D. Nelson	Moorhead	Nels Nelson	Moorhead
	Monroe County—					
352	Albia Cry. Co.	Albia	Sam Jones	Albia	Earl Burlingame	Albia
	Montgomery County—					
353	Tyler Bros. Cry. Co.	Villisca	Royal P. Tyler	Villisca	H. P. Tyler	Villisca
	Muscatine County—					
354	West Liberty Co-op. Cry. Co.	West Liberty	C. A. Mountain	West Liberty	O. J. Gustin	West Liberty
	O'Brien County—					
355	The Hartley Cry. Co.	Hartley	J. C. Joslin	Hartley	C. W. Green	Hartley
356	Sutherland Cry. Co.	Sutherland	Adolph Christensen	Sutherland	Adolph Christensen	Sutherland
357	Sheldon Cry. Co.	Sheldon	D. A. Miller	Sheldon	D. A. Miller	Sheldon
358	Caledonia Cry. Co.	Paullina	J. C. Savage	Paullina	Wm. Gebris	Paullina
359	Archer Cry. Co.	Archer	B. G. Renslnk	Archer	F. Welter	Archer
	Osceola County—					
360	Ashton Cry. Co.	Ashton	J. A. Kramer	Ashton	J. A. Kramer	Ashton
361	Sibley Cry. Co.	Sibley	H. C. Kofoed	Sibley	H. C. Kofoed	Sibley
362	Melvin Cry. Co.	Melvin	F. W. Year	Melvin	J. C. Turner	Melvin

	Page County—					
364*	Swift & Co.	Clarinda	F. S. Hayward	Chicago, Ill., Union Stock Yards	C. S. Hulse	Clarinda
	Palo Alto County—					
365	Depew Cry. Co.	Cylinder	P. C. Duer	Emmetsburg	Henry Hansen	Cylinder
366	West Bend Co-op. Cry. Co.	West Bend	A. L. Frye	West Bend	O. W. Dobbs	West Bend
367	Pars. Co-op. Cry. Co.	Ruthven	G. A. Appelman	Ruthven	Paul E. Hough	Ruthven
368	Mallard Butter & Cheese Assn.	Mallard	T. C. Trnog	Mallard	T. R. Wilson	Mallard
369	Lost Island Cry. Co.	Graettinger	A. C. Christiansen	Graettinger	M. P. Junker	Graettinger
370	Emmetsburg Cry. Co.	Emmetsburg	L. Stuehmer	Emmetsburg	M. Andersen	Emmetsburg
371	Rush Lake Cry. Co.	Curlew	D. Z. Martin	Curlew	C. W. Nelson	Curlew
372	Silver Lake Cry Co.	Ayrshire	F. W. Shellman	Ayrshire	F. W. Shellman	Ayrshire
373	Fairville Cry. Co.	Cylinder	C. H. Blackwman	Cylinder	Robt. Bless	Cylinder
374	Pars. Co-op. Cry. Co.	Graettinger	Jorgen Andersen	Graettinger	Wm. Matters	Graettinger
375	Rodman Cry. Co.	Rodman	Elmer Gustafson	Rodman	Elmer Gustafson	Rodman
	Plymouth County—					
376	LeMars Cry. Co.	LeMars	W. R. Hutchinson	Sioux City	P. E. Hornor	Le Mars
376½	Farmers Cry. Co.	Brunsville	J. Kennely	Brunsville	J. Kennely	Brunsville
	Pocahontas County—					
377	Pocahontas Cry. Co.	Pocahontas	J. A. Crowther	Pocahontas	Gust Wehler	Pocahontas
378	Laurens Cry. Co.	Laurens	J. G. Hinn	Laurens	F. W. Johnson	Laurens
379	Palmer Cry. Co.	Palmer	J. I. Johnson	Palmer	Ed. V. Johnson	Palmer
	Polk County—					
380*	Des Moines Creamery Co.	Des Moines	J. P. Dawson	Des Moines	A. L. Larson	Des Moines, 4100 Kingman Blvd.
381*	Swift & Co.	Des Moines	F. S. Hayward	Chicago, Ill., Union Stock Yds.	G. M. Bock	Des Moines, E. 1st and Maple
382*	Pars. Co-op. Prod. Co.	Des Moines	L. O. Loizeaux	Des Moines	N. Danielson	Des Moines
383*	Beatrice Cry. Co.	Des Moines	H. R. Wright	Des Moines	S. R. Pemberton	Des Moines
	Pottawattamie County—					
384*	Bloomer Cold Storage Co.	Council Bluffs	Fred E. Hurd	Council Bluffs	John O. Dutton	Council Bluffs
	Poweshiek County—					
385*	Grinnell Cry., Ice & Cold Storage Plant	Grinnell	J. W. Fowler	Grinnell	Milton Powers	Grinnell
386	Brooklyn Cry Co.	Brooklyn	G. H. Guthrie	Brooklyn	G. H. Guthrie	Brooklyn
	Ringgold County—					
387	Mt. Ayr Cry. Co.	Mt. Ayr	L. O. Bement	Mt. Ayr	Louis Pohle	Mt. Ayr

CREAMERY LIST—Continued.

Number	Name of Creamery	Located at or Near	Name of Proprietor, Secretary or Manager	P. O. Address of Proprietor Secretary or Manager	Name of Buttermaker	P. O. Address of Buttermaker
	Sac County—					
388	Hillman Cry. Co. i	Lytton	I. Hillman	Lytton	Geo. Hillman	Lytton
389	Fars. Co-op. Cry. Co. c	Early	K. K. Kennedy	Early	K. K. Kennedy	Early
390	Lake View Cry. Co. i	Lake View	E. C. Rogers	Lake View	E. C. Rogers	Lake View
391	Sac City Cry. Co. s	Sac City	A. C. Schultz	Sac City	M. L. Phillips	Sac City
	Scott County—					
392	Star Cry. Co. s	Long Grove	J. H. Marriott	Long Grove	Guy Mathias	Long Grove
393*	Bell-Jones Company s	Davenport	Bell-Jones Co.	Davenport	Geo. Ferris	Davenport
394*	Davenport Cry. Co. s	Davenport	P. J. Lingholm	Davenport	Jay Broderick	Davenport
	Shelby County—					
395	Prairie Rose Cry. Co. c	Walnut (8 mi. n)	John H. Vinding	Walnut, R2	Thorwald Petersen	Walnut, R 2
396	Fars. Mut. Co-op. Danway Cry. Co. c	Kirkman	Fred Koenig	Kirkman	Chris Andersen	Kirkman
397	Buck Valley Cry. Co. c	Kimballton	H. H. Jorgensen	Harlan, R2	Chris. B. Jensen	Harlan, R 5
398	Harlan Ice & Cold Storage Co. c	Harlan	M. Ankerstjerne	Harlan	M. Ankerstjerne	Harlan
	Sioux County—					
399	Fars. Co-op. Cry. Assn. c	Hull	J. W. Smit	Hull	Aug. M. Hein	Hull
400	Mueller Bros. Cry. i	Hawarden	E. Zorr	Hawarden	E. Zorr	Hawarden
401	Hospers Cry. Co. i	Hospers	Stover & Boterman	Hospers	W. H. Gehris	Hospers
402	Alton Cry. Co. s	Alton	C. J. Mueller	Alton	H. E. Collins	Alton
403	Fars. Mut. Co-op. Cry. Assn. c	Orange City	W. Sterrenburg	Orange City	D. Sterrenburg	Orange City
404	Fars. Co-op. Cry. Co. c	Boyden	John Rensink	Boyden	Henry J. Wargasky	Boyden
405	Fars. Mut. Co-op. Cry. Co. c	Sioux Center	J. E. Vermeer	Sioux Center	Evert DenHerder	Sioux Center
406	Rock Valley Cry. Co. i	Rock Valley	P. Vander Stoep	Rock Valley	Ed Vander Stoep	Rock Valley
407	Granville Cry. Co. i	Granville	F. J. Diederich	Granville	F. J. Diederich	Granville
	Story County—					
408	Fars. Co-op. Cry. Assn. c	Gilbert	C. P. Lake	Gilbert	C. P. Lake	Gilbert
409	Huxley Fars. Co-op. Cry. c	Huxley	Sam Maland	Huxley	O. J. Olson	Huxley
410	Roland Fars. Cry. Co. c	Roland	E. M. Rod	Roland	Geo. Wick	Roland
411	Story City Cry. Co. c	Story City	Alex Henderson	Story City	Fred Miller	Story City
412	Fars. Co-op. Cry. Co. c	Slater	Chas. Skortman	Slater	Clarence Clark	Slater
413	Zearing Cry. Co. s	Zearing	C. P. Bean	Zearing	P. D. Shiflet	Zearing
414	Iowa State College Cry.	Ames	Prof. M. Mortensen	Ames	John A. Luithly	Ames
415	McCallsburg Fars. Cry. Co. c	McCallsburg	G. J. Vallem	McCallsburg	C. T. Knutson	McCallsburg

	Tama County—					
416	Garwin Cry. Co. i	Garwin	Day & Blanchard	Garwin	A. M. Blanchard	Garwin
417	J. H. Nell Cry. Co. i	Tama	J. H. Nell & A. J. Elhoim	Tama	C. H. Wood	Tama
418	Gladbrook Cry. Co. c	Gladbrook	M. Mee & O. S. Mitchell	Gladbrook	C. S. Mitchell	Gladbrook
419	Traer Cry. Co. i	Traer	G. E. Olson	Traer	N. F. Reed	Traer
	Taylor County—					
420	The Bedford Cry. Co. i	Bedford	Frank Dunning	Bedford	Leslie Klopp	Bedford
421	Peacock Cry. Co. i	Lenox	A. H. Peacock	Lenox	A. H. Peacock	Lenox
	Union County—					
422	Fars. Co-op. Cry. Co. c	Afton	V. O. Williams	Afton	V. O. Williams	Afton
423*	Swift & Co. s	Creston	F. S. Hayward	Chicago, Ill. Union Stock Yds.	Leonard Brotherton	Creston
	Van Buren County—					
424	Blue Grass Cry. Co. c	Stockport	W. P. Dow	Stockport	J. B. Garrett	Stockport
	Wapello County—					
425*	Swift & Co. s	Ottumwa	F. S. Hayward	Chicago, Ill. Union Stock Yds.	L. E. Fletcher	Ottumwa
426*	Yorkshire Cry. Co. s	Ottumwa	R. N. Morrell	Ottumwa	N. F. Harvey	Ottumwa
427*	Buxton Cry. Co. s	Ottumwa	F. G. Buxton	Ottumwa	P. N. Keltner	Ottumwa
	Washington County—					
428	Wellman Cry. Co. c	Wellman	Keota Produce Co.	Oskaloosa		
	Wayne County—					
429*	Old Colony Cry. Co. i	Humeston	J. L. Humphrey, Jr.	Humeston	M. W. Bixby	Humeston
430	Corydon Cry. Co. s	Corydon	J. R. Green	Corydon	E. P. Davis	Corydon
	Webster County—					
431*	Gold Bar Cry. Co. i	Ft. Dodge	S. U. Deucker	Ft. Dodge	Rudolph Deucker	Ft. Dodge
432*	Ft. Dodge Cry. Co. s	Ft. Dodge	A. R. Loomis	Ft. Dodge	Bernhard Jensen	Ft. Dodge
433	Dayton Co-op. Cry. Co. c	Dayton	J. A. Cling	Dayton	R. F. Palmer	Dayton
434	Gowrie Co-op. Cry. Co. c	Gowrie	J. E. F. Johnson	Gowrie	A. E. McClune	Gowrie
	Winnebago County—					
435	Forest City Co-op. Cry. Co. c	Forest City	John Carson	Forest City	F. A. Jensen	Forest City
436	Lake Mills Cry. Co. c	Lake Mills	Ole T. Grove	Lake Mills	C. G. Howland	Lake Mills
437	Lincoln Co-op. Cry. Co. c	Rake	P. N. Peterson	Rake	L. K. Blorke	Rake
438	Scarville Cry. Assn. c	Scarville	J. E. Hermanson	Scarville	Sorn Kristensen	Scarville
439	Vinje Cry. Co. c	Scarville	Ole Strom	Scarville	H. C. Standal	Scarville
440	Thompson Co-op. Cry. Assn. c	Thompson	M. M. Tapager	Thompson	A. M. Hanson	Thompson
441	Buffalo Center Co-op. Cry. c	Buffalo Center	B. E. Hook	Buffalo Center	W. A. Fritz	Buffalo Center
442	Leland Co-op. Cry. Co. c	Leland	O. M. Peterson	Leland	Sever Rusley	Leland

CREAMERY LIST—CONTINUED.

Number	Name of Creamery	Located at or Near	Name of Proprietor, Secretary or Manager	P. O. Address of Proprietor, Secretary or Manager	Name of Buttermaker	P. O. Address of Buttermaker
	Winneshiek County—					
443	Ridgeway Cry. Co. i	Ridgeway	L. T. Fosse	Ridgeway	G. G. Bowers	Ridgeway
444	Lincoln Cry. Co. c	Ridgeway	O. O. Rue	Ridgeway	J. H. Bakken	Ridgeway
445	Silver Springs Cry. Co. ..... s	Ossian	H. P. Nicholson	Ossian	O. O. Hauge	Ossian
446	Nordness Cry. Co. ..... s	Nordness	J. N. Bragestad	Decorah, Rl.	Victor V. Johnson	Decorah, R 2
447	Highland Cry. Co. i	Newhouse, Minn. (8 mi. s)	Bidne & Akre	Highlandville	P. J. Bidne	Highlandville
448	Festina Cry. Co. c	Festina	H. J. Schupanitz	Festina	Mike Hauer	Calmar, R 1
449	Calmar Cry. Co. ..... s	Calmar	A. A. Olson	Calmar	Iver Barlow	Calmar
450	Silver Creek Cry. Co. c	Burr Oak	W. H. Emmons	Burr Oak	John O. Johnson	Burr Oak
451	Decorah Fars. Ice Cave Cry. ..... s	Decorah	N. O. Bendickson	Decorah	N. O. Bendickson	Decorah
	Woodbury County—					
452*	Blue Valley Cry. Co. ..... s	Sioux City	O. J. Walker	Chicago, Ill.	C. L. Smith	Sioux City
453*	Arctic Cry. Co. ..... s	Sioux City	C. E. Gear	Sioux City	N. H. Timble	Sioux City
454*	Hanford Prod. Co. ..... s	Sioux City	J. W. Schunck	Sioux City	M. O. Wheelock	Sioux City
	Worth County—					
455	Joice Cry. Co. c	Joice	M. O. Evans	Joice	J. H. Hagen	Joice
456	Fars. Co-op. Cry. Assn. c	Kensett (10 mi. nw)	O. K. Storre	Kensett	N. O. Dahlen	Northwood
457	Hartland Cry. Co. c	Northwood (9 mi. nw)	S. G. Bjorlie	Emmons, Minn.	Andrew Dahlen	Northwood, R 3
458	Fars. Co-op. Cry. Co. c	Manly	H. D. Backhaus	Manly	F. C. Hinze	Manly
459	Fars. Butter & Cheese Assn. c	Northwood	M. D. Johnson	Northwood, R6.	P. D. Warner	Northwood
460	Kensett Cry. Co. i	Kensett	Nils Gylleck	Kensett	Nils Gylleck	Kensett
461	Fertile Co-op. Dairy Co. c	Fertile	J. A. Johnson	Fertile	J. A. Johnson	Fertile
462	Hanlontown Cry. Co. c	Hanlontown	E. A. Gudvangen	Hanlontown	E. A. Gudvangen	Hanlontown
	Wright County—					
463	Goldfield Co-op. Cry. Co. c	Goldfield	C. M. Clausen	Goldfield	Nels J. Nelson	Goldfield
464	Fountain Cry. Co. i	Eagle Grove	W. E. Mann	Eagle Grove	A. J. Kittleson	Eagle Grove
465	Fars. Co-op. Cry. Co. c	Belmond	G. F. Elder	Belmond	C. H. Jennings	Belmond
466	Clarion Cry. Assn. c	Clarion	Wiert Johnson	Clarion	J. W. Cagley	Clarion
467	Norway Co-op. Cry. Co. c	Belmond (9 mi. w)	O. L. Lein	Kanawha, R5	L. R. Roderick	Kanawha, R 5

IOWA STATE DAIRY ASSOCIATION.

Report of the work of this association during the year 1915:

The Iowa State Dairy Association which has been conducting educational work for the promotion of the industry during the past six years, again received its appropriation from the legislature covering the years 1915 and 1916.

A special effort has been made to overcome the difficulty of reaching the non-believer in progressive dairying. This has been done by introducing some attractive and exceedingly practical features into each program. The results indicate that this method has been a great help to arouse interest among those who would not otherwise have given dairying a trial.

The work has been conducted as nearly as possible in those sections where dairying is least developed and where its introduction will be of greatest benefit in improving the agricultural conditions. The southern half of Iowa is in need of more dairying because of the condition of the soil and the relatively low income obtained with the present methods of farming used on high priced land. The mild climate, the abundance of grass, the adaptability of the soil for the growing of milk producing feeds make the natural conditions ideal for the economical production of milk. There are but few creameries in this portion and therefore, the market for dairy products is not as well developed as in the northern portions. In order to be of the greatest assistance, a large part of the recent work has been devoted to the southern half of the state.

Up to the winter of 1914-15, the department had operated thirteen dairy trains. These covered every railroad line in the state and furnished the lecturers an opportunity to reach 672 towns, 61 of which were given two or more meetings due to the crossing of the various lines. These special trains were conducted in a manner to create an interest in dairying and prepared the way for more detailed information in the localities visited.

During the year ending November 1, 1915, representatives of the association met 259 audiences in 71 counties. The records of attendance show that 46,200 people were reached. Of the 259 audiences, 37 were in attendance at farmers' institutes, 58 at dairy

and creamery meetings, and the remaining 164 at meetings conducted by the dairy association directly.

Two special dairy trains were operated during the months of January and February, 1915. Each trip was three and one-half weeks in length. The lines of the Chicago Great Western, the Chicago, Milwaukee & St. Paul and the Waterloo, Cedar Falls & Northern were covered. In each case the railroad companies furnished the equipment absolutely free of charge to the Association.

Half day and full day meetings were held at each town. In addition to the regular lecture work, community dairy shows, boys' and girls' judging contests, milk record, contests, etc., were conducted. More extensive exhibit cars were carried on these trains than on any previous campaigns.

THE COMMUNITY DAIRY SHOW.

Community dairy shows were held in conjunction with fifty-eight meetings. These were more successful than had been anticipated and brought out an average of eighteen cows and bulls at each place. The business men at each town co-operated in making the show a success and offered attractive cash and merchandise prizes for the best animals exhibited. The dairymen and leading farmers in the communities also gave considerable of their time in encouraging their neighbors to exhibit cattle. All breeds of cattle used for milk production, whether grades or pure breds, were entered, which gave an excellent opportunity for comparison of the various types.

The shows were held in a lumber yard or livery stable which afforded the best place obtainable to stable the animals and furnish shelter for the audiences as well. The programs were opened by leading the best cows into the ring and using them to demonstrate the essential characteristics of good productive dairy type. Questions were then called for and discussions held in which all were invited to participate.

After the cow demonstration was completed, the ring was made larger or when the weather would permit all of the animals were led into the streets, and the judging of the various classes begun. The animals were then placed by the judge in regard to their dairy qualities after which each was gone over carefully and its desirable and undesirable points explained.

The community Dairy Shows made it possible to reach the man milking a few cows and point out to him by the use of a member

of his own herd the difference between the profitable and the unprofitable dairy cow. It was explained to him on his own basis, and he was encouraged to determine further the real value of his herd by weighing and testing the milk. Considerable friendly rivalry was created among the exhibitors which will undoubtedly lead in many instances to better feed and care in the average herd of milch cows.

INTERESTING THE CHILDREN.

In addition to the Farmers' meetings, an effort was made to reach the younger generation. The majority of the county superintendents were glad to comply with the request that the rural schools close for a day and the children be allowed to attend the meetings. It was not an uncommon sight to see a country school teacher bring all of her pupils to town in a sleigh or wagon. The students from the country and town were assembled in the high school where lectures were given on the importance of agricultural training with special reference to dairying.

At the completion of the lectures at the high school, the students accompanied by the instructors, were taken to the barn where the cattle for the community dairy shows were kept, and instruction given in judging. The cow demonstration was given first to explain the characteristics of the correct type of dairy cow. Then the boys and girls were supplied with directions and all required to compare the class of animals brought before them. After inspecting the animals for twenty minutes, the students wrote their placing together with the reasons for same, on the directions sheet and these were handed to the lecturer in charge. Discussions were then held and all questions answered.

The business men at the various towns gave prizes for the boys and girls who judged. The students generally were very much interested in the work and expressed a desire to study their agricultural work in school in a similar way. During the winter of 1914-15 nearly 3,000 boys and girls were reached in this manner.

WEIGHING AND TESTING THE MILK.

To be capable of judging and comparing dairy cows is important, but the only definite way to determine the value of a cow is to weigh and test her milk. It was a question as to how this could be introduced to best advantage on the average farm. The work was carried on along the Chicago, Burlington & Quincy line in

southern Iowa, where the small number of dairy cattle would not permit the organization of cow testing associations. It was simply a matter of getting some one in as many families as possible started to weighing and testing the milk of the herd.

It was decided that this could be most efficiently done by inaugurating a milk record contest among the boys and girls between the ages of twelve and twenty years. These age limits were made to insure fair competition to all who entered and also to interest those who were in a position to derive the greatest benefit from the work. It was found easier and more helpful to mould the future of the boy and girl than to change the fixed habits of the father and mother.

Any boy and girl between the specified age limits who could weigh and test the milk of three or more cows for three consecutive months, was eligible to enter the contest. The contest proper closed in three months, but the contestants were all encouraged to continue the work for at least one year in order to get the entire lactation period of each cow.

A supply of monthly record sheets, feed standards, and pamphlets containing all of the necessary directions for carrying on the work, were furnished to each contestant. They were required to furnish themselves with scales and wherever possible, with Babcock testers. In case the tester could not be secured, the contestant was required to have the creamery or station man test the samples for butter-fat not less than twice each month. At the end of each month, the records were transferred to a summary sheet and the complete data mailed to the office of the association.

The manner of grading the reports was based upon the efforts put forth by the contestants, and not on the production of the cows. In addition to the reports, an essay of not to exceed 500 words describing the manner in which the work was carried on and the benefit derived therefrom was required from each contestant. Any changes which improved the rations or made the production of milk more economical, were recognized, but it was realized that the contestant had no opportunity to select the cows with which he must work.

The following score was used in grading reports:

Accuracy, 25; number of cows, 15; neatness, 20; completeness of details, 20; essay, 20; perfect score, 100.

The breeders of dairy cattle, the publishers of dairy magazines, and the manufacturers of dairy appliances assisted very materially in making the contest a success by offering valuable and practical prizes for furthering the dairy industry.

The results of the contest are gratifying. There were 157 boys and girls who completed the work. Many of these tested more than the required number of cows, while some tested as high as fourteen during the entire contest. The reports show that 623 cows produced an average of 404 pounds of milk and 19.6 pounds of butter-fat per month or 13.5 pounds of milk and .65 pounds of fat per day. The average milking period as tabulated on the reports, is eight and one-half months, which makes an average of 3,434 pounds of milk and 166.6 pounds of butterfat per year. The average cost of feed per month was $4.50 per cow. This included dry feed two months and pasture one month. The cost of producing 100 pounds of milk averaged $1.11, and of producing one pound of butter-fat twenty-three cents.

The average price received for butter-fat which was sold for the manufacture of butter was 23.5 cents per pound. This shows a profit of only one-half cent per pound for the butter-fat if the skim-milk and manure are allowed to balance the cost of labor, interest and depreciation. The average price received for butter-fat used in ice cream making, was thirty-eight cents which shows the advantage in selling sweet cream for this purpose.

The relatively low price of butter-fat, as shown by the reports of the contestants, is due mainly to the lack of local markets. During the same months, the price received for butter-fat in the northern half of the state, was twenty-eight cents per pound. The high cost of production is accounted for by the unbalanced rations fed. Of the 157 herds in the contest, thirty-two were receiving silage, twenty-nine alfalfa hay, and only eighteen a combination of these two feeds. The amount of cottonseed meal, oil meal and bran fed was small and limited to only a few herds. The principal ration used consisted of corn and oats, mixed hay, and corn fodder.

The results of the milk record contest show the conditions as found in the average small herd of milch cows in southern Iowa. They emphasize the importance of getting the farmer, who milks a few cows, interested in his herd. They also indicate the part these herds play in lowering the production of the Iowa cow.

OTHER WORK.

The calls from the farmers' institutes for speakers were more numerous this year than heretofore. A large number of requests could not be accepted, because of the other work which was being carried on at the same time.

Several dairy short courses were also conducted. These were in the older dairy communities where detailed information was required. These were three days in length and instruction in breeding, feeding, testing, dairy cattle judging, etc., was given. Although the special dairy short course was new, the attendance was very good at each of these conducted.

Due to the exceedingly unfavorable weather during the past summer a smaller number of creamery picnics were held than usual. Such gatherings are an excellent means of bringing the patrons together in a social way as well as to hear the practical discussion of subjects essential to the improvement of conditions on the farm.

During the spring and fall months when the work is urgent on the farm and it is therefore difficult to hold meetings, bulletins are sent to the local newspapers. These contain timely suggestions which assist the farmer in solving the problems which confront him with reference to his dairy herd. They are written with the idea of assisting the creameries in improving the quantity and quality of raw product. The newspapers are lending their assistance by giving the information a prominent place in their columns.

One of the important features of the work has been the establishment of a Dairy Cattle Congress in conjunction with the annual convention. This year the show was unsurpassed by any similar event. It brings dairy cattle breeders with their choice animals from every part of the United States and offers the farmers of not only Iowa, but the Mississippi Valley, an opportunity to become acquainted with the various breeds. Premiums are offered for butter, cheese, and milk, which in addition to the display of dairy appliances and farm implements, bring thousands of prosperous farmers. The convention proper is held in a building on the grounds, and subjects of interest to the buttermakers, creamerymen and dairymen are discussed by authorities of national reputation.

The Iowa State Dairy Association in all of its work has been assisted in a large measure by the other dairy interests of the State.

Chief among these is the Dairy and Food Department which had a number of speakers on the trains throughout the tours and also co-operated in all the other work. The individual dairymen have also sacrificed portions of their time to educating their brother farmers in better methods and giving them the benefit of valuable experience. The Dairy Department of Iowa State College and the State Veterinary Department have also given a great deal of assistance from time to time.

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FOR THE

YEAR ENDED OCTOBER 31, 1916

W. B. BARNEY

STATE FOOD AND DAIRY COMMISSIONER

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