

Thirty-Ninth Annual Report
OF THE
MISSOURI
State Board of Agriculture

A Record of the Work for the Year 1906.

ALSO VALUABLE INFORMATION ON BREEDING AND FEEDING LIVE STOCK,
IMPROVING THE FERTILITY OF THE SOIL, GROWING CROPS, DAIRYING,
AGRICULTURE AND LIVE STOCK STATISTICS, ETC.

PUBLISHED 1907.



THE HUGH STEPHENS PRINTING COMPANY,
JEFFERSON CITY, MO.

UNIVERSITY OF CALIFORNIA
LIBRARY
COLLEGE OF AGRICULTURE
DAVIS

Digitized by Google

Original from
UNIVERSITY OF CALIFORNIA

Officers of State Board of Agriculture, 1907.

President—S. W. Hudson, Buckner.
Vice-President—Norman J. Colman, St. Louis.
Secretary—Geo. B. Ellis, Columbia.
Assistant Secretary—J. B. Rector, Columbia.
Institute Clerk—S. M. Jordan, Stanberry.
Treasurer—W. A. Bright, Columbia.
State Veterinarian—Dr. D. F. Luckey, Columbia.
State Highway Engineer—Curtis Hill, Columbia.

EXECUTIVE COMMITTEE.

S. W. Hudson, Buckner. W. C. Howell, Ulman.
Norman J. Colman, St. Louis. W. C. Hutchison, Jamesport.
H. J. Waters, Columbia. M. B. Greensfelder, Clayton.
 A. T. Nelson, Lebanon.

EX-OFFICIO MEMBERS.

Governor of Missouri—Jos. W. Folk.
Superintendent of Schools—H. A. Gass.
Dean Agricultural College—H. J. Waters.

(2)

While this plan is more expensive per individual instructed, I believe it is profitable, because of the number of farmers who hear the lectures who otherwise would not when the meetings are held only in larger places.

In this connection, I would recommend that an increased appropriation for institute work be asked for, and if it is secured, that an institute assistant be employed for the entire time. During the institute season he can attend the meetings, and during the rest of the year he can assist in the organization of the work and attend occasional meetings that are asked for continually throughout the year.

GOOD ROADS.

The question for a better system for road construction and maintenance in this State has been given a prominent place in our institute work. At most of the regular meetings the subject has been taken up, and in addition several road conventions have been held and are now arranged for. Early last spring Mr. G. H. Lawson of Livingston county, representing the business men and farmers of that county, proposed to the Board of Agriculture that they would furnish the necessary expense for paying premiums and advertising a good roads' convention, to be held under the auspices of the State Board of Agriculture, to be held in Chillicothe during the first week in September. This proposition was accepted and the convention was held, with an attendance of 200 regularly appointed delegates from other counties and a local attendance estimated at 4,000 to 5,000 people. During the convention three miles of improved dirt road were constructed in competition for a prize of \$200.00. One of these roads was built by the citizens of Livingston county, another mile by the Smith Manufacturing Company, and the third by the Austin-Western Manufacturing Company; the first prize being awarded to a mile of road improved by the Austin-Western Company, which was over a clay gumbo bottom. For the best display of road machinery the award was a tie, and the premium divided between the Smith Manufacturing Company and the Austin-Western Manufacturing Company. At the conclusion of the convention the following resolutions were unanimously adopted:

First. We favor the creation by the next General Assembly of the office of State Highway Engineer, under the jurisdiction of the State Board of Agriculture, to co-operate with the local officers in the furtherance of good roads.

Second. To provide an adequate number of trained men for the supervision of road construction in the various localities of this State, we recommend the immediate establishment of a course in road engineering and the equipment of a suitable laboratory for the testing of road materials at the State University at Columbia.

Third. All the people of the State being interested in and benefitted by a better system of highways, State aid should be extended to the various counties for the construction and improvements of the public roads, such State aid being provided from new sources of revenue other than those now existing or in the treasury.

Fourth. Redress from the present distressing situation in road maintenance and construction can only come through judicial changes in our State Constitution, and such changes being possible more quickly and more surely by the adoption of a new Constitution covering adequate sources of revenue than by any amendment to the present Constitution, we, therefore, strongly urge upon the Legislature the calling of a constitutional convention at the earliest possible moment.

Fifth. We strongly endorse the drag as the most effective and practical method of maintaining dirt roads, and would suggest that some law be enacted whereby its more general employment for this purpose may be effected.

Continuing this campaign, I have asked the co-operation of the commercial clubs and county courts with our Board in holding district road conventions, and we have arranged for the following meetings under this co-operation: Maryville, December 19; Moberly, December 20; Kirksville, December 21; Mexico, December 22; Lamar, December 26; Harrisonville, December 27, and Sedalia, December 28. We have also arranged to co-operate with the county court organizations of the State to hold a State good roads' convention January 15 and 16 in Jefferson City. It is hoped by this agitation to crystallize public sentiment in favor of some broad, progressive system that will bring about better roads for the State, particularly to put road building and maintenance in the hands of an organized department of trained men, and furthermore, to provide for State aid.

CORN IMPROVEMENT AND SOIL FERTILITY.

Two other subjects, which have been presented at practically all of our institute meetings, are corn improvement and soil fer-

FORTIETH ANNUAL REPORT,

OF THE

MISSOURI

State Board of Agriculture

A Record of the Work for the Year 1907.

ALSO VALUABLE INFORMATION ON BREEDING AND FEEDING LIVE STOCK,
IMPROVING THE FERTILITY OF THE SOIL, GROWING CROPS, DAIRY-
ING, AGRICULTURE AND LIVE STOCK STATISTICS, ETC.

PUBLISHED 1908.



THE HUGH STEPHENS PRINTING COMPANY,
JEFFERSON CITY, MO.

UNIVERSITY OF CALIFORNIA
LIBRARY
COLLEGE OF AGRICULTURE
DAVIS

Officers of the State Board of Agriculture.

President—N. J. Colman, St. Louis.
Vice-President—H. J. Waters, Columbia.
Secretary—Geo. B. Ellis, Columbia.
Assistant Secretary—J. B. Rector, Columbia.
Institute Specialist—S. M. Jordan, Stanberry.
Treasurer—W. A. Bright, Columbia.
State Veterinarian—Dr. D. F. Luckey, Columbia.
State Highway Engineer—Curtis Hill, Columbia.
State Apiary Inspector—M. E. Darby, Springfield.

EXECUTIVE COMMITTEE.

N. J. Colman, St. Louis.
S. W. Hudson, Buckner.
W. R. Wilkinson, St. Louis city.
H. J. Waters, Columbia.
W. C. Hutchison, Jamesport.
W. B. McRoberts, Monticello.
John L. Christian, Rockport.

COMMITTEE ON PUBLIC ROADS.

Governor Jos. W. Folk.	N. J. Colman.
S. W. Hudson.	H. J. Waters.
Allen M. Thompson.	N. H. Gentry.
	Geo. B. Ellis.

EX-OFFICIO MEMBERS.

Governor of Missouri—Jos. W. Folk.
Superintendent of Schools—H. A. Gass.
Dean Agricultural College—H. J. Waters.

(2)

REPORT OF STATE HIGHWAY ENGINEER.

Columbia, Mo., December 17, 1907.

Mr. President and the Honorable Members of the State Board of
Agriculture:

Since assuming office on July 6th, I have devoted two-thirds of my time to two of the three proposed cross-state roads from Kansas City to St. Louis. The idea which first went abroad that the State was to build this road, created much enthusiasm, which was greatly lessened after the facts were understood. There still remain enough genuine advocate of this movement to eventually bring results. The idea is to build these roads by the organization of road districts under the "benefit assessment" law. Five proposed districts, comprising in all about 50 miles of road, are in different stages of organization. The publicity given these roads has done much in the agitation for better roads.

During the time not devoted to the cross-state roads, I have been fully employed with other roads of the State. Besides inquiries answered by mail, I have made personal trips for investigation to Troy, Elsberry, Steedman, Springfield, Raymore, Belton, Marshfield, Billings, Neosho, Odessa, Norborne and Van Buren. Places which have made calls and now await a personal trip are Gazette, Novelty, Savannah, Oregon, Holden, Hardin and Gainsville.

Estimates of cost have been made for 18 miles of road at Troy, 6½ miles at Elsberry and 6 miles at Steedman. I am drawing up specifications and forms of contract for 5½ miles at Springfield and 18 miles at Raymore. Have had made a complete field survey and am working on plans, estimates, specifications and contract for 4 miles of road at Pleasant Hill. The calls to Marshfield, Billings and Neosho were to assist in devising some method for general improvement of the surrounding roads; to Odessa, for consultation in the formation of a benefit district for the purpose of making a graded earth road and construction of permanent cul-

verts; and to Norborne, to investigate draining a road through low grounds. A survey has been made and when time permits, I shall make an estimate and draw plans and specifications for bridging the Current river at Van Buren.

There is considerable unfinished work on hand, and where it has been necessary to have assistants, I have employed them. The cost of this assistance to date amounts to \$83.35, which I have submitted, with receipts, in my expense account. Until such time as a deputy is required, this method can be used with less expense than the employment of a regular assistant.

As I now view the situation the engineer must, for the present, devote his time to organizing counties under the new road laws; systemizing road work, making and maintaining earth roads and constructing permanent culverts of stone masonry or concrete. It is in this way that we must prepare for, or lead up to, a hard surface on the main roads. All the encouragement and assistance possible should be given to making rock roads, but by far the greater part of the State is not ready for them.

The work has been of such nature as to keep me away from the office, leaving practically no time for the preparation of publication. It is my intention to prepare a bulletin of instructions to the county engineers. This bulletin will call attention to wrong ways now used on working the roads, and will contain general plans and remarks for the care of earth roads. It will contain drawing and plans for concrete and stone masonry culverts, with general items of approximate cost. It will set out and define some of the new road laws, the benefit assessment law, the enactments governing the State road fund and the county highway engineer, with his duties and his relation to the county court. The main feature, however, will be the development of the earth road with permanent culverts and bridges.

I advise the establishment of a road laboratory in conjunction with the University Engineering College. The approximate cost of this will be \$800.00. The Board of Agriculture through the road department could pay one-half the cost, or \$400. The laboratory is a necessary adjunct to the University in the establishment of a course in road engineering. Aside from the benefits to be derived from training boys in road work, we will then be prepared to test road material from different parts of the State.

Some inducement is necessary to stimulate action toward the more liberal application of rock as a road surfacing.

In a great many places to quarry and crush the rock, in whole

or in part, would be considerable aid. This can be done by convict labor, a plan of which I wish to present to the Board.

The State can own quarry and crusher plants, to be operated under State supervision by the less troublesome convicts from the penitentiary. These must be portable plants with some portable means of housing the prisoners, and can be so limited in number as to utilize only the less vicious convicts. Two hundred convicts suitable for this work are now available in the penitentiary, enough to operate ten plants, with an output from each of 60 cubic yards of crushed rock per day, or a total of 600 cubic yards; sufficient during the nine working months of the year, for 70 miles of road.

The cost would be about \$5,000.00 per plant, and the care of each prisoner, 40 or 50 cents per day.

The State would soon be more than repaid by the increased revenue derived from the increase in population and the increased valuation of property accruing from good roads.

I do not advocate scattering the convicts out along a road. I would keep them confined strictly to the quarry and crusher plants, and leave hauling the rock and other work necessary to road construction to be performed by the community for which the road is being made. With systematic order of distribution and application for such plants, much assistance can be given in the form of State aid to road work. Were these plants available, I could use four of them when the season opens next spring. As affairs now stand, there may be nothing done. It is my belief, that in less than two years we would have in constant use every plant the State could man.

If such use of convicts is not inconsistent with the view of the Board, I shall make a closer study of the subject and present it in more detail.

Respectfully submitted,

CURTIS HILL,

State Highway Engineer.

FORTY-FIRST ANNUAL REPORT

OF THE
C. B. Robinson

MISSOURI

State Board of Agriculture

A Record of the Work for the Year 1908.

ALSO VALUABLE INFORMATION ON BREEDING AND FEEDING LIVE-STOCK,
IMPROVING THE FERTILITY OF THE SOIL, GROWING CROPS,
DAIRYING, POULTRY-RAISING, ROAD-MAKING, HOME-
ECONOMICS AND THE IMPROVEMENT OF THE
FARM HOME. AGRICULTURAL AND
LIVE STOCK STATISTICS, ETC.

PUBLISHED 1909.



THE HUGH STEPHENS PRINTING COMPANY,
JEFFERSON CITY, MO.



OFFICERS OF THE STATE BOARD OF AGRICULTURE.

President—H. J. Waters, Columbia.
 Vice-President—John Deerwester, Butler.
 Secretary—Geo. B. Ellis, Columbia.
 Assistant Secretary—W. L. Nelson, Columbia.
 Institute Specialist—S. M. Jordan, Columbia.
 Live Stock Assistant—F. G. King, Columbia.
 Treasurer—W. A. Bright, Columbia.
 State Veterinarian—Dr. D. F. Luckey, Columbia.
 State Highway Engineer—Curtis Hill, Columbia.
 State Apiary Inspector—M. E. Darby, Springfield.

EXECUTIVE COMMITTEE.

H. J. Waters, Columbia. John Deerwester, Butler.
 W. B. McRoberts, Canton.

EX-OFFICIO MEMBERS.

Governor of Missouri, Herbert S. Hadley. Superintendent of Schools, H. A. Gass
 Dean Agricultural College, H. J. Waters.

CORPORATE MEMBERS.

(Term expires July 20, 1909.)

Cong. dist.	Name.	Residence.	County.
1	W. B. McRoberts	Canton	Lewis.
4	John L. Christian	Rockport	Atchison.
7	N. H. Gentry	Sedalia	Pettis.
8	W. C. Howell	Ulman	Miller.
15	Sanford Mc. Smith	Reeds	Jasper

(Term expires July 20, 1910.)

6	John Deerwester	Butler	Bates.
9	J. W. Boles	Auxvasse	Callaway.
10	M. B. Greensfelder	Clayton	St. Louis.
11	Norman J. Colman	St. Louis	821 Holland Bldg.
12	W. R. Wilkinson	St. Louis	212 N. Main Street.

(Term expires July 20, 1911.)

2	W. C. Hutchison	Jamesport	Daviess.
3	A. M. Thompson	Nashua	Clay.
5	J. B. Sampson	Lee's Summit	Jackson.
13	E. E. Swink	Farmington	St. Francois.
14	R. A. Young	Alton	Howell.
16	A. T. Nelson	Lebanon	Laclede.

REPORT OF STATE HIGHWAY ENGINEER.

Columbia, Mo., Dec. 15th, 1908.

To the Honorable Members of the State Board of Agriculture:

Gentlemen—Looking back over the season's work, a decided improvement is evident all along the line. Many things can still be seen which might be improved upon and many more which should be improved upon where the conditions will not permit. No man's foresight is so good as his back-sight, for it is only by the past that we can judge the future. The best results are to be obtained from a study of the scrap pile. Road officials are therefore advised to look back over the season's work and to study the scrap heap.

Reviewing the past year's work of the State Highway Department, I find that the Department's representatives have visited about 100 separate localities for the purpose of attending meetings, making road addresses, or for investigating and giving advice upon road and bridge matters. Few hard surfaced roads have been made under our supervision, the greater number of our calls being for consultation upon earth roads, culverts or bridges. The Department has sent out 15 steel bridge plans, aggregating 2,600 linear feet of bridging at an estimated cost of \$37,000.00; 72 concrete bridge and culvert plans aggregating about 760 lin. feet of bridging at an estimated cost of \$25,000.00. A total aggregate of 87 structures—3,360 lin. feet and \$62,000.00 cost. These plans were made for and upon request of the County Highway Engineers, and about 25 per cent have been contracted for and built.

At the instigation of the State Department, the county engineers have formed a highway engineers' association of the State, the object and purpose being to secure uniformity of methods, the establishment of closer relations and the advancement of knowledge pertaining to road building and maintenance among the county engineers.

We gave all aid possible to the road overseers' schools of instruction, and I am convinced that the law requiring that all overseers of a county be called together for instructions at the county seat by the county engineer, at least once a year, is one of the best features of our new road laws.

The machinery for testing road materials was purchased last spring, but has only recently been installed in the engineering building of the State University. We are now prepared to test any kind of road or bridge material which may be sent in by the county officials, at no expense to them save for the shipment of the materials to Columbia.

The road exhibit put on by the highway department at the State Fair last October was creditable, and consisted of road tools and machinery and models and structures in concrete and steel.

In my report last year I advocated the use of some of the State convicts upon the public roads, which advocacy I wish to renew. I do not advocate scattering the convicts out along a road, but would keep them confined strictly to quarrying and crushing, leaving the hauling and other work necessary to the completion of the road to be performed by the community for which the road is being made. With a systematic order of distribution and application for such work, much assistance can be given in the form of State aid to road work. Road material of average quality is accessible in almost every county of the State, and in a number of counties it can be found within reasonable hauling distance of any road. I would have the State own portable outfits for quarrying and crushing, with an average output of about 100 c. y. per outfit per day, to be manned by State convicts. A steel cage mounted on wheels with bunks, which could be lowered and raised on the plan of Pullman coach, could be purchased to accommodate 16 or 18 men. With crusher, cook and guard outfits on separate trucks, the whole could be transported to the railroad, shipped to the next place where wanted, and again hauled out to the road or quarry. This quarrying and crushing should be in some form of State aid, the county or road district having done the grading necessary to prepare the road-bed for receiving the rock and also having made arrangements to put on the rock after it is crushed for them.

I beg to call attention to Greene county, Missouri, where the road officials have this year succeeded in putting out a convict rock crushing outfit with county prisoners exactly like the plan I have outlined. The county convict outfit consists of a traction

engine, the convict cage, cooking tent and guard outfit. The crew of a team, two guards, an engineer and 12 prisoners with an output of about 80 c. y's. per day at a cost to the county of about \$15.00 per day. The convict outfit does only the crushing, the road district doing everything else. So successful has it proven that the demand for it from different districts is great enough that two or three such outfits could be kept busy. The cost to the county is so small that the taxes on the increased valuation of property caused by the improvement will pay the county a good interest upon the capital invested.

The work of a large number of our county highway engineers cannot be too highly praised. In some counties it has required the man to be philosopher, orator, politician, economist and engineer. It has been a hard position to fill, and even with a discouraging season the roads have been improved. The haphazard way of attending to the road interests is fast disappearing, and is superceded by order and system under the supervision of the county highway engineer. There is a saving in handling and buying tools, implements and materials; there is better and more permanent work and better maintenance. More hedges are trimmed, more poll-tax collected, and men and teams are worked to better advantage. Small things, as opening ditches, placing culverts in the right place or abandoning others, putting fences on the established lines or clearing the right of way of obstacles have been attended to. Many things which any sensible man knows how to do, have never before been done simply because there was nobody whose business it was to do them. This is the result of supervision, and in every county where it has had a fair, honest trial the results are good.

The roads of the State have been gradually improving for years along with the natural growth and progress. But the year just past shows more advance and improvement in the roads than any other one year. With the plans already made by the county engineers for next year's work the end of another year will see the most decided advancement in road improvement that has been seen in any other one year. The efforts of the State highway department shall be for the improvement of the roads as a system and not for an isolated road here and there. In order to accomplish this, it is necessary:

1st. To give whatever assistance we can to any place or community showing a spirit for improvement and a desire to im-

prove. In this way we give aid to the isolated road because it is a part of the road system and all cannot be improved at one and the same time.

2nd. To have road laws which can and will be complied with. Our present laws are good, but need to be made consistent in a few inconsistent minor points. Because there has never, until this year, been anyone whose business it was to see that the road laws were enforced, the average citizen has not respected them, but has felt at liberty to ignore them.

3rd. To obtain uniformity in methods and a system of work, and in keeping records. Records of contracts and of the roads themselves have been kept in a very careless manner, if kept at all. We find there is no record of at least one-half of our public roads, and some of the records which are found could have but little standing in the courts. One of the greatest disadvantages our engineers have in the enforcement of the road work is the lack of any record of the roads themselves.

4th. To give attention to the maintenance of the earth roads. Over 95 per cent of our roads are earth, and it will be some years before as much as 10 per cent of them will be anything more. Hard surfaced roads are too expensive to build and maintain to plan a very rapid progress in their construction. The largest mileage will, and should be, earth roads for a long time to come, and in the meantime the best should be made of them that the means and natural conditions permit.

5th. With this care of the earth road, attention must be given to the construction of good, substantial and permanent culverts and bridges. The highway department should be given more control over this feature of the work in order to prevent the substitution of unsuitable, unsubstantial or unsightly structures. Not so much to procure the structure at a less cost, but to obtain a suitable one, worth the price paid for it. As the roads improve the loads increase, and it is both safety and economy to build permanent bridges and culverts. Well maintained earth roads with good bridges and culverts is the solution for the majority of our road difficulties.

6th. Where the travel converges upon our main roads, making the traffic too heavy to maintain earth roads, they should be hard surfaced as fast as possible. These roads are of enough importance to justify the increased expenditure. This is another feature of our road work over which the State department should

have more power of control. A road is not made by piling on the material in a haphazard way without attention to the foundation or drainage. Using more material than is necessary is another waste. Money is being wasted in all these ways in Missouri. It costs too much money to make good roads for the work to be done in a careless manner or without attention to the principles of road-building.

7th. Many people advocate expensive road building without a thought for maintenance. Any road will wear out and as soon as a road is built provisions should be made for maintaining it. Maintenance is second in importance to construction, and we must not lose sight of the fact that a good earth road is largely a question of maintenance. Before we can have a good system of roads, we must have a good maintenance system—a continuous maintenance. Our road district might be of a suitable size to own an outfit and employ a man to do nothing the year around but keep up the roads of that district. It is the most economical in the end and will eventually develop a class of men who make it their business. It will be their duty to care for the roads while other men are attending to their own particular line of business.

I wish, also, to do some research work or investigation this year, to begin as soon as I know what funds the department has for expenses.

1st. Demonstrate the use of the road drag for maintaining hard surfaced roads. I know that the drag properly used upon gravel roads will keep the surface smooth. It ought to do the same with roads surfaced with chats. I do not know what might be the result upon a macadam road, but I am arranging to give it a thorough trial in several places in the State.

2nd. Make a study and test of road material of the State, taking up those sections first which promise to need it first.

3rd. An investigation and census for the amount of travel; the kind and size of loads; date and length of time of heavy, wet roads; and the effect of bad roads upon public school attendance.

4th. Collect interesting and historical data concerning the old State roads opened years ago by the State. This is valuable from a historical standpoint only, but will soon all be lost—much of this history is gone beyond recovery now.

5th. Add a little each year to the State Fair road exhibit. It helps to keep up interest and is a feature for instruction upon road affairs.

6th. Make field and laboratory tests upon paints and preservatives for steel highway work. It is a feature of maintenance which has been neglected. Well directed attention to this question will mean several years added to the life of steel bridges,

Respectfully submitted,

CURTIS HILL,

State Highway Engineer.



A LAWRENCE COUNTY ROAD.

FORTY-SECOND ANNUAL REPORT

OF THE

MISSOURI

State Board of Agriculture

A Record of the Work for the Year 1909.

ALSO VALUABLE INFORMATION ON BREEDING AND FEEDING LIVE-STOCK,
IMPROVING THE FERTILITY OF THE SOIL, GROWING CROPS,
DAIRYING, ROAD-MAKING, HOME ECONOMICS AND
THE IMPROVEMENT OF THE FARM HOME,
AGRICULTURAL AND LIVE STOCK
STATISTICS, ETC.

PUBLISHED 1910.



UNIVERSITY OF CALIFORNIA
LIBRARY

THE HUGH STEPHENS PRINTING COMPANY,
JEFFERSON CITY, MO.

1910.



OFFICERS OF THE STATE BOARD OF AGRICULTURE.

President—A. T. Nelson, Lebanon.
 Vice-President—W. C. Hutchison, Jamesport.
 Secretary—T. C. Wilson, Columbia.
 Assistant Secretary—W. L. Nelson, Columbia.
 Institute Director—S. M. Jordan, Columbia.
 Treasurer—W. A. Bright, Columbia.
 State Veterinarian—Dr. D. F. Luckey, Columbia.
 State Highway Engineer—Curtis Hill, Columbia.
 Deputy State Highway Engineer—F. J. Kersting.
 State Apiary Inspector—M. E. Darby, Springfield.

EXECUTIVE COMMITTEE.

A. T. Nelson, Lebanon. W. C. Hutchison, Jamesport.
 F. B. Mumford, Columbia. W. A. Dallmeyer, Jefferson City.
J. W. Boles, Auxvasse.

EX-OFFICIO MEMBERS.

Governor of Missouri, Herbert S. Hadley. Superintendent of Schools, H. A. Gass.
Dean Agricultural College, F. B. Mumford.

CORPORATE MEMBERS.

(Term expires July 20, 1910.)

Cong. Dist.	Name.	Residence.	County.
6.....	John Deerwester.....	Butler.....	Bates.
9.....	J. W. Boles.....	Auxvasse.....	Callaway.
10.....	M. B. Greensfelder.....	Clayton.....	St. Louis.
11.....	Norman J. Colman.....	St. Louis City.....	821 Holland Bldg.
12.....	W. R. Wilkinson.....	St. Louis City.....	212 N. Main St.

(Term expires July 20, 1911.)

2.....	W. C. Hutchison.....	Jamesport.....	Daviess.
3.....	A. M. Thompson.....	Nashua.....	Clay.
5.....	J. B. Sampson.....	Lee's Summit.....	Jackson.
13.....	E. E. Swink.....	Farmington.....	St. Francois.
14.....	R. A. Young.....	Alton.....	Howell.
16.....	A. T. Nelson.....	Lebanon.....	Laclede.

(Term expires July 20, 1912.)

1.....	E. L. Newlon.....	Lewiston.....	Lewis.
4.....	Geo. H. Sly.....	Rockport.....	Atchison.
7.....	N. H. Gentry.....	Sedalia.....	Pettis.
8.....	W. A. Dallmeyer.....	Jefferson City.....	Cole.
15.....	S. McSmith.....	Reeds.....	Jasper.

REPORT OF STATE HIGHWAY ENGINEER.

Columbia, Mo., December 28, 1909.

To the Honorable Members of the State Board of Agriculture:

Gentlemen—In my report for the year, 1908, among other things planned for the year, 1909, I mentioned a systematical study of the road materials of the State, a census for the amount of travel, whereby the roads could be classified, the collection of historical data upon the old State roads, and the tests of paints and preservatives for steel highway bridges. These plans had to be abandoned because of an insufficient appropriation. The appropriation by the last Legislature for the biennial period is not sufficient to carry on the regular routine work of the office for the two years, aside from gathering useful information or broadening the scope of our work. The office is constantly receiving calls, the nature of which requires visits to the localities. In order to treat all alike, after April 1st, we shall be compelled to request that necessary traveling expenses be provided by the community or local authorities desiring such services. With very little more funds, the work of the office could be made many times more valuable to the State. The prospect for the next year is not to enlarge, but to curtail the work.

DUTIES OF THE STATE HIGHWAY ENGINEER.

The duties assigned by law for the State Highway Engineer are to devise plans and estimates for road and bridge construction, best suited to the needs of the different counties of the State; to hold public meetings in the various parts of the State, and to give assistance and advice to local road officials whenever any of said officials may request it; to disseminate information and instructions by bulletins, publications, etc.; to assist in the construction of demonstration roads, and to investigate the character of the different road materials of the State.

For the first of these duties, the office has made plans and estimates by actual study and survey of the ground of something like seventy miles of rock and gravel road, a few miles of which were superintended during construction by the office. This does not include plans, estimates, or specifications sent out from surveys made by local engineers. We have made plans and estimates for fifty-four steel bridges aggregating 6,650 linear feet, and 123 concrete structures aggregating 1,420 linear

feet, the total amounting to 177 bridge plans and 8,070 linear feet of bridging at an estimated cost of approximately \$190,000.00.

In holding public meetings and in advice and assistance given local officials, representatives of the office have made 250 visits for the purpose of holding, or assisting to hold, road meetings, and for advising upon road and bridge matters. Many of these meetings have been strictly road gatherings, while in some the road question was discussed in conjunction with other subjects, such as farmers' institute work. All of this is aside from the hundreds of inquiries answered by mail.

Nine bulletins and several circulars have been issued. These relate to the different manner and forms of road and bridge construction, and aid in securing uniformity of methods, system and organization in road work and road expenditures.

I have not been called upon to superintend the construction of any demonstration road. I have put on six demonstrations during the two years, and these only in a small way, for the purpose of illustrating some feature of work adaptable to that particular locality. Two of these demonstrated the use of the road drag for maintaining gravel roads, especially upon newly made roads, without the use of a road roller, and where the gravel is packed by travel. In Cape Girardeau county, where the County Highway Engineer, Mr. Scivally, worked earnestly in conjunction with us, the drag is now being used successfully to help maintain the gravel roads.

I believe that almost every section of the State contains some kind of road-making material which can be found by well directed research. For example, by a personal investigation in a certain locality of the State, I found an excellent road gravel in abundance where the people were under the impression that they had no material with which to make roads.

Again, we have a large area of low lands in Southeast Missouri, which is generally supposed to be without material. They have sand and an excellent quality of gumbo. One year ago I made a campaign of three weeks in that section upon the sand-gumbo road. I repeated the campaign last March with the aid of an engineer from the United States Office of Public Roads, with the result that Mr. Ellis, Highway Engineer of Mississippi county, succeeded in building a mile of this particular road last August. This has since been followed by a mile in Scott county by Mr. Warner, County Engineer. It is attracting considerable attention, and is the opening wedge for better roads, at a reasonable price, in a section where the cost of imported material almost prohibits hard roads.

These things are small in themselves, but next to a general desire

are the first steps toward acquiring good roads, but there is some expense attached even to this.

You will all realize that my work is of such a nature that its value cannot be estimated in dollars and cents. With a rating at the usual fees charged for engineering consultation the amount will just about balance the expenditures upon the office. This estimate does not nor cannot take into account the loss which might have occurred through faulty construction, since without such an official as State Engineer, the local officials would never have sought advice upon the subject, nor does it take into account the far reaching effect which the road meetings, publications, and other similar works may have.

For example, we have not only made the plans for concrete structures, but have in some instances gone to the county where no such work had been done, and aided in preliminary construction. In four cases we went before the county courts and argued for a beginning in concrete culvert work. These, among other counties, are now doing concrete work as fast as their means will justify.

Six years ago Dallas county paid \$4,450.00 for a 120-foot steel bridge with approaches. Under our plans, by rejecting bids and re-letting, a similar bridge was built last year for \$2,750.00. In the adjoining county of Polk where a similar condition existed, a contract was closed upon our plans and by our advice in which all bids were rejected two different times, the first received being over \$5,000.00. The contract price was finally closed for \$2,650.00 or about one-half that paid by the county for the same sized structure a few years ago, and a little more than one-half the amount of the lowest bids first received.

We constructed six miles of rock road for one county this year at an average contract price of \$4,200.00 per mile, exclusive of grading. A few other roads have been built in that vicinity, under similar conditions, which cost \$5,000.00 per mile. This reduction in cost is due to the difference in plans and methods for construction, and we have as good a road for the less cost.

These examples will not apply throughout the State, nor is the value of the State office altogether in reducing the cost of work. In some cases we have increased the cost. We have changed details of numbers of plans which were sent to us for advice, which neither increased nor decreased the cost of the work, but give better work for the same cost.

PERMANENCY OF CONSTRUCTION.

Approximately, \$3,000,000 was spent upon the roads of the State last year, divided about equally between improved roads, the earth roads and bridges and culverts. Of these three millions of dollars of expendi-

ture, about \$310,000 was for culverts (structures less than 10 feet clear span). As you all know, many of these structures are made of timber, and are always dangerous, rotting out, or having to be renewed. Of this \$310,000, 41 per cent. was for repairs and maintenance. Any method of culvert construction which costs 41 per cent. of the annual expenditures for repairs, is wrong. The counties cannot spend their road revenue to better advantage than for concrete culverts. We must build more permanent structures with public road funds.

The State has approximately 110,000 miles of road, 5,000 miles of which may be classed as improved, leaving 105,000 miles of earth roads. This 5,000 miles of improved roads consists of various degrees and manner of improvements, many miles of which are poorer than a good earth road with good concrete culverts. The term "good roads," is a relative term, and what is considered and reported as an improved road in some sections would be called a very poor road in another. Missouri has a small mileage of modern, first-class, up-to-date roads. All of which again calls to mind the lesson that could be taught with demonstrations and a few sample roads.

MAINTENANCE OF THE STATE HIGHWAY DEPARTMENT.

Good roads, in by far the larger part of the State, is a matter of education. It is a question of teaching the people to know good roads, thus creating a desire for them. This is of interest to the State, and is as much a problem for the State as for the community. The State could not spend a few thousand dollars to better advantage than to supply the State Engineer with means to make demonstrations and to build sample roads.

An annual State license could be placed upon automobiles, the proceeds of which should be used solely for the support of the State Highway Engineer's office. This license could be made sufficient to permit an investigation of road materials and to make demonstrations. It would also put the office upon a better footing.

STATE AID TO ROAD BUILDING.

The last Legislature passed a resolution submitting a constitutional amendment for a State road tax of 5 cents on the \$100.00 worth of assessed valuation. I urge the adoption of this amendment, that through State aid there will be an inducement for the improvement of our road system, a stimulus for the construction of permanent highways, and because it is an equitable plan for road improvement. If some broad policy were definitely adopted whereby the cost of making roads would be

proportioned between the community, county and State, a creditable showing would soon be made without working a hardship upon anyone. Examples can be cited in the counties of Johnson, Cass, Boone, Cooper, Clay, Platte, Montgomery, Nodaway, Holt, Callaway, Pettis, Saline, Jefferson, Scott, Douglas, Greene, where the communities or districts desiring to build, felt that the total cost was too much for them, but with a little financial assistance would have gone ahead with the work. This, in turn, would bring further improvements. Missouri will succeed in road work whenever she acquires State aid for public roads.

THE COUNTY HIGHWAY ENGINEER.

There is a great deal of talk against the office of County Highway Engineer. Under the last legislative action, petitions are being circulated in a few counties for the purpose of suspending the County Highway Engineer act, while one county has already voted in favor of the suspension clause.

The law creating the office of County Highway Engineer is good and is sound in principle. If any county does not improve road conditions under it, it is the fault of the county, and not of the law. If every man would acquaint himself with the loose methods of the past forty years, namely, the condition of our road records, the utter disregard for road laws and road regulations, the counties' mercy at the hands of the unscrupulous contractors, and the unsystematical ways in vogue, he would certainly see the necessity for the office of County Highway Engineer. The county engineer can, in many places, collect more of the poll-tax than was collected before him, get the funds upon the road at a less percentage for overseeing, and can gradually bring order out of chaos.

Take, for example, the cases of Lawrence and Moniteau counties, where the cost of overseeing was formerly about 50 per cent. of the funds; the engineers have reduced it to 20 per cent. and 30 per cent., respectively. In one district in another county, it was costing 97 per cent. of the funds to get them on the road. With the same overseer, the engineer succeeded in reducing this to 40 per cent. the first year, and to 30 per cent. this year. One other county shows 30 per cent. saved in the purchase price of road tools alone, and in still another, where only 50 per cent. of the poll-taxes were ever collected, through the attention and spur given the road interests by the engineer, 90 per cent. of these taxes are now collected.

The amount of work for which the engineer is called upon, is evidence enough of the need for such an official. The county court of

Greene county have signed a volunteer statement to the effect that the County Highway Engineer fills a long felt want, and that the position saved \$4,000.00 in different ways to Greene county in the year 1908.

The cost of the County Highway Engineer to the county is not greater, in many instances, than the sum of the fees paid out under the old fee system. Take, for example, the county of Buchanan, where this year the amount of salaries paid into the County Highway Engineer's office was \$4,400.00, and the year preceding the advent of the County Engineer the fees for road supervision cost the county \$4,608.00. In Chariton county the salary of County Highway Engineer is \$2,000.00, while the last year before the engineering supervision the fees paid the ex officio road and bridge commissioner were \$2,194.00. In Johnson county a similar comparison shows the fees under the last year of the old law to have been \$1,550.00, the County Highway Engineer's salary is \$1,200.00. In Pettis county the fees were \$1,280.00 and salary of engineer is \$1,400.00. In Mississippi county the fees were \$1,330.00 and salary of the engineer is \$900.00. In Scott county the fees for road supervision averaged over the seven years preceding the County Highway Engineer act, \$1,730.00, not including fees of records of several instances where special commissioners were employed. The County Engineer's salary is \$1,500.00. Besides this, the engineer has the supervision of road and bridge work, of the overseers, of the surveying, ditching and clearing of the right-of-way, and a number more of other duties are required of him than were required of any man under the old system, or ever will be required of an ex officio County Highway Engineer. His whole time and attention is required upon the county's roads, for which the county is paying but little or no more than it formerly paid out in fees for inferior service. And, furthermore, the pay of the county engineer does not keep the amount of his salary from the roads, because he is paid out of the county funds, as any other county officer is paid, and not from the road funds.

A STANDARD OF QUALIFICATIONS FOR HIGHWAY ENGINEERS.

Unfortunately, some of our highway engineers are not qualified to hold their office. We should have an examining board, competent to judge and fix a standard of highway engineers, and require each engineer to obtain a license from this board.

A CASH SYSTEM OF ROAD TAXES AND REGULARLY ORGANIZED ROAD CREW.

We should do away with the labor tax system. The working out of taxes is an inadequate, inefficient and indefensible form of revenue. We

must substitute a cash system and road workers with competent supervision. The men who work out their taxes, as a rule, know nothing and care but little about the work. Many of them work with the sole idea of working out the taxes, not to benefit the roads. It is not so much the fault of the men as it is the fault of the system, a "venerable" system which has been handed down from generation to generation, but which has become rotten with age.

In the first place, it is difficult to get men to serve as road overseers. We must depend upon the farmers to fill these positions—men whose living and business is farming, not making roads. They, even as overseers, cannot be expected to give the roads due attention at times when roads should be worked, considering that they are as competent road men as they are farmers. Their farms have first call upon their time, attention and study.

We should have a few men in each county whose business is working roads; men who make it a business, men who have an organization, and who are prepared for it as a business. They will accomplish more with one dollar than the average overseer can with two. These road crews should be under the direction of the county engineer, to be sent any place in the county where necessary, such as the districts where we have incompetent overseers or none at all, or where a good overseer requires aid, or where work can be put directly under the engineer. One or two such crews could be kept busy in a county the entire year, and additional crews could be put on in the proper working season. It need not mean the abolishment of the overseer system where good men can be secured to act, but one good outfit, with a competent foreman, to a township, or to 50 or 100 miles of road, would accomplish something in a year's time. It is doubtful if it would cost any more than under the present methods, but even if it should, it will bring results.

Furthermore, the business for this crew of road workers will be to care for the roads while other people are attending to their own business, for as long as road work is everybody's business, it will be poorly done. Road affairs being everybody's business, together with politics, causes more loss and poorer work upon the roads than all the other things together, for the inevitable result is incompetency or loose methods.

THE ELIMITATION OF POLITICS FROM ROAD AFFAIRS.

Another indication of rottenness in our "venerable system," is the infusion of politics into road affairs. The roads do not belong to any party, set, or faction, but are the property of all. In some of our coun-

ties the road affairs are nothing more than a political machine. More than one instance can be pointed out where the roads have been made to suffer in order to reward a political henchman. This can never be entirely eliminated from the business, but a healthy public sentiment for the selection and the retention of men for their fitness for the work rather than for their political affiliations, will be helpful.

THE EARTH ROAD.

Road dragging last year was not, on the whole, kept up to the standard of former years. The season was discouraging, but our attempt to place road dragging under supervision and upon a cash contract basis, checked the work. Our plan is to grade a continuous piece of road, then to contract with parties living along the road, to drag it. This has met with a surprising number of obstacles in one way or another. In some cases, the engineer or overseer was not permitted to pay a sufficient price to cover the expense of dragging. Others oppose it because they do not believe in the efficiency of the drag. Numerous instances have come to my notice where a long stretch of road was being dragged with one or more undragged sections in it. When the engineer would contract to have these poor sections dragged, many quit who were dragging voluntarily, and then would not contract for the work. The greatest difficulty in contracting the dragging has been to get citizens who will do the work. It has been impossible to make contracts—neither will the citizens keep it up properly as volunteer work. Volunteer dragging can never be more than temporary, and it must be solved, either by contract (or payment for the work), or else by a law, compelling every property holder to drag his road a required number of times under the direction of the road officials.

I shall here reiterate my oft-repeated assertion that we should give closer attention to the earth road. The largest road mileage of the State will be earth roads for a long time to come, even at a very rapid progress in road building, and in the meantime the best possible should be made of the earth roads. Well-maintained roads, with good bridges and culverts, will solve the greatest problem in our road difficulties.

RAILROAD RATES.

I desire to mention a recent action upon freight rates for Missouri on road materials and machinery by the Chicago & Alton and the Chicago, Burlington & Quincy railroads. About the middle of October, the Chicago & Alton announced that that road would put into effect a tariff of one-half cent per ton per mile, car load lots, on road material and ma-

chinery, provided the shipment is without profit, and is billed to road officials. About December 1st, the C., B. & Q. R'y announced that they were willing to publish the same rates under the same conditions. This rate is the actual cost of transportation by rail over these roads, and is an expression of the friendly disposition of these roads toward highway improvement in the State. Credit for acquiring this tariff should be given more to Frank W. Buffum of Louisiana, Mo., than to any other individual in the State. He has been working upon this particular matter for two years.

SUMMARY.

A summary of the main points in this report is: Give the vital interest of road betterment financial support and a front rank in affairs where it belongs; raise the standard of road work and road workers, take them out of the category of dog-catchers, and thereby create a more wholesome respect for the roads and the road laws; cash taxes; better the working system by organization of road work; State aid and close supervision. I might add in conclusion that cash taxes, State aid and competent supervision is the prescription for good roads.

Yours truly,
CURTIS HILL,
State Highway Engineer.



FORTY-THIRD ANNUAL REPORT
OF THE
MISSOURI
State Board of Agriculture

A Record of the Work for the Year 1910

ALSO REPORT OF MISSOURI FARMERS' WEEK, 1911, TOGETHER WITH CENSUS
RETURNS, FARM STATISTICS AND OTHER INFORMATION
AND PAPERS RELATING TO AGRICULTURE
AND ITS ALLIED INDUSTRIES.

PUBLISHED 1911



THE HUGH STEPHENS PRINTING COMPANY,
JEFFERSON CITY, MO.



OFFICERS OF THE STATE BOARD OF AGRICULTURE

President—W. C. Hutchison, Jamesport.
 Vice-President—P. P. Lewis, Crescent.
 Secretary—T. C. Wilson, Columbia.
 Assistant Secretary—W. L. Nelson, Columbia.
 Institute Director—S. M. Jordan, Columbia.
 Treasurer—W. A. Bright, Columbia.
 State Veterinarian—Dr. D. F. Luckey, Columbia.
 State Highway Engineer—Curtis Hill, Columbia.
 State Apiary Inspector—M. E. Darby, Springfield.

EXECUTIVE COMMITTEE.

W. C. Hutchison, Jamesport,	F. B. Mumford, Columbia,
P. P. Lewis, Crescent,	Chas. Householder, Thompson,
E. L. Newlon, Lewiston,	Fred. T. Munson, Osceola.

EX OFFICIO MEMBERS.

Governor of Missouri, Herbert S. Hadley. Superintendent of Schools, Wm. P. Evans. Dean Agricultural College, F. B. Mumford.

CORPORATE MEMBERS.

(Term expires July 20, 1911.)

Cong. Dist.	Name.	Residence.	County.
2.....	W. C. Hutchison.....	Jamesport.....	Daviess.
3.....	A. M. Thompson.....	Nashua.....	Clay.
5.....	J. B. Sampson.....	Lee's Summit.....	Jackson.
13.....	E. E. Swink.....	Farmington.....	St. Francois.
14.....	R. A. Young.....	Alton.....	Howell.
16.....	A. T. Nelson.....	Lebanon.....	Laclede.

(Term expires July 20, 1912.)

1.....	E. L. Newlon.....	Lewiston.....	Lewis.
4.....	Geo. H. Sly.....	Rockport.....	Atchison.
7.....	N. H. Gentry.....	Sedalia.....	Pettis.
8.....	W. A. Dallmeyer..	Jefferson City.....	Cole.
15.....	S. Mc. Smith.....	Reeds.....	Jasper.

172287 (3)

REPORT OF STATE HIGHWAY ENGINEER.

Columbia, Mo., December 31, 1910.

To the State Board of Agriculture:

Gentlemen—In view of the fact that this is my fourth annual report, my term of office expiring within a few months, I shall take the liberty to make a general summary of the work and policies during my tenure of office.

Summary of Work—Beginning with July 6, 1907, and ending December 31, 1910, the State Highway Engineer's office has responded by sending a representative to 420 separate calls throughout the State upon road affairs; made field surveys, plans and estimates for 109 miles of road at an estimated cost of \$200,000; designed 162 concrete bridges having a total length of 2,080 feet at an estimated cost of \$109,820, and 126 steel bridges with a total length of 10,067 feet, at an estimated cost of \$236,950. A total estimated cost of work upon plans made by the office of \$546,770. Eleven bulletins and several circulars upon road and bridge work have been issued. All this does not include the numerous inquiries which have been answered and consultations given by mail. Much of the work is of such a nature that its value cannot be estimated in dollars and cents nor take into account the far-reaching effect which the road meetings, publications and other similar efforts may have. Neither has it been the aim to cheapen the work, but rather to get good road work at its true value.

Assistance Where Asked—The office has given assistance in road affairs to any reasonable request where possible to do it, regardless of whether it was a public or private road and whether aid was requested by a road official or private citizen. We advocate uniformity in methods and work; a strict accounting for money expended; better work and more of it; construction of permanent bridges and culverts; making hard surfaced roads; attention to the earth roads and the use of the drag; better maintenance; cash taxes and State aid. We especially urge State aid, both cash and convict labor, for we believe it to be the key to the solution of the road work in general.

Office Maintenance—Like many other concerns of both private and public nature, and like the State itself, the State Engineer has been long on talk and short on revenue. The appropriations made by the Legis-

lature for maintaining the office for the biennial periods have proven insufficient to meet the routine work of the office. For this reason many of the things planned and mentioned in my former reports have never been carried out. One was to make a systematical study and test of road materials of the State, the first step toward which was the installation of testing machinery. The cost of one-half of this machinery, established in conjunction with the engineering school of the University two years ago, would have been lost to my present four-years term had not the University Engineering Experiment Station come to the rescue. During the past few months the Engineering Station has paid the expense for collecting samples of hard road material from the several counties of the State. These samples will now be tested and the results issued by the engineering school in bulletin form.

It was necessary toward the close of the last biennial period for localities desiring our services to pay the necessary traveling expenses. These have been paid upon twenty-nine trips, some of which were paid from the institute funds for road lectures at farmers' institutes, while twenty-six other localities requested our assistance but did without it rather than pay our necessary traveling expenses. No bulletin matter was sent to press during the past nine months; the services of a stenographer were dispensed with on August 1st, and my deputy quit several days earlier than he otherwise would in order to cut down the running expenses of the office. These precautions were not effected quite soon enough, however, and the ledger balances on the wrong side, the deficiency for the biennial period being about two hundred dollars.

Engineers' Association—At the instigation of the State Engineer, the county engineers have formed a Highway Engineers' Association of the State, the object and purpose being the exchange of ideas relative to securing uniformity of methods, the establishment of closer relations and the advancement of knowledge pertaining to road building and maintenance among the county highway engineers.

Overseers' Schools—I have given all aid possible to the road overseers' schools of instructions, and I am convinced that the law requiring that all overseers of a county be called together for instructions at the county seat by the county engineer, at least once a year, is one of the best features of our road laws.

Effect Upon Schools.—Further efforts of the office have been to determine the effect of bad roads upon public school attendance and to locate and map the old State and Government roads in the State, and to collect the history and other data relative to them. Almost every large and important town or city of the State is upon one or more of

these old roads or trails which opened Missouri to settlement. Their traditions and history should be preserved, and much of the information concerning them will soon be lost if not collected and preserved.

State Aid—There is no question but that our roads have gradually improved with the development of the country, but they are not improving as rapidly as conditions warrant or as fast as they should. We are content to work on too cheap a plan. This office has been a constant supporter of State aid for road purposes because *State aid*, in both revenue and supervision, is the *key* to the solution of the problem. State aid expended and controlled through the authority of a State Highway Department will solve the problem, for under this spur and stimulus the districts and counties will provide their share of the cost and all the other matters will right themselves to conform to it. From my experience and observation in road making, I feel free to say that there is no greater stimulus to the improvement of a state's public road system nor inducement to the construction of permanent work than State aid. State aid is for the general public welfare. It is the principle which should govern in any improvement for the general good, like the public roads. We cannot succeed with a Chinese wall around each community, each county or each state. The road question is larger and more far-reaching in effect than the community. The public roads are too important a matter toward any state's progress and prosperity to be neglected by the State.

State Convicts—In former reports I advocated the use of some of the State convicts upon the public roads, which advocacy I wish to renew. I do not advocate scattering the convicts out along the road, but would keep them confined strictly to quarrying and crushing, leaving the hauling and the work necessary to the completion of the road to be performed by the community for which the road is being made. Road material of average quality is accessible in almost every county of the State, and in a number of counties it can be found within reasonable hauling distance of any road. With concentrated camps of State convicts to prepare this material for the road and with a systematic order of distribution and application for such work, much assistance can be given in the form of State aid to road work.

Earth Roads—It has been my endeavor to give attention to the maintenance of the earth roads. Over 95 per cent of our roads are earth, and it will be some years before as much as 10 per cent of them will be anything more than that. Hard surfaced roads are too expensive to build and maintain to plan rapid progress in their construction. The earth road cannot possibly be made of equal superiority with the well

built roads of other materials, but neither is the earth road as expensive, and it is within the reach of every community where the rock road may not be. If the well kept earth road proves sufficient for the demands it is enough, and it is unnecessary to make larger expenditures upon it. The country road will be built of the most available material, and the solution is not so much one of building expensive roads, but satisfactory ones, with this available material, and which, after all, resolves itself into a question of administration. Especially a question of administration when applied to the earth road. The largest mileage will, and should be, earth roads for a long time to come, and in the meantime the best should be made of them that the means and natural conditions permit.

Permanent Crossings—With this care of the earth road, attention must be given to the construction of good, substantial and permanent culverts and bridges. The Highway Department should be given more control over this feature of the work in order to prevent the substitution of unsubstantial or unsightly structures. No so much to procure the structure at a less cost, but to obtain a suitable one, worth the price paid for it. As the roads improve the loads increase, and it is both safety and economy to build permanent culverts and bridges. Well maintained earth roads with good bridges and culverts is the solution for the majority of our road difficulties.

Main Roads—Where the travel converges upon our main roads, making the traffic too heavy to maintain earth roads, they should be hard surfaced as fast as possible. These roads are of enough importance to justify the increased expenditure. This is another feature of our road work over which the State Department should have more power of control. A road is not made by piling on the material in a haphazard way without attention to the foundation or drainage. Using more material than is necessary is another waste. Money is being wasted in all these ways in Missouri. It costs too much money to make good roads for the work to be done in a careless manner or without attention to the principles of road building.

Demonstrations—Demonstration work, owing to the lack of funds, has been limited. Five or six small demonstrations upon concrete or the road drag, road exhibits at the State Fair and at the sessions held by the State Board of Immigration at Springfield and Moberly, and a road making demonstration trip over the line of the Frisco Railroad from St. Louis across the State, by the way of Springfield and Lamar, will complete the list. These, however, while in a small way for the purpose of illustrating some feature of work adaptable to the particular locality in which the demonstrations were made, have not been entirely void of

good results, as may be seen by reference to an article on "Road Demonstrations," now being prepared for publication in the Annual Report of your Board.

Road Records—Further, my policy has been to build up the roads as a road system and to obtain uniformity in methods and a system of work, and in keeping records. Records of contracts and of the roads themselves have been kept in a very careless manner, if kept at all. We find there is no record of at least one-fourth of our public roads, and some of the records which are found could have but little standing in the courts. One of the greatest disadvantages our engineers have in the enforcement of the road work is the lack of any record of the roads themselves. If the reader doubts this, glance at the one example given below of many of our road opening records. It is a true copy of a county record filed in 1881, and upon which I was called in for advice:

"Beginning at the ——— and ——— road where the line between Hall and Jones intersects said road near the S. E. corner of N. W. section 34-31-26, thence W. past the house of Hall to the McCullough farm, around the W. side of said farm, also on north side of A. Gillespie's and McFaddler's farms on E. side of Turnback near the bluff to N. W. corner of Fiddler's field, thence W. to creek crossing at the Cow ford, thence up the creek to R. R. crossing. Thence following traveled road W. of Gillespie's barn, thence westerly to lane between Gillespie and Fiddler, thence following traveled road to near the S. E. corner S. W. N. W. Sec. 33-31-26, thence W. along center line of Sec. 33 to near W. line. Thence following old road past residence of old man Jeffries striking center line of Sec. 32 near S. E. corner of S. W. N. W., thence W. on line past house of Jas. Jeffries to W. side of a hollow, thence in S. W. direction to crossing on Limestone near line between N. E. S. W. and S. E. S. W., Sec. 31, thence W. to intersection of..... and road."

County Supervision—The office of county highway engineer directly concerns this office. It is allied to this office by mutual interest and should be by law. I would refrain from mentioning it but for the fact that it is a very unpopular law, and, under the present form, it is doubtful if it will withstand the unfavorable sentiment. The county highway engineer law provides the way whereby any county may avail itself of good supervision, but much of the present dissatisfaction seems to be over the fact that such provisions are now a part of the road laws, while there are enough people in some counties looking for excuses and means to keep from making roads to prevent the fulfillment of the law's intentions. The law intended that the county highway engineer should

be the county superintendent of roads, and that he should have control and supervision of the road work and the overseers of his respective county. It is the law of the State and is mandatory upon each county court to appoint an engineer, but the office may be suspended in any one county by a vote of the county. The local option feature went into effect less than two years ago, since which time, from reports received, twenty counties—every one where it was voted upon—have suspended the act. From my information upon the question there are not over a dozen counties in the State that would not do the same thing if someone took the trouble to get the question put upon the ballots. The control and supervision of road affairs is going through the same fight which that for the supervision of schools and other public affairs went through. Close supervision of road work is ahead of the times, and we have got to fight it out along these lines till it does eventually win. Does the taxpayer want his road taxes spent in a loose, unbusinesslike way, or does he prefer to feel that there is some effort being made to properly supervise the expenditures? If any taxpayer wishes to get a comparison between the old methods without county supervision or those in vogue under the county highway engineer, let him investigate for himself in any county which has complied with the intent of the law and provided a competent man.

The law creating the office of county highway engineer is good, and is sound in principle. If every man would acquaint himself with the loose methods of the past forty years, namely, the condition of our road records, the utter disregard for road laws and road regulations, and the unsystematical ways in vogue, he would certainly see the necessity for a county highway department. The county engineer can, in many places, collect more of the poll tax than was collected before him, get the funds upon the road at a less percentage for overseeing and can gradually bring order out of chaos.

Take, for example, the cases of Lawrence and Moniteau counties, where the cost of overseeing was formerly about 50 per cent of the funds; the engineers reduced it to 20 per cent and 30 per cent, respectively. In one district in another county, it was costing 97 per cent of the funds to get them on the road. With the same overseer the engineer succeeded in reducing this to 40 per cent the first year and 30 per cent the second year. One other county showed 30 per cent saved in the purchase price of road tools alone (and this is one county which voted to do away with county supervision), and in still another where only 50 per cent of the poll taxes were ever collected, through the at-

tention and spur given the road interests by the engineer, 95 per cent of these taxes are now collected.

The amount of work for which the engineer is called upon is evidence enough of the need for such an official. The county court of Greene county signed a voluntary statement to the effect that the county highway engineer filled a long felt want, and that the position saved \$4,000 in different ways to Greene county in the year 1908.

The cost of the county highway engineer to the county is not greater, in many instances, than the sum of the fees paid out under the old fee system. Take, for example, the county of Buchanan, where in the year 1908 the amount of salaries paid into the county highway engineer's office was \$4,400, and the year preceding the advent of the county engineer the fees for road supervision cost the county \$4,608. In Chariton county the salary of the county highway engineer is \$1,500, while the last year before the engineering supervision the fees paid the ex officio road and bridge commissioner were \$2,194. In Johnson county similar comparison shows fees under the last year of the old law to have been \$1,550; the county highway engineer's salary is \$1,200. In Pettis county the fees were \$1,280 and salary of engineer is \$1,400. In Mississippi county, the fees were \$1,330 and salary of the engineer \$900. In Scott county the fees for road supervision averaged over the seven years preceding the county highway engineer act \$1,730, not including fees of records of several instances where special commissioners were employed. The county engineer was paid a salary of \$1,500, and this is another county which suspended the act. Besides this, the engineer has the supervision of road and bridge work, of the overseers, of the surveying, ditching and clearing of the right of way, and a number of other duties are required of him than were of any man under the old system, or ever will be required of an ex officio county highway engineer. His whole time and attention is required upon the county's roads, for which the county is paying but little or no more than it formerly paid out in fees for inferior service. And, furthermore, the pay of the county engineer does not keep the amount of his salary from the roads because he is paid out of the county funds, as any other county officer is paid, and not from the road funds.

Six years ago Dallas county paid \$4,450 for 120-foot steel bridge with approaches. Under the engineer's plans, by rejecting bids and re-letting, a similar bridge recently was built for \$2,750. In the adjoining county of Polk, where a similar condition existed, a contract was closed upon our plans in which all bids were rejected two different times, the first received being over \$5,000. The contract price was finally

closed for \$2,650, or about one-half that paid by the county for the same sized structure a few years ago, and a little more than one-half the amount of the lowest bid first received.

Six miles of rock road was constructed in one county at an average contract price of \$4,200 per mile, exclusive of grading. A few other roads have been built in that vicinity, under similar conditions, which cost \$6,000 per mile. This reduction in cost is due to the difference in plans and methods for construction, and as good a road exists in one case as in the other.

These examples will not apply throughout the State nor is the value of the engineering offices altogether in reducing the cost of work. In some cases it has increased the cost. Plans have been made or changed which neither increased nor decreased the cost of the work, but give better work for the same cost.

These are only a few examples of what may be corrected by good supervision. Many names and localities are purposely omitted. It is difficult to change the customs and habits of a century, but it seems that if any taxpayer in any part of the State would take a little time for investigation of road affairs he could not object to knowing that his taxes were being spent with at least some semblance of skilled supervision. Unfortunately for many, there are two things every man thinks he knows how to do—one is to build a road and the other is to judge a gold mine. The road work can never be successful while it is a side business for everybody. Men must attend to their own individual business upon which their living depends, and they are usually too busy at that to properly attend to road affairs. As a general rule a man must give some one thing his time and attention to become trained or skilled. In every community somebody should be trained for road work and kept in charge of it while the other people are attending to their own individual affairs. It is slowly being recognized that every man is not a born road builder, and the sooner the roads are put under trained supervision the better it will be for the roads.

Our vast sums of road expenditures without a legal head and competent, trained supervision is a proposition of folly. If we assume that road building is to make use of natural materials in such a manner as to produce the improved road and that the roads should be built to meet the needs and the demands of travel coming upon them, it follows that all the roads should not be rocked, graveled or oiled, neither should all be of earth. The State has such a diversity of road-making material that no one method or plan of construction is adaptable in all parts of the State, and plans must frequently be varied over one county. In one

section rock construction is best, in another gravel and in still others sand-clay or chert. A special feature in some counties is the well-dragged earth road, while in others concrete or masonry in culverts or bridges may be pre-eminent. It is necessary for the highway engineer to study the field and choose the methods, plans and materials adaptable to the locality, and a competent county supervisor, trained in road building, is absolutely necessary if the best results are to be expected.

Our present laws for the county highway engineer do not go far enough, if they are defective in anything, for instead of merely a county highway engineer we should have a *county highway department*—a highway department (not merely an office) in every respect, put upon a footing and given recognition with other offices and departments, and stop peddling out so important a work as that of supervision of roads and highways. The county court should no more have control of the roads and road work than that of the schools, the county collector, or assessor, or attorney's office.

A county judge is not elected because he is a dentist, a lawyer, a stone mason, a road builder or a skilled artisan of any particular kind, but because he is a good citizen and has sound judgment upon affairs in general. The county judges, invariably men of good character and standing in their communities, cannot, as a rule, as individual members of the court, supervise the actual work, draw plans, make estimates and look after this part of the county's business. There should be a county highway department in every county of every state with powers for execution of the actual work, unhampered by courts, boards and commissions. The official of this county department should have authority to act upon his own initiative, be free to carry out his own plans and details of his work, and should receive compensation in accordance with the importance of the work and skill required.

A capable man in such a department will see that the work is done right, protect the county against unscrupulous contractors, open the road drains and prevent the roads from being used for artificial farm drains, cut the hedges, clear obstructions from the right of way, create a wholesome respect for the roads and the road laws, assist in correction of the road records, know how many tools and implements the county owns, know how and where the road money is spent, regulate accounts and avoid excessive bills, be an aid to the overseers and build up a road working and maintenance system and organization. A thousand small details can be attended to—things small in themselves which any man of good sense can do but are otherwise left undone, simply because it is

nobody's business, in particular, to look after them. The cost of such supervision of the road work of a county is money saved and not money lost, and if any county does not improve road conditions under it, it is the fault of the county and not of the law. The county must get a man competent to fill the position—the law cannot legislate brains into men.

Maintenance—Many people advocate expensive road building without a thought for maintenance. Any road will wear out, and as soon as a road is built provision should be made for maintaining it. Maintenance is second in importance to construction, and we must not lose sight of the fact that a good earth road is largely a question of maintenance. Before we can have a good system of roads, we must have a maintenance system—a continuous maintenance. The county might own an outfit and employ a crew of men to do nothing the year around but keep up the roads of the county. This road working crew, with the necessary equipment and a good foreman, could work out a part of the taxes of each district under the direction of the engineer or overseers, thereby saving the overseer's time upon the roads and work the roads in a season when they should be worked, from early spring to such time as grading should be stopped. Employ them for the remainder of the year upon culvert work, graveling, and other work seasonable for fall and winter. Or, a dozen districts could band together in a similar arrangement to work out a part or all of the district funds. It is the most economical in the end and will eventually develop a class of men who make it their business. It will be their duty to care for the roads while other men are attending to their own particular lines of business.

Any kind of a road will be gradually worn out and this loss must be replaced or the road will gradually go down. The old adage is true that a "stitch in time saves nine." Any road of good material will become unevenly worn in a few years, and it is then necessary to add new material if it has not been added continuously during the time of wear. In any event, the continuous maintenance system is advantageous over that of any other. The system of going over and repairing the roads once a year or once every few years is not maintaining, but it is rebuilding. There are seasons of bad weather and initial destruction when a one-man patrol of our roads would be more effective than any other method. The road district should be of suitable mileage to employ an overseer by the year. During rainy season, the winter months and at all times out of the actual road working season this overseer, provided with the necessary equipment, should patrol the roads under his care. This overseer, and those of a county under the direct control of the county supervisor and highway department, who in turn has a

State Highway Engineer and State Department with whom to consult and advise, would constitute an economical and effective organization and working system for road building and maintenance. A working organization whereby any community may acquire permanent maintenance and skilled supervision of roads.

Cash Taxes—No better reason exists for a man to work out his road taxes than for him to teach out his school taxes. The working out of taxes is an inadequate, inefficient and indefensible form of revenue. The men who work out their taxes, as a rule, know nothing and care but little about the work. Many of them work with the sole idea of working out the taxes, not to benefit the roads. It is not so much the fault of the men as it is the fault of the system, a "venerable" system, which has been handed down from generation to generation until it has become rotten with age.

Elimination of Politics—Another indication of rottenness in our "venerable system" is the infusion of politics into road affairs. The roads do not belong to any part, set, or faction, but are the property of all. In some of our counties the road affairs are nothing more than a political machine. In more than one instance the roads have been made to suffer in order to reward a political worker. This can never be entirely eliminated from the business, but a healthy public sentiment for the selection and the retention of men for their fitness for the work rather than for their political affiliations will be helpful.

Cross-State Roads—The idea for cross-state roads is a commendable one in some ways, but they should be considered in the light of a series of connected local roads, and therefore their value in a local sense rather than that of through travel. Through roads will serve long distance travel more from the view of pleasure than a commercial value. But we should not lose sight of the fact that roads should be built for the comforts and pleasures of travel as well as their pecuniary value, while the cross-state road has a commercial value as a through road, since it will aid in the development of the State. On the other hand, it is the improvement of the local road, the road from the granary to the railroad shipping point, the road which builds up the social, education and commercial sides of the country and community life, that are so badly needed and which will serve the best interests of the State. Water and rail are the established means for long distance transportation, the highway for local exchange. The electric road serves the purpose of local transportation to a limited extent, but no means of rail transportation can reach every man's farm, cannot possibly usurp the place of the wagon road. The wagon road serves the purpose of local transportation

and is the connecting link for local traffic with the means for long distance transportation. Placing markers upon old trails and expending energy and money upon cross-state roads does not serve the best interest of the State, nor of road improvement, unless they be so routed to be of value to the local communities through which they are built. This question of good country community roads is one of the most vital with which the people of Missouri have to deal today. There is no one internal improvement so necessary and essential to the progress and prosperity of the State as that of the betterment of the highways, the betterment of the means for local transportation and country community life, the improvement of the local wagon road.

Yours truly,

CURTIS HILL, State Highway Engineer.



FORTY-FOURTH ANNUAL REPORT

OF THE

MISSOURI

State Board of Agriculture

A Record of the Work for the Year 1911

ALSO REPORT OF MISSOURI FARMERS' WEEK, 1912, ASSOCIATION MEETINGS, FARM STATISTICS AND OTHER INFORMATION AND PAPERS RELATING TO AGRICULTURE AND ITS ALLIED INDUSTRIES.

PUBLISHED 1912.



THE HUGH STEPHENS PRINTING COMPANY
JEFFERSON CITY, MO.

OFFICERS OF THE STATE BOARD OF AGRICULTURE.

President—P. P. Lewis, Crescent.
 Vice-President—W. A. Dallmeyer, Jefferson City.
 Secretary—T. C. Wilson, Columbia.
 Assistant Secretary—W. L. Nelson, Columbia.
 Treasurer—W. A. Bright, Columbia.
 Institute Lecturer—S. M. Jordan, Columbia.
 Institute Lecturer—J. Kelly Wright, Columbia.
 State Veterinarian—Dr. S. Sheldon, Columbia.
 State Highway Engineer—Curtis Hill, Columbia.
 Deputy State Highway Engineer—W. C. Davidson, Columbia.
 Apiary Inspector—M. E. Darby, Springfield.
 Dairy Commissioner—Dr. W. P. Cutler, Columbia.

EXECUTIVE COMMITTEE.

P. P. Lewis, Crescent.	Charles Householder, Thompson.
W. A. Dallmeyer, Jefferson City.	Fred T. Munson, Osceola.
F. B. Mumford, Columbia.	E. L. Newlon, Lewiston.

EX OFFICIO MEMBERS.

Governor of Missouri, Herbert S. Hadley. Superintendent of Schools, Wm. P. Evans.
 Dean Agricultural College, F. B. Mumford.

CORPORATE MEMBERS.

(Term expires July 20, 1912.)

Cong. Dist.	Name.	Residence.	County.
1	E. L. Newlon	Lewistown	Lewis.
4	Geo. H. Sly	Rockport	Atchison.
7	N. H. Gentry	Sedalia	Pettis.
8	W. A. Dallmeyer	Jefferson City	Cole.
15	S. Mc. Smith	Reeds	Jasper.

(Term expires July 20, 1913.)

6	Fred T. Munson	Osceola	St. Clair.
9	Charles Householder	Thompson	Audrain.
10	P. P. Lewis	Crescent	St. Louis.
11	Henry Steinmesch	St. Louis city.	
12	W. R. Wilkinson	St. Louis city.	

REPORT OF STATE HIGHWAY ENGINEER.

Columbia, Mo., January 1, 1912.

To the Honorable State Board of Agriculture:

Gentlemen—The State Engineer's office has rendered assistance whenever possible during the past year in the usual manner. Much of this time has been consumed on long-distance roads, upon one road in particular, namely, the Old Trails road.

The idea for cross-state or long-distance roads is commendable, but they should be considered a series of connected local roads, not only for their local but for their through value. The long-distance road, beginning somewhere and ending somewhere, has a commercial value since it aids in the development of the State and, by the attention which is attracted to the road question thereby, is a great stimulus for better roads.

Work along the Old Trails road has been making satisfactory progress since my report on October first. Weather conditions have delayed outside work and but little more will be done until next season, still the formation of special road districts continues. While but eight districts existed along the road between Jackson and St. Charles counties on October first, there are now twenty-one.

Along with the Old Trails road, some time was spent on the other two St. Louis-Kansas City propositions, namely, the Capital route and the North Missouri cross-state highway. Each of these roads is doing considerable work, and as far as a rock road surface is concerned, the Old Trails road can yet lose the prize won to the Capital route. The North Missouri highway is an earth road proposition for sometime to come, and should be developed as such. Furthermore, the Hannibal and St. Joseph cross-state highway from east to west, following the old immigrant trail, will show considerable development before another year. It is a proposition well worth consideration.

Some of the many other long-distance highway projects are Kingshighway, the Sedalia-Springfield road, the Interstate trail and the Kansas City-Joplin route.

Kingshighway is one of the oldest, if not the oldest, highway in Missouri, and one of the most noted. It follows the trail made by De Soto and De Lassus. It was named by the Spaniards, and extends from

St. Louis south through De Soto, St. Genevieve, New Madrid and Caruthersville. An act of the Territorial Assembly of Louisiana opening this road in 1808 was signed by Merriwether Lewis. Work is being done along this road in places, and it should receive encouragement by this Board.

The Sedalia-Springfield road is a very worthy and practical project, since it extends through a good country, a section of the State without a railroad. A good organization is being perfected with the view to organizing special districts to finance its building. It should be extended north from Sedalia to Boonville, Fayette, Moberly, Macon and Kirksville.

Several long-distance roads are being agitated in Northwest Missouri from St. Joseph to the Iowa line. Also, two distinct routes between Kansas City and St. Joseph, and one from Kansas City to the southwest mining district, through the county seats of the western tier of counties. Each of these routes is well organized, and considerable grading and culvert work has been done on them.

A Springfield-Jefferson City road should not be overlooked in connection with the Hahatonka park project. A more worthy project could not be undertaken by the State than to purchase Hahatonka park and build a road from Jefferson City through the park to some accessible point on the Sedalia-Springfield road. It would be an example in road building by the State which would be a stimulus to road improvement, and would give Missouri the distinction of having a State playground and park surpassed by none and a way to get to it by a pleasant run over a good highway from three main railroad systems—Missouri Pacific, Rock Island and Frisco. It is one road which should be completed as a State road, built and maintained by the State, together with the State park.

The foremost indication of road improvement is a public interest, and the people are becoming thoroughly interested in good roads. It is no longer so much a question of the advantages of good roads as it is how to obtain the means with which to build them and how best to expend these means. Thought and action are turning to special district organization, followed by a tax per acre or a bond issue to pay the cost of construction. One hundred and twenty of these districts are now in operation in the State, with several more likely to be formed in the near future.

The road drag is used quite generally throughout the State. Here and there will be found a community, a district or a township which has the dragging work well organized and systematized. Fifty per cent of

the road mileage of the State is adaptable to the use of the drag—the best maintenance tool known for earth roads. This is especially true in the great rich lands of Western, Central and Northern Missouri. Hard-surfacing material is scarce in parts of the north, north central and northwest portions of the State, but in many of these parts paving brick material is found. Gravel and crushed limestone roads are built in the central, western, eastern, northeastern and most all of the southern counties; in the southwest flint boulders, mining chats, gravel and chert are used; in the central-southwestern part, mining chats, gravel and decomposed limestone and sand gumbo. Oil is used on the roads in Jasper, Jackson and St. Louis counties. Greene and Jackson counties make good use of the county prisoners for road building purposes. The State has a total of five thousand miles of improved roads, good, bad and indifferent. The greatest mileage of permanent roads is in the counties of St. Louis, Jackson and Jasper. If to these we add Pike, St. Charles, Lincoln, Franklin, Jefferson, St. Francois, Gasconade, Cole, Cape Girardeau, Buchanan, Greene, Lawrence, Boone, Moniteau, Marion and Pettis, we have almost covered the mileage of hard-surfaced roads. The rest, made principally by special districts, are scattered over the State from one to ten miles in a place.

I recommend special road districts, and district, township and county bonds for road building. A good road is a form of public improvement for the general good which should be paid for out of public revenue. A road bond is simply one form of taxation and nothing else. It is a form of taxation whereby the community may secure the money, upon credit, complete the work and then pay off the debt gradually while enjoying the improvement. With the exception of two or three counties having large cities to draw revenue from (which counties represent only a small percentage of the total area or total road mileage of the State, not an average condition but above the average, and are not to be considered when treating the subject as a whole)—with these exceptions—anybody who knows anything about road work knows that our regular tax levy is not sufficient to build the roads, but is sufficient for maintenance. The funds for construction must come from some other source than the present amount of road taxes. First build the roads and then the present road levy will maintain them, but there is nothing to maintain unless first built. We have been trying too long to make roads without money.

Article 6, chapter 102, Revised Statutes of Missouri, 1909, provides for the organization of special road districts of territory not exceeding 8 miles square nor 64 square miles in area, wherein is located a city, town or village containing less than 100,000 inhabitants. The last Leg-

islature enacted a law authorizing such road district to issue bonds not exceeding five per cent of the assessed valuation of the district, to run not more than fifteen years, for the purpose of making roads. This same form of bonding law for roads applies to a township.

Another special district, termed the benefit assessment, article 7, chapter 102, R. S. 1909, empowers the landowners along a road to build, improve and maintain the road by organizing and fixing a special tax upon the lands of the district for the purpose of paying the cost of construction. The method of issuing bonds under this district is not satisfactory, the bonding companies having refused to accept them. The only way to dispose of the bonds is through arrangement with local capital.

Our laws are now complete for issuing bonds by the eight-mile special district and by townships. These road-bonding laws apply only to the eight-mile district, and not to the benefit assessment district in the one case and to townships, in both regular and township counties, in the other. The laws for special tax bills in the benefit assessment district and also for issuing county road bonds are defective and should be corrected.

Missouri does not give aid commensurate with the size, standing and ability of the State. There are single counties in Missouri spending more money upon the roads of a county than the State spends over 114 counties. One method of State aid I recommend is the utilization of convict labor upon the roads, since it seems that we cannot obtain sufficient money aid to do any good. Convict labor, reduced to a cash basis, is a form of revenue. It is giving to the highway department from the prison department the equivalent in prison labor to that amount of cost in free labor. It is simply one means of reaching the end, one of the many units which makes up the whole fabric of the road problem. There should also be a legal connection between the offices of State and county highway departments. I do not recommend drastic laws to the extent of absolute control by a State highway department, but that the State Engineer should be given authority whereby he could control the nature and class of construction wherein the State money is used and of the State expenditures thereon and have some control of the county departments.

Furthermore, the State Highway Department should receive sufficient appropriation from the State Legislature to run it through the biennial period, which consideration it does not receive. This department cannot possibly comply with the various demands made upon it, simply because it has never received sufficient funds from the State to employ a sufficient force of engineers. In addition to meeting the reg-

ular demands, the office should receive appropriations which would enable the State Engineer to experiment, demonstrate and introduce the best methods of road construction applicable to the different sections of the State, but above all, appropriation enough to carry on the regular work. My office must either close up by August 1 or else run a large deficiency, and this without being able to meet the demands made in the meantime.

If not, why keep the office of State Highway Engineer? The idea of a State Engineer without State aid, without any authority and without funds, answering all calls upon him with no control to have his plans complied with when the local officials do adopt them is upon the wrong premises.

The State of Missouri has approximately 110,000 miles of public wagon roads, 90,000 culverts and 16,000 bridges, mileage enough to reach across the State 400 times, or for forty roads across the United States. The bridges, if continuous, would make two hundred and forty miles of bridging, enough to span the State. Upon all these roads and bridges there has been expended not less than one hundred million dollars (\$100,000,000.00). During the last few years we have been expending about three million dollars a year upon these roads and bridges; one million for earth roads, one million for improved roads and one million for bridges and culverts, expended through 4,000 road overseers. Should not all this vast public interest, expenditure and responsibility be supervised by competent authority at least partially vested in the State?

Let me here call attention to the fact that we are just beginning the erection of a capitol building to cost three million dollars. Provisions were made for the best supervision in its erection that the State can afford. But we are spending a like sum upon the roads of the State each and every year with only half-hearted arrangements for its supervision.

A county judge or township commissioner is not elected because he is a dentist, a lawyer, a stone mason, a road builder or a skilled artisan of any particular kind, but because he is a good citizen and has sound judgment upon affairs in general. The county judges or commissioners, invariably men of good character and standing in their communities, cannot as a rule, as individual members of the court, supervise the actual work, draw plans, make estimates and look after this part of the county's business. There should be a county highway department in every county of this State, with powers for execution of the actual road work, unhampered by courts, boards or commissions. The official of this county department should have authority to act upon his own initiative, be free to carry out his own plans and details of his work and

should receive compensation in accordance with the importance of the work and skill required.

Our present laws for the county highway engineer are a credit to the men who created them, and they represent all that could be obtained at that time. They were a long step in the right direction, but they are not being carried out as it was believed they would be. These laws will not be enforced as intended, and if defective in anything, they do not go far enough, for instead of merely a county highway engineer we should have a *county highway department*—a highway department through which all road work should be directed, audited and accounted for with authority to direct and govern the work—a highway department in every respect, put upon a footing and given recognition with other offices and departments. So important a work as that of the supervision of roads and highways should not be peddled out to the lowest bidder, regardless of his qualifications. A recent poll shows that fifty per cent of the county engineers are paid not to exceed \$600 per year. If he attends to his business, one-third of this salary is necessary for actual expenses. What can be expected under such a state of affairs? The county court, while remaining a governing board in being a check upon abuses, should no more have full control of the actual road work than that of the schools, the county collector or of the attorney's office.

We have the office of county surveyor, elected for a term of four years, into which the office of county highway engineer, with all the duties and powers of that act, should be submerged and given one title and with a line of connection to the State department. The State Highway Commission should then be empowered to judge and fix a standard for the county surveyor, and require each candidate for the office to obtain a license from this board. Fix the salary under some method whereby there is something definite to it. In this way combine the two offices, that of the county highway engineer and county surveyor, into one office, and clothe him with authority whereby he is a man of some responsibility. Build up a county highway department out of the office of county surveyor and stop the farce which both offices now are in so many counties.

I recommend that the Legislature appropriate a small amount of funds therefor and empower and direct the State Highway Engineer to locate a system of inter-county roads to be designated and known as State roads. That such State roads be made the framework or skeleton upon which a system of State roads be improved. That such system of roads be located from the county seat of each county to the county seat or county seats of each adjoining county or counties, by and with the written approval of the county road officials of such counties through

which the road or roads may extend, and that such location shall not be changed except with the written approval of the State Highway Engineer.

In conclusion, and as a summary, I advise an act for the system of inter-county highways to be known as State roads; correction of the benefit assessment district and the county bonding laws; issuing district, township and county road bonds; acquisition of a larger State aid fund; making the State Highway Department commensurate with the position of the State and a county highway department in keeping with the advancement of the county.

Yours truly,

CURTIS HILL,
State Highway Engineer.



A LAWRENCE COUNTY, MISSOURI, ROAD.

FORTY-FIFTH ANNUAL REPORT

OF THE

Missouri State Board of Agriculture

A Record of the Work for the Year 1912

ALSO REPORT OF MISSOURI FARMERS' WEEK, 1913, ASSOCIATION
MEETINGS, FARM STATISTICS AND OTHER INFORMATION
AND PAPERS RELATING TO AGRICULTURE
AND ITS ALLIED INDUSTRIES

PUBLISHED 1913

UNIVERSITY OF CALIFORNIA
LIBRARY
BRANCH OF THE
COLLEGE OF AGRICULTURE



THE HUGH STEPHENS PRINTING COMPANY
JEFFERSON CITY, MO.

Digitized by Google



Original from
UNIVERSITY OF CALIFORNIA

VETERINARY SERVICE.

Date.			Dr.	Cr.
Jan.	8, 1912	To balance	\$510.27	
Feb.	5, 1912	To State warrant	1,200.00	
Mar.	4, 1912	To State warrant	1,200.00	
April	2, 1912	To State warrant	1,000.00	
May	2, 1912	To State warrant	1,500.00	
June	3, 1912	To State warrant	1,000.00	
July	9, 1912	To State warrant	1,500.00	
Aug.	2, 1912	To State warrant	1,000.00	
Sept.	3, 1912	To State warrant	1,000.00	
Oct.	2, 1912	To State warrant	1,000.00	
Nov.	2, 1912	To State warrant	1,100.00	
Jan.	11, 1913	To overdraft	10.11	
Jan.	11, 1913	By warrants paid and cancelled		\$12,020.38
Totals			\$12,020.38	\$12,020.38

REPORT OF STATE HIGHWAY ENGINEER.

To the Honorable State Board of Agriculture:



Curtis Hill.

While there has been an increase in efficiency and in the expense of this office because of growth, there has been no material change in the appropriations for operation. From the creation of the office in 1907 to the present time the appropriation has been \$6,000 per year, \$12,000 for each biennial period. Near the close of the biennial period of two years ago the office was practically closed for the last four months in order to avoid a deficiency. This year, however, it was thought best not to stop work on

or about July when the funds became exhausted, but to run a deficiency, which, on January 1, will amount to about \$2,800. The warrants are being held, upon a six per cent discount, by the Boone County Trust Company.

In the State there are approximately 108,000 miles of public roads, 100,000 culverts, structures of less than ten-foot opening, not including the small twelve-inch and less sized drains, 20,000 bridges, structures of more than ten-foot opening. We have a total of between four and five thousand miles of improved roads, good, bad and indifferent. The greatest mileage of permanent

roads is in the counties of St. Louis, Jackson and Jasper. If to these we add Pike, St. Charles, Lincoln, Franklin, Jefferson, St. Francois, Gasconade, Cole, Cape Girardeau, Buchanan, Greene, Lawrence, Boone, Moniteau, Marion and Pettis, we have almost covered the mileage of permanent roads. The rest, made principally by special districts, are scattered over the State from one to ten miles in a place.

The road drag is used quite generally throughout the State. Here and there will be found a community, a district or a township which has the dragging work well organized and systematized. Fifty per cent of the road mileage of the State is adaptable to the use of the drag, the best maintenance tool known for earth roads. This is especially true in the great rich lands of western, central and northern Missouri. Hard surfacing material is scarce in parts of the north, north central and northwest portions of the State, but in many of these parts paving brick material is found. Gravel and crushed limestone roads are built generally throughout the State and in addition: in the southwest, flint boulders, mining chats and chert are used; in the central southeastern part, mining chats and decomposed granite; in the southeast, decomposed limestone and sand gumbo. Oil is used on the roads in Jasper, Jackson and St. Louis counties.



One of the well-dragged roads of Salisbury township, Salisbury, Mo.

It is no longer so much a question of the advantages of good roads as it is how to obtain the means with which to build them and how best to expend these means. Thought and action are turning to special district organization, followed by a tax per acre or a bond issue to pay the cost of construction and to township and county bonds. One hundred and forty of these special districts are now in operation in the State with several more likely to be formed in the near future.

The era of voting road bonds, and therefore I believe the era of real road making in Missouri, has begun within the past two years, almost within the past year. Boone county issued a few thousand dollars of rock road bonds in 1850 and Franklin in 1870. Forty years later, in 1910, a special district in Greene county issued \$6,000. Beginning, then, with the agitation in 1911, and including the Greene county district issue, bonds have been voted to build roads in 11 eight-mile special districts, 10 benefit assessment districts and 4 townships, making 25 separate localities, in the total amount of \$1,053,000. This department rendered some aid in every one of these localities, and in about three-fourths of them made preliminary estimates of cost and held road meetings.

The agitation, talk and road tours are having the desired effect to arouse enthusiasm and create definite action for improvement. The interest aroused by the tours, inspections and location of the cross-state highway over the Old Trails road has started travel across the central part of Missouri which hitherto went around the State and would continue to pass around if something or somebody did not invite the travelers across. It has aroused the good roads spirit throughout the entire counties through which the road is projected and has started action for general road improvement in a manner that is entirely satisfactory. The work, agitation and selection of the Old Trails road for the cross-state highway of Missouri by Board of Agriculture and its officers did not stop on the border of Missouri, but has expanded into a trans-continental Old Trails road from Washington to San Francisco, and with a Missourian, Judge Lowe of Kansas City, the first and present president of the national association. From a poor road across Missouri eighteen months ago, without a single efficient local road organization, to a fairly good summer road now, upon which not less than \$100,000 has been expended, \$350,000 in road bonds voted and with special and efficient local organizations along almost its entire length, is the general record along this route.

This road across Missouri is a fixture; it is here to stay, and sooner or later, whether in one year, five, ten or fifteen years time, it will eventually be a great highway. The long distance road is inevitable, and I look upon the establishment of the cross-state highway along the route of the Old Trails road as the greatest piece of road work accomplished by your administration.



Modern crushing plant—capacity, 150 tons per nine hours.

Some of the good road work of the State can well be illustrated by the selection of a few localities, so I beg to report upon one township, two special districts, each district representing different conditions, and one county. Special mention is made of these because we have been brought into close touch with them (there are many others in the State doing as well) and because these bring out distinctly the benefit of organization and close supervision, and are therefore good examples.

SALISBURY TOWNSHIP, SALIBURY, MO.

There are seven main roads, each five miles long, leading into Salisbury, making a total of 35 miles of road. These roads are being systematically dragged during the year. The system used is to employ a man living on each road to drag the road along which he lives when called upon to do so by the president of the

township board. The draggers are paid 50 cents a mile for one round. They are under contract with the township board, who guarantees them 15 draggings each year. The cost for one dragging of a five-mile stretch is \$2.50. Although 15 draggings per year are guaranteed, the number more often reaches 18 to 20. The drags used are a four-horse steel drag, purchased at a cost to the township of \$17.50 each.

The funds for carrying on this work are obtained from the city council of Salisbury and from the township board, half from each. During the present year (1912) a total of \$500 was raised. This money was deposited to the credit of Mr. John Legandre, president of the township board, and was paid out by personal check to the road draggers. The township board, at the beginning of the dragging season, drew one warrant for \$250 in favor of the president of the board. This system of dragging has been used in Salisbury township for the past four years, and this 35 miles of roads will compare favorably with any earth roads in the State. It is now proposed to extend the above-mentioned system of dragging to all the roads in the township, rather than only the main roads leading into Salisbury.

Twenty-three concrete culverts were built during the summer of 1912. Last year seven concrete culverts were built; the year preceding that, one, and the year before that, none. All culverts up to two feet in diameter are corrugated metal without head walls. Above two feet in diameter they are built of concrete arch section with head walls. Two sizes of arches have been built thus far, namely, four feet and six feet. The county pays for all cost above \$100 on a single culvert. The concrete foreman with team and helper is paid \$5.50 per day.

MONETT SPECIAL DISTRICT.

The Monett, Barry county, district is a fair example of what may be accomplished by a special district of average conditions without issuing bonds. The district is in a square four by four miles, sixteen square miles area, and has twenty-eight miles of public wagon roads outside of the city limits of Monett, which city lies about one mile north of the center of the district with a population of four thousand. The population of the district outside of the city is about six hundred. The nature of the country is generally level to slightly rolling. There is considerable cherty

and gravelly soil, which often makes an expensive first cost for grading. The district was organized in 1906.



Good concrete work, Monett district in Barry county.

The assessed valuation of the city is one million dollars, the area outside eight hundred and eighty thousand, a valuation for the entire district of \$1,880,000. The county levies the full twenty-five cent special levy for road purposes and allows the district twenty cents of the proportion paid within the district, thus making a district fund of \$4,700. Besides this there is saloon revenue for roads to the district of \$3,000, pool and billiards \$250 and \$250 poll tax, making the total district road revenue about \$8,200 per year.

Besides the three road commissioners, the Commercial Club of Monett has a road committee of three to help promote good roads interest and render whatever service they can. When the district was organized the first commissioners appointed a superintendent of roads of the district, who, except a one-year interval, has served continuously ever since. The district owns its road tools and machinery, hires men and teams and does its own work, except concrete, which is contracted. All actual work of whatever nature is under the direct supervision of the superintendent. Payments are made by warrants. All bills of materials, claims, orders, etc., must first be approved by superintendent. These are taken up at the end of each week and warrants drawn by the secretary of the commission for those approved and endorsed by the president. When presented to the treasurer the holder is required to endorse them, when a check is drawn for the amount.

All work of the district is substantially done. A number of concrete culverts have been built, two small concrete and one sev-

enty-five foot concrete bridge. The roads are most all graded, some very well, and the main ones kept dragged under the supervision of the superintendent. All the hills have been cut until there is not a bad grade remaining within the district. While the hard surfacing is second-class work, five miles have been surfaced with a chert and gravel strip ten feet wide in the center of the road for about \$1,000 per mile.

LEXINGTON SPECIAL DISTRICT.

Some of the best road work in the State is in the Lexington special district, Lafayette county. It is a fair example of good work under a road bond issue. This district is eight by eight miles, the Missouri river forming the north boundary and reducing the area of the district from that of a square by cutting in on the northwest corner, and contains about 75 miles of public roads. The district contains very little local rock of roadmaking quality, but some that may be used for base rock, all of it being too soft for the wearing surface. The topography is that usually found along the river bluffs, rolling and broken by small streams flowing into the river.

The assessed valuation of the district is two and three-fourth million dollars. The annual revenue derived from taxes and saloon licenses is about \$12,000. This district was organized November 27, 1909, and on March 25, 1910, an election was held to issue \$120,000 of road bonds, which carried by a vote of 1,344 to 237. When the law under which the bond election was held was found to be unconstitutional, the district officials had a new bonding law drawn and passed through the Legislature, and then called another bond election on April 10, 1911, for \$125,000, which carried by an increased majority. The bonds were issued for fifteen years and were sold at five and one-half per cent at par. The amount of these bonds is a few thousand under the maximum of five per cent of the valuation allowed by law.

Considering that the valuation remains stationary and that the payment of capital and interest is extended equally over each year, it will require an annual payment of \$12,000 to pay off the bonded indebtedness in fifteen years. This would require a levy of about 44 cents on the \$100 assessed valuation. It costs the individual citizen living in Lexington with a business and property assessed for taxable purposes at \$5,000, an average of \$22.00 per year. Or, a farmer owning lands assessed at \$15.00 per acre pays

a little over six cents per acre per year. For a 200-acre farm it is \$13.20 per year. Many of these men, interested in good roads, have been donating more than this amount every year before the bond issue, and had no roads, either. The board of commissioners of the district early employed a competent engineer for supervisor, and put him in charge of the field work. All bills and accounts are approved by the engineer, then passed upon by the board and paid by warrants, except contracts, which, after the work is accepted and approved by the engineer, are paid by checks.

The roads have been kept dragged, but the bulk of the work has been upon concrete crossings, no other kind being put in, and upon grading and rocking the road surface. All the crossings, culverts and bridges on all the main roads have been made of good substantial concrete at a contract price of from seven to nine dollars per cubic yard.



A well-dragged earth street in Salisbury. Note that the roadway section is not wide, thus making maintenance easier and better, and by leaving a parking on each side between the ditch and sidewalk, makes the street attractive.

The roadbeds are graded 32 feet wide and the rock sections are 16 feet wide. The rock sections are class A roads, with a sledge base 6 inches deep and a crushed rock surface 4 inches at the center and 3 inches at the sides. Six and four-tenths miles of the Higginsville road has been graded. The excavation amounted to 30,600 cubic yards of earth, at a contract cost of \$7,340, or 24 cents per yard, \$1,150 per mile.

Six miles of the Columbus road has been completed. This includes 3,910 cubic yards of earth excavation per mile, at a contract cost of \$702, or 18 cents per yard. The rock, shipped by rail about

forty miles, cost \$4,884 per mile. The total contract cost for grading and rocking being \$5,586 per mile.

The Old trails road is rocked for a distance of seven and one-half miles, three miles west and four and one-half miles east from Lexington. The three miles west was contracted for \$6,100 for grading 22,486 cubic yards of earth, and 1,664 cubic yards of rock and \$11,220 for rock, or \$17,320 total for the three miles. Local rock was used here principally, the contract prices in place and complete being: base, \$1.30 per cubic yard for local rock and \$1.68 per yard for shipped, loose measurement. Top surface, \$1.55 per cubic yard for local rock and \$1.85 per yard for shipped, loose measurement.

The four and one-half miles east from Lexington was made entirely of shipped rock at a straight contract price of \$2.25 per cubic yard, loose measurement, complete. This cost \$6,200 per mile. The grading was 57,400 cubic yards of earth, an average of 1,275 yards per mile, at 13½ cents, or \$1,689 per mile. The total cost for grading and rocking being practically \$7,900 per mile.

A section of bituminous bound pavement was put down on a grade too steep on which to hold the water-bound macadam, as follows:

Grade of section paved.....	8 per cent.
Length of section paved.....	1,120 feet.
Width of section paved.....	30 feet.
Thickness of base (sledge base, loose measurement).....	8 inches.
Thickness of top course (loose measurement).....	2½ inches.
Bitumen (Am. asphalt) per sq. yd., 1st pouring.....	3.03 gals.
Bitumen (Am. asphalt) per sq. yd., 2nd pouring.....	0.50 gals.
Total bitumen per sq. yd.....	3.53 gals.
Cost of subgrade preparations.....	\$0.061 sq. yd.
Cost of labor (hauling, teams, water, fuel, roller expense, laying and finishing).....	0.540 sq. yd.
Cost of rock and freight on rock.....	0.589 sq. yd.
Cost of asphalt (\$0.112 per gal.).....	0.396 sq. yd.
Cost of incidentals.....	0.004 sq. yd.
Total.....	\$1.590 sq. yd.
Rate per mile, 15-foot road.....	\$13,992.00

MARION COUNTY.

The county of Marion was selected for this report because it is doing good work as a county unit under the strict supervision of a county highway engineer, and is not broken up into small units and is unhampered by townships or special districts. Marion county topography, soil and climate are characteristic of our river counties. The soil is a productive limestone soil, the topography

broken by the river bluffs and streams flowing into the river, gradually becoming less broken and less rough as the distance from the river increases, until a few miles back it is a gently rolling to level farm country. Limestone or creek gravel of an average road-building quality is found generally over the county.



A well-crowned and maintained road in the Monett district.

The assessed valuation of Marion county is twelve and one-half million dollars. This figure includes real and personal property and all public service corporations. Road revenue is derived from a regular road tax of 10 cents on the \$100 of assessed valuation, a special road and bridge tax of 25 cents on the \$100 of assessed valuation, and saloon licenses. The total amount of road funds available for the year 1912 is derived from the following sources:

Saloon licenses.....	\$14,000
Regular tax.....	6,000
Special tax, 25 cents on \$100.00.....	28,000
	<hr/>
Total yearly expenditure.....	\$48,000

Of this sum \$6,000 is paid to the road overseers for district work. Fifty per cent of this amount is paid to the road overseers in salaries alone. The remainder is spent on repairing wooden culverts and grading roads. According to a statement made by one of the county judges, "there is absolutely nothing to show at the end of the year for an expenditure of \$6,000 of the county funds."

The sum derived from saloon licenses, \$14,000, is expended in the construction of concrete culverts and steel bridges and the purchase of road machinery. Twenty per cent of this fund has

been spent for machinery during the present year. The culvert and bridge construction is carried on under the direction of the county court and the county highway engineer. The distribution of this fund is as follows:

Steel bridges.....	\$6,000
Machinery.....	2,800
Concrete culverts.....	6,200
Total.....	\$14,000

On the rock road between Palmyra and Hannibal all the bridges and culverts are being paid for out of the fund derived from the special 25-cent levy. With this exception the money derived from the 25-cent special road and bridge tax is expended upon the construction of hard surfaced roads, of which there are now in the neighborhood of 75 miles in the county.



Reinforced concrete bridge, 15-foot span, 16-foot roadway and 7 feet clear waterway.

Taxes and license fees are first paid into the hands of the county collector, who turns it over to the county treasurer. It is then paid out to the treasury on warrants drawn by the county court. Payment is made for work every two weeks. The county engineer meets with the court and furnishes them an itemized progress report of the road work of the county, together with a statement of labor performed and materials used. The court then draws warrants to pay the bills which are presented and recommended by the engineer.

The total road equipment of the county represents an investment of \$10,000, and includes approximately the following items:

- 1 10-ton road roller.
- 2 20-horse power steam engines.
- 2 120-ton capacity rock crushers.
- 2 spans of mules.
- 15 wheel scrapers.
- 20 drag scrapers.
- 2 elevators for rock crushers.
- 2 screens and bins for rock crushers.
- Quarrying tools.
- Road plows.
- Road drags.
- Road graders.
- 1 Monroe leveller with a 45-horsepower I. H. C. gasoline tractor.



Earth roadway first time over with modern machinery.

The steam traction engine costs \$1,500, while the Monroe leveller and engine costs \$3,200. The Monroe leveller is a form of road drag or grader which covers the entire roadway from ditch to ditch. Its field is the earth road, which must be graded to a good crown prior to use of leveller and the surface of the road must be practically free from vegetation, especially sod. The road should also be practically free of rocks. The machine and engine each cover a width of 12 feet, so that all culverts and bridges must have at least a width of 12 feet to allow crossing. The machine is so constructed that the grading blades may be drawn in, thus permitting the machine to pass over bridges and culverts, and also permitting its use on roads of less width than the maximum draft of the machine.

The operating expense of the Monroe leveller outfit is \$9.00 per day. This figure includes gasoline, lubricant and hire of two men, one to operate the leveller and the other to run the engine. It is claimed by the manufacturers that 15 to 20 miles of road can be traversed per day one way, and that once going over the road is sufficient to put it in first-class condition. This assumes the road to be in ideal condition for work. It is our opinion, however, that one round will be necessary on most roads to give satisfactory results. Admitting that 20 miles can be traversed per day, and that one round is necessary to put the road in prime condition, a length of 10 miles of road can be graded per day. The cost will therefore be 90 cents per mile.



Hannibal and Palmyra macadam road, Marion county.

At the present time a macadam road is under construction between Palmyra and Hannibal, a distance of 12 miles. Seven miles of the road has been constructed. The work of construction is still going on, but it is not expected that the road will be completed before the summer of 1913. The rocking of the road is being done under a contract of \$1.25 per cubic yard in the finished road, the county furnishing the crushing and quarrying equipment, consisting of engine, crusher, elevator, screen and quarrying tools which include drills, picks, crowbars, etc. The subgrade is placed in con-

dition to receive the metal, and no part of its preparation or grading is included in the foregoing contract. All concrete culverts are constructed by the county, and this work is done prior to the macadamizing. Concrete for culverts is costing \$7.00 per cubic yard. This road is costing \$4,000 per mile, inclusive of the above grading, culverts and metal. There is not a grade on the entire 12 miles to exceed 4 per cent. The road is 22 feet wide from ditch to ditch, with a width of metal of 14 feet and a depth of 12 inches loose measure. The subgrade is being thoroughly rolled with a 10-ton roller before receiving the metal, which is placed in two courses, each 6 inches thick. Each course of crushed stone is likewise being thoroughly compacted by rolling. Limestone screenings are finally spread over the surface, which is again rolled. No water is used in the construction of the macadam roadbed.

Yours very truly,

CURTIS HILL,
State Highway Engineer.

Columbia, Mo., December 30, 1912.

ANNUAL REPORT OF THE STATE VETERINARIAN.

Mr. President and Gentlemen of the Board of Agriculture:



Dr. S. Sheldon.

I beg herewith to submit my annual report for the year 1912 for your consideration. All lines of sanitary control work attempted by this department have progressed satisfactorily.

We are much concerned over the numerous reports of sheep scabies. While the reported points of infection are reduced practically one-half over the year 1911, yet the infection is scattered over a wide territory and will demand our serious consideration and attention the coming year. There have been shipped from Missouri to the public markets thirty shipments of sheep infected with scabies. We have traced the infection from several of these shipments back to the public stockyards, unquestionably coming from other states.