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U. S. DEPARTMENT OF AGRICULTURE.  
OFFICE OF ROAD INQUIRY.

PROCEEDINGS

OF THE

VIRGINIA GOOD ROADS CONVENTION,

HELD IN

RICHMOND, VIRGINIA,

OCTOBER 18, 1894.

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PUBLISHED BY AUTHORITY OF THE SECRETARY OF AGRICULTURE.

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WASHINGTON:  
GOVERNMENT PRINTING OFFICE.  
1895.



BULLETIN No. 11.

U. S. DEPARTMENT OF AGRICULTURE.  
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## LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF AGRICULTURE,  
OFFICE OF ROAD INQUIRY,  
*Washington, D. C., December 7, 1894.*

SIR: I have the honor to transmit herewith, in a condensed form, the proceedings of the Virginia Good Roads Convention, held at the Chamber of Commerce in Richmond, October 19, 1894.

The Convention was well attended by representatives from all portions of the State, and, since the conditions in respect to roads and road making vary in the different regions of Virginia in such a manner as practically to typify almost the whole South, I am of the opinion that the views and experiences given will be of general interest throughout that section. I therefore recommend the publication of the proceedings as a bulletin of this office.

Very respectfully,

ROY STONE,  
*Special Agent and Engineer.*

Hon. J. STERLING MORTON,  
*Secretary of Agriculture.*





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## VIRGINIA GOOD ROADS CONVENTION.

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The Virginia Good Roads Convention met in the hall of the Chamber of Commerce, and was called to order at 10.45 a. m. by the chairman, Hon. H. W. Anderson, of Roanoke, Va.

The proceedings were opened with prayer by Rev. George H. Ray, D. D. The chairman then read the call for the meeting, which was signed as follows:

Young Men's Business League of Roanoke, Va., by H. W. Anderson, chairman committee on roads.

The Richmond Chamber of Commerce, by John M. Taylor, chairman committee on streets, roads, and parks.

The Virginia State Agricultural and Mechanical Society, by H. W. Wood, president.

The Association of Engineers of Virginia, by Charles S. Churchill, president.

Virginia State Farmers' Alliance, by B. L. Winston, president.

Staunton Chamber of Commerce, by Isaac Witz, president.

Virginia Division, League of American Wheelmen, by A. A. O'Neill, chief consul.

President of the Virginia State Board of Agriculture, S. Wellford Corbin.

Mr. ANDERSON. This question has been before the people of Virginia for a number of years, but there has never been any definite action taken until this time. In 1893, the Association of Engineers of Virginia appointed a committee, composed of five members, to draft a bill to be presented to the last session of the legislature. That committee, after a very careful consideration of the question and after much study—to which I can bear personal testimony—prepared a bill, which has since been indorsed by the association. That bill was introduced into the legislature by Mr. Wood, and a committee of the association was sent to the city of Richmond to urge its passage; but it being late in the session, no action was taken further than to refer it to a committee to report at the next session. During the past few months the organizations having the matter in hand decided to issue the call for this convention. We are now here to consider the question of improving the roads in Virginia, and it is hoped that the result of the deliberations of this body will be a marked improvement in the next few years in the public roads of our State, and that a permanent organization

may be formed here for taking hold of the matter in the future. It is now my pleasure to introduce Judge George L. Christian, president of the Richmond Chamber of Commerce.

#### ADDRESS OF JUDGE GEORGE L. CHRISTIAN.

GENTLEMEN OF THE CONVENTION: When I received, a day or two since, the invitation to deliver a short address of welcome, on the opening of this Convention—while I appreciated very highly the honor thus intended to be conferred—I would certainly have felt it my duty to decline it, owing to the pressure of other engagements but for the great interest I have felt in this movement from its inception. As I said in our Chamber of Commerce when this movement was first brought to its attention by the committee of the Young Men's Business League of Roanoke, I do regard this as one of the most important movements for the material development of the State that has been inaugurated within its limits. I know this language sounds very strong, but I am perfectly candid when I say that I don't believe I have exaggerated one particle in the form in which I have stated the proposition.

In an address delivered before the National League for Good Roads in Chicago, just two years ago, one of the speakers made this startling statement: "In the State of Illinois the money lost by bad roads, to farmers alone, is estimated on good authority at \$16,000,000 per annum. This, of course, is not the whole tax, since the people in towns bear their full share in loss of trade and increased cost of living, but it will be a safe basis of calculation; and at this rate, the total loss for the United States would approximate \$300,000,000 per annum. The average earnings of capital in this country may be taken as about 3 per cent, at which rate this \$300,000,000 is the interest on \$10,000,000,000, or one-sixth of the entire wealth of the country."

Of course, gentlemen, it is impossible for anyone to say that the foregoing, almost incalculable, estimate is accurate. But I don't think anyone will hesitate to affirm that the loss sustained by the country by reason of bad roads is enormous, and almost fabulous. If this can be affirmed with reference to the country generally, is it necessary to say to you, representative men of Virginia, that it is especially and most lamentably true of Virginia? It is said that the civilization of a people can be measured by the condition of its roads. This may be true of some people, but, thank God, old Virginia is a monumental exception to this rule. I believe it is almost universally conceded that we have in this grand old Commonwealth as true, as brave, as intelligent, as patriotic, and as good people in every way as can be found on this green earth, and certainly that is what I think of them; but I am obliged to acknowledge that our roads are as bad as I think our people are good. Indeed, I believe I have heard almost everything in Virginia praised except her roads. Her men have been acknowledged to be the first in the field, in the forum, and in the councils of the nation; her women (God bless them) the fairest, the gentlest, and the queenliest in the world; her soil and climate everything that could be desired; her mountains and her valleys, her rivers and her harbors, the very perfection of nature's handiwork, combining with the rest of her natural gifts to make her an empire within herself. The things she really needs most is good roads. I therefore hail this Convention as a most important movement, especially at this time; and, therefore, on behalf of the Chamber of Commerce of Richmond, I not only welcome you to this historic and beautiful city, but to this, our chamber's new home, where I hope that your deliberations will not only be pleasant, but wise and conducive to the best interests of the old mother State, for the upbuilding of whose material and moral interests this building was erected, and to advance which this chamber has at all times directed its best efforts.

I said I regarded the assembling of this Convention as most opportune and auspicious. On yesterday there adjourned from within these walls a convention called and held for the promotion of immigration to this State and the South. Could there

be a more fitting companion of that movement than this you are here to inaugurate to-day? Ask any real estate dealer in this city or elsewhere how many sales of farms he has failed to make because of the bad and inaccessible roads leading to them, and I am content that these answers shall be the measure of the importance of your work.

A State or a county can make no better investment than to spend money in improving its highways. I have seen the statement that one county in New Jersey spent \$300,000 in improving its highways, and in three years the lands all over the county increased in value 5, 25, 50, 100, and in some instances as much as 300, per cent. Yes, if I were asked, What is the best thing that can be done to induce immigration and to enhance and make salable the lands in Virginia to-day, I would answer without the slightest hesitation, Make these lands accessible to the centers of population and to the railroads by good county roads. Not only are bad roads an obstacle to the advancement of every community where they exist by keeping the people from that religious, social, and intellectual intercourse by which they would be elevated and enlightened, but, as I have said before, the loss sustained in money is simply incalculable. With good roads the farmer could market his crops whenever the market was best and it suited him best to do the hauling. With bad roads he is at the mercy of the buyer, because when he can haul (when the roads are good) everyone else can do the same, and so the market is glutted, and the buyer reaps the benefit of this condition of things. With good roads twice as much can be carried at a load, and in this way, too, the saving to teams in labor and in time would be simply enormous.

But again, good roads make good lands. Suppose there was a splendid highway going by your farm, along which all your neighbors and friends passed and repassed daily. Do you believe you would let that place remain in the same dilapidated condition you would if it was off in the woods and only accessible by cow paths, or by such county roads as I have driven over so often in Virginia, when my neck, or some other member, was constantly in danger? Of course you would not. It is only necessary to visit the suburbs of this city and see the splendid improvement in the way of good roads and good farms which our enterprising and big-headed and big-hearted citizen, Maj. Ginter, has accomplished there, to see how contagious is this development. Yes, everyone in that section is improving his property, and the contagion is spreading and will continue to spread, I hope and believe; and while all can't be Maj. Ginters, all can do something, and nothing will contribute more to induce that something than the improvement of our county roads.

In his *Old Virginia Gentleman*, Dr. Bagby describes the approach to Mr. Piedmont's house in a way which will be recognized as a true picture of the Virginia country road by every native of this old historic State. He says: "Pleasant it was to trot through these forests on a hot summer's day, knowing what was to come at the journey's end; pleasant, too, to bowl along under the arching bows, albeit the ruts were terrible in places; and there were two or three immemorial holes made by the butts of saw logs that made every vehicle, but chiefly the bug-back carriage, lurch and careen like a ship in a heavy sea. But these were useful holes. They educated the young negro driver, and compelled the old one to keep his wrinkled, mealy hand in. They toned, or rather tuned, up the nerves of the young ladies, and gave them excuse for uttering the prettiest shrieks; whereat the long-legged cousin leaning to the left at an angle of 90 degrees, with his abominable red head forever inside the carriage window, would display his horsemanship in the most nimble, overaffectionate, and unpleasing manner (unpleasing to the young gentleman from the city, who has not a cousin, didn't want to be a cousin, and wasn't a bit proud of riding, but had some decency and really a very high regard for the sensibilities of the most refined ladies in the whole State of Virginia). Many were the short but fervent prayers ejaculated by the old ladies in consequence of these same holes, which came to be the provocatives of late piety, and on that account were never

molested. And they were prized beyond measure by the freckled-faced 10-year-old brother, who, standing up behind and hanging back by the carriage straps, yelled with delight every time the bug-back went way down, and wished from the very bottom of his horrid boy's heart that the blamed old thing would bust all to flinders and plump the whole caboodle smack into the middle of the mud puddle."

It is a great mistake to suppose that only the country people suffer by bad roads. Indeed, the welfare of the cities is so linked with, and dependent on, the prosperity of the country that whatever injures one injures the other, and vice versa. The denizen of the city or country who fails to recognize this as a patent fact is simply an ass. Yes, my friends from the country, the cities suffer from bad roads just as the country does, and feeling this to be true, it was meet that the "Magic City" of your State should have inaugurate<sup>d</sup> this movement, which was so heartily seconded by the chief commercial organization of your metropolis.

Not only all the civilization of the past, but the best of that of the present, attests the importance of good roads, as well in the influence and power of a people as in their material development. What would Rome have been three centuries before the Christian era, when she dominated the then known world; without her Appian Way and "all the roads" which led to that once imperial and so-called Eternal City? England has to-day what is called its local government board, the president of which is a member of the British cabinet, which is specially charged with the maintenance and construction of the highways of the kingdom; and hardly anything has been done more to extend the power and influence of that great people, "whose drumbeat greets the rising sun around the world," than her splendid highways. What these highways have done for London and the other cities of England is equally true of Paris, of Berlin, of St. Petersburg, of Vienna, of Constantinople, and of cities the world over.

In Virginia, by a late decision of our court of appeals, we have no general road law at all now, and I don't think the amendment proposed to the constitution will meet the needs of the case. This amendment only provides that the "general assembly may impose upon every male inhabitant of the State between the ages of 16 and 60 years the duty of working, not exceeding two days in any one year, upon the public roads and highways therein, subject, however, to such exemptions from said duty as may be from time to time prescribed by law."

This Convention ought not to adjourn without either formulating some law and some system of operating under it (or appointing a committee who will do so), so that the general assembly can have this law before it at the beginning of its next session. Frame such a statute, if possible, as will meet the public needs at this time; get a public sentiment aroused in favor of the measure, and you will find no difficulty in getting the legislation. Nothing controls legislation like votes, and every man, woman, and child in the State is interested in, and ought to be in favor of, good roads. The main thing, then, is to frame the good law. This, I am sorry to say, I can't tell you how to do, because I don't know enough about the practical working of the systems in other places and have had no time to inform myself about them since I received the invitation to address you, as I have been engaged about other matters nearly all the time. Some of the proposed plans contemplate national aid and a grand national system. On principle, I should not be inclined to favor this; but it would be beyond my province to attempt to advise this Convention as to its line of policy or what its plan of operations should be.

I only beg leave to make the suggestion that in the present financial condition of our people we must not undertake more than we can with safety accomplish. We need not undertake to rival telford or macadam, except in certain localities where we can afford such roads as they built and they are needed. All that we need for general use in our State, in my opinion, is good dirt roads, properly drained, graveled, and rolled. These can be made at comparatively small cost, and would pay for themselves the first year after they are made.

Thanking you for your attention, I welcome you all most cordially to this chamber and to this your capital city, whose gates are at all times ajar, not only to all the citizens of the Old Dominion, but to those of every clime and country who come in the interests of moral and material development. Yes,

“Come, broad-shouldered Commerce, hear her proud ‘all hail,’  
 Treasures of ocean and of soil unsealing,  
 Come on the pinions swift of steam and sail.  
 Yet evermore by highway, river, rail,  
 With golden trade bear wealth of golden feeling!

“Bear with the weavings of our toil and skill,  
 A tie to bind us in fraternal band,  
 With offerings of the farm, the mine, the mill,  
 A reciprocity of men’s good will  
 To hold earth’s sundered peoples hand in hand.”

After a brief intermission, the committee on credentials reported that 82 delegates were present, representing the various counties and organizations, as follows:

#### LIST OF DELEGATES.

<i>Name.</i>	<i>Representing—</i>
Jos. S. Ball.....	Accomac County.
H. L. Lyman.....	Albemarle County.
R. E. Bridgforth.....	Amelia County.
R. T. Vaughan.....	Amelia County.
W. H. Ligon.....	Appomattox County.
Judge Lyman Chalkley.....	Augusta County.
J. C. Cochran.....	Augusta County.
Geo. E. Murrell.....	Bedford County.
Jas. Munday.....	Botetourt County.
J. W. Bailey.....	Brunswick County.
L. B. Lesneur.....	Buckingham County.
R. A. Ricks.....	Caroline County.
Judge T. N. Welch.....	Caroline County.
J. W. Morton.....	Charlotte County.
S. E. Spaulding.....	Charlotte County.
A. W. Pulliam.....	Culpeper County.
W. E. Terrill.....	Culpeper County.
A. G. Willis.....	Culpeper County.
J. C. Smith.....	Dinwiddie County.
R. H. Watson.....	Elizabeth City County.
C. T. Hottyclaw.....	Elizabeth City County.
Chas. E. Hewins.....	Elizabeth City County.
J. W. Woodward.....	Floyd County.
B. W. Anderson.....	Fluvanna County.
Samuel B. Chapman.....	Gloucester County.
R. C. Selden.....	Goochland County.
David B. Harris.....	Goochland County.
Jerman L. Straiton.....	Goochland County.
J. Milton Jennings.....	Goochland County.
A. E. Wilkins.....	Halifax County.
G. P. Haw.....	Hanover County.
Fenton Noland.....	Hanover County.
Dr H. E. Johnson.....	Henrico County.
Dr. C. R. Cullen.....	Henrico County.



<i>Name.</i>	<i>Representing—</i>
John F. Byrd .....	Highland County.
H. B. Warren .....	James City County.
Judge John Dew .....	King and Queen County.
Jos. F. Bland .....	King and Queen County.
R. M. Hart (proxy).....	King and Queen County.
S. Wellford Corbin.....	King George County.
F. F. Ninde .....	King George County.
Dr. John P. Stiff (proxy).....	King George County.
T. C. Cummings.....	King William County.
A. T. Mooklar.....	King William County.
John C. Utz.....	Madison County.
Wm. A. Hill.....	Madison County.
A. Burwell.....	Mecklenburg County.
J. K. P. Daugherty .....	Nansemond County.
Frank Wright .....	Nansemond County.
L. P. Brinkley .....	Nansemond County.
J. L. Bond.....	Orange County.
A. W. Wilson .....	Powhatan County.
James Hobson.....	Powhatan County.
Richard Reams.....	Powhatan County.
Judge James M. Kelway .....	Princess Anne County.
J. E. Whitehead .....	Princess Anne County.
P. D. Camp.....	Southampton County.
Clarence Coleman .....	Association of Engineers of Virginia.
H. A. Gillis.....	Association of Engineers of Virginia.
H. A. Gillis.....	Young Men's Business League of Roanoke.
H. W. Anderson .....	Young Men's Business League of Roanoke.
J. R. Collingwood .....	Young Men's Business League of Roanoke.
Col. S. S. Brooke.....	Board of Trade of Roanoke.
J. O. Shepherd .....	Buena Vista Board of Trade.
J. W. Talley .....	Buena Vista Board of Trade.
John Graham, jr.....	Norfolk Chamber of Commerce.
W. M. Field.....	Petersburg Chamber of Commerce.
John M. Taylor .....	Richmond Chamber of Commerce.
Thos. L. Moore.....	Richmond Chamber of Commerce.
Judge Chas. Grattan.....	Staunton Chamber of Commerce.
Henry W. Wood .....	Virginia Agricultural and Mechanical Society.
H. L. Staples .....	Richmond, Va.
Chas. Lassiter Trotter.....	Petersburg, Va.
Richard B. Gaines.....	State Board of Agriculture.
Jackson Bolton .....	City Engineer's Department, Richmond, Va.
Prof. David C. Humphreys.....	Washington and Lee University.
Prof. L. S. Randolph .....	Virginia Agricultural and Mechanical College.
J. R. Collingwood .....	Virginia Wheel Club, Roanoke.
Dr. E. T. Baker .....	Virginia Division, League of American Wheelmen.
Rev. S. S. Hepburn.....	Alliance of Hanover.
Capt. O. A. Browne .....	Delegate at large.
Prof. R. E. Ganion .....	Richmond College.

Mr. J. M. Taylor, chairman of the committee on permanent organization, presented the following report, which was adopted:

President, S. Wellford Corbin.

Vice-presidents: M. Glennan, Tidewater; Dr. J. W. Southall, Middle; George E. Murrell, Piedmont; M. Erskine Miller, Valley; H. A. Gillis, Appalachia.

Secretary, R. A. Dunlop.

Assistant secretaries, members of the press.

Mr. Corbin, on assuming the chair, spoke as follows: "This is an unexpected honor, for which I thank this Convention. Representing the agricultural interests of the State, I think it is the most important meeting that has been in session within my recollection. I hope the deliberations will result in great good to the people all over the country. While I am a delegate from King George County, I am also, I believe, an accredited delegate from the State Board of Agriculture. What I propose to offer to the Convention now does not bind the State Board of Agriculture; it is merely my report from the Eighth district, and I don't know a more opportune time than the present to put it before the Convention. It is not exactly the kind of an address usual on taking the chair, but embraces what I have to say before this Convention."

#### ADDRESS OF S. WELLFORD CORBIN.

GENTLEMEN OF THE GOOD ROADS CONVENTION: For the attainment of good roads in Virginia, the first question to be considered is the all-important one of ways and means. It takes large expenditure of force to make a good road, and it requires money to command the requisite labor to accomplish the end. This money can only be obtained by taxation. All taxation is obnoxious, and especially unpopular are new and increased taxes. None will be voted to build good roads unless the people are convinced that great benefits will accrue to them as a recompense, and that the tax is an equitable and a fair one. To secure the sanction of the taxpayer, education is a prerequisite. The subject must be continuously agitated and the people instructed as to the large benefits attaching to every locality where, good roads obtain. In regard to the equity of the tax, assurance must be made that every dollar of the assessment levied will be expended in the locality wherein the tax is collected.

One hundred dollars will build five times as much good road in the tide-water section of the State as it will in the Piedmont section.

The legislature should pass a general road law, authorizing a vote to be polled in each county in the State, upon the application for the same of 100 voters (who shall be freeholders) in the county. The vote shall be for or against the issue of bonds by authority of the county officials; which bonds shall not mature for thirty years, and bear 5 per cent interest, payable semiannually. The bonds at first sale not to be disposed of below par value, and the money so obtained to be sacredly used in maintaining the roads in the county, to be constructed by and at the expense of the State. The law should provide that when a county will pledge to maintain in good and thorough order the roads constructed by the State within the limits of the county for a specified number of years, that the State will then undertake to construct one or more thoroughfares and highways through the borders of the county so contracting. This work to be done under the survey, supervision, and control of a competent State engineer, who is to be assisted, at a fair rate of compensation, by the graduates of the Virginia Military Institute who have received benefits at that institution as State cadets. One year's service as such assistant engineer to cancel the obligation now attaching to each State cadet to teach two years.

All convicts of the State, that can be made available in any capacity whatever, to be employed on this work. The idea seems to prevail that as soon as a sheriff delivers a convict at the penitentiary, he must be made self-supporting; his punishment is a secondary consideration. Convicts should never be employed at work that competes with honest corporate or individual enterprise or labor.

The system that prevails now of hiring the convicts of both sexes to contractors at a cost to them of far less than they would have to pay for free labor to perform like service is baleful and pernicious. It is conceded that the penitentiary under this policy is self-supporting, but to a large per cent of the convicts the confinement is the only punishment or hardship attaching to their condition. They are all well fed, clad, doctored, and guarded at the expense of the State. The contractor controlling such involuntary service at will, to work whenever he sees fit, is enabled to turn out a product which he can place upon the market and dispose of at a profit that will defy competition at the hands of his brother manufacturers who employ free labor. The knowledge gained by the convict under this system during his incarceration is of absolutely no value to him when he gains his freedom unless he again becomes part and parcel of the machine which, like himself, can do only one thing. For years past I have been a strong advocate for the abolition of statutory labor. The supreme court of the State now sustains this opinion, and such labor will not hereafter be available either in constructing or in maintaining good roads.

History teaches that the best and most permanent roads constructed all over the world have been built by convict labor. Hard labor by the convicts on the public roads will do more in ten years to accomplish appreciable benefit to the State in both good permanent highways and in the certain curtailment and depletion of the numbers now entertained at the "White House," than by a continuance of the policy now pursued.

A further provision of the law proposed should grant power to the counties to levy a wheel-and-hoof tax upon all roads they construct or maintain; and a most equitable feature of the new law would be a provision making it obligatory upon all cities and towns of 3,000 or more inhabitants to maintain in good condition all highways leading into their borders for at least five miles beyond their corporate limits.

The question of how to construct a good road will depend wholly upon the surroundings of the locality through which the road is to be built. Material available in one section will not be accessible for another, and no arbitrary rule can be laid down to control the construction of roads throughout the State. A competent engineer can easily master the details and the difficulties incident to his work whenever the occasion arises.

The CHAIRMAN. We will now have the pleasure of listening to a few remarks from Gen. Stone, of the U. S. Department of Agriculture.

Gen. STONE. Mr. Chairman and Gentlemen: I thought at first that it would be well for me to prepare a general address on the subject of road improvement, but on consideration I concluded it would be better to take part in the general debate on the practical questions that should arise here—questions of ways and means, plans of building, and everything of that kind. I see that some very important papers are to be presented, and I have no doubt the general discussion will be upon the practical questions which arise in this State as to the construction of roads. On those points I shall be able to give you some information that will be more apt than anything I could give you in advance of the discussion. I have had occasion to watch the progress of road improvement in all the States of the Union since a road inquiry office was established in Washington, and there is a great deal of valuable information that might be given to you, but I can make it much more valuable if I can bring it in later in the course of the discussions that arise.

I congratulate you, Mr. Chairman, and you all, gentlemen, on the evident success of this Convention. I have attended so many conventions—which were widely heralded, but did not produce enough delegates to fill the offices—that I am agreeably surprised this morning on coming here to find so large an attendance. I am also very well pleased with the earnest and fixed attention given to everything that is being done here. I see that the matter is considered of very great importance all through the State. I bring you some good tidings as to the general progress of road improvement, as to which I will say a few words, without going into details. It has been considered generally throughout the United States (and I have been engaged in this movement for three or four years) that the actual attainment of good roads was something very far off, away in the dim future, but I can point to-day to a hundred places in the United States where good roads are being made, and being enjoyed by the people who have made them. They are being paid for without any difficulty by an equitable distribution of the cost—which cost has been greatly reduced within the last two or three years—and missionaries are going out in every direction to preach the gospel of “good roads.”

I can point you to two or three cases where committees have been sent from one State to another to ascertain just what is being done in road building—how it is being done, and how the people manage to pay for their roads; and these committees have all returned to their homes enthusiastic on the question. They find that in these United States there are plenty of farmers getting rich to-day because they have good roads—making money right in the midst of these hard times—and some communities are paying for them as they go. In one case in the State of New York the farmers themselves, aided only by the village included in the township, have built 15 miles of good stone road in the last four years, and built it at a cost which would absolutely surprise you by its insignificance. Their conditions are much the same as yours in the Piedmont region and the mountain region of the State; they have plenty of stone in their fields and clay in their roads; they break up their stone with a crusher and make a narrow stone road, which answers their purpose well; the grass grows along the sides of the road up to the stone, and the teams turn out without any difficulty on that grass; and they have all the benefit of a macadam road 15 feet wide, while they have a stone road only about 8 feet wide. It has cost them to build it only about \$800 per mile. With a proper distribution of the cost, there is no question that any community can have good roads without their construction becoming too much of a burden.

There is another thing I want to say to you. The railroads, and especially the Southern railroads, are becoming very deeply interested in road improvement, and they are willing to do a great deal toward it. The Southern Railway has carried free a committee of eight or ten

citizens from North Carolina to the North and brought them back again, and they have offered to do the same thing for any well-chosen committee properly authorized to go and see any section of good roads. The Pennsylvania Railroad carried about seventy-five men from New York down into New Jersey to see the roads there, and they went back and within a week had introduced into their legislature, and passed through one house, an act similar to the New Jersey law.

There are one or two things which I would like to suggest for discussion here, and I will take some part in it myself if the matter comes up—the question of a State commission for highways. I understand your legislature does not meet this winter, and of course it could not at present be made an official commission; but if you make an organization here, as I hope you will, a permanent State organization, the leaders of that organization could, until the legislature meets, act in a measure as a State commission.

They will need to familiarize themselves thoroughly with everything that is going on in the United States in the way of road building. This country is so big that a great deal goes on that we don't all know about. What we are doing in Washington is simply to set up a watch, to keep an eye on the whole country, and report what is going on. With what help we could give you from Washington, and the privilege of traveling more or less to see what is being done, your representatives in the State road association, who would afterwards probably be the highway commission, could by the time the legislature meets have a thoroughly well-digested report on all the road construction that is going on in the United States, and find out what will best suit your conditions here, and be able to recommend such legislation as would meet with the favor of the legislature at once, since their recommendation would be the result of more study than the legislature could possibly give to the subject in the limited time at its command. Of course, I can not say what kind of legislation that would naturally be; it might be the county-road law of New York, or Michigan, or Missouri, or it might be the convict system of North Carolina, or the better convict system of Delaware, or a still better convict system that you might develop for yourselves, or it might be the State-aid plan of New Jersey.

But there are a hundred very important questions that should be thoroughly digested by the best representative citizens of your State before your legislature meets; and that is the great value, it seems to me, of this convention; to put the matter in the hands of half a dozen or a dozen of the best men you can select from the different sections of the State to develop, before your legislature meets, a thorough system to recommend to that body. I will not say anything further at present, but will listen to the discourses that are to follow, and will be glad to take part in the general discussion hereafter.

The CHAIRMAN. We will now listen to an address by Mr. Clarence Coleman:

### WHAT OUR BAD ROADS COST US.

By CLARENCE COLEMAN.

*Member of Association of Engineers of Virginia.*

In point of conception and invention, and in boldness of execution as a builder of the highest type of road known to science and art, the American of the nineteenth century stands preeminently in the front rank. Cities teeming with busy and thriving populations have sprung into existence, moved by the potent sign of the iron cross, made by these knights of the age of iron and steel. Fair fields are yielding rich harvests and paying their tribute to the commerce of the world in places that would have been inaccessible without the grand crusade of these modern knights who have come, not like the knights of yore, leading their captives in their train and bearing their trophies on their shields, but like the avatar of progress and science, leaving their indelible tracks in iron and steel emblazoned on the everlasting rocks.

The capitalist has been so lavish in creating and fostering these pathways of steel that to-day 170,637 miles of railway in the United States represent in capital and funded debt the enormous and incomprehensible sum of \$10,268,169,042, while the total amount of money in the United States on the 1st of July, 1893, was only \$2,323,402,392. The General Government has given 200,000,000 acres of the public domain and hypothecated its credit for \$100,000,000 in the interest of these vast schemes. Certainly the arteries of the country have been nourished to the neglect of the veins, and, as in the physical constitution of the animal organization, these systems of circulation are so correlated that the very existence of the body corporate depends upon their synchronous development and action, so in the body politic, one system of internal improvement created and magnified to the utter exclusion of its correlated part destroys the equilibrium of its own creation and saps the very foundation of commercial prosperity.

It is no marvel that the human mind has been actually entranced by the magnificent possibilities of the modern railroad. It is no wonder that the tiller of the soil has plodded over miles of highway of miry consistency and almost fathomless depth to offer his life earnings at the altar of this nineteenth century fetish. We would not deprecate the advance and progress of this great factor in human civilization, nor can we deprecate its transcendent results. It is in accordance with the natural order of things that capital should seek investment in the most skillfully managed concerns and that it should avoid such ignominious failure as the management of our common roads presents. Had the improvement of our highways kept pace with the development of our railroads, we would have advanced the hands on the clock of progress another hundred years.

There is an aphorism of political economists that "The civilization and prosperity of a State is measured by the condition of its highways." Then, if we are prepared to recognize the value of good roads, we must, by an inverse process of reasoning, admit the cost of bad roads. If we could follow the differentiations of value in the one case, and of cost in the other, it would not be difficult to determine the result; but the problem presents a moral as well as a mathematical condition, and while it would be interesting to enter into the domain of speculative philosophy and to apply the axiom of cause and effect to each particular ramification of this comprehensive subject, it will perhaps be better suited to our purposes to deal with actual facts as they unfortunately exist with us in this State.

To arrive at any definite conclusions in regard to these facts, it is necessary to institute some basis of comparison, and for this purpose I have selected France as having the most complete and perfect system of highways in the world, and exhibiting a degree of domestic, commercial, and financial prosperity which is in a great measure due to the equipoise of her system of internal improvements.

The State of Virginia comprises an area of 40,125 square miles, and has a population of 1,655,980, or 41.27 inhabitants for each square mile of area. France, with an area of 204,000 square miles and a population of 38,125,395, has 186.88 inhabitants for each square mile of area. Virginia has a total railroad mileage of 3,426.43, or 11.71 square miles of territory for each mile of railroad. France has a total railroad mileage of 24,018, or 8.49 square miles of area for each mile of railroad. Or, reasoning inversely, Virginia has 0.085 mile of railroad for each square mile, and France 0.116 mile of railroad for each square mile of territory. Virginia has 483.29 inhabitants for each mile of railroad, and France has a population of 1,586.53 to each mile of railroad; or Virginia has 10.92 feet of railway to each inhabitant, and France 3.32 feet to each inhabitant. Thus it is seen that France, with a little upward of five times the area of Virginia, has about twenty-three times the total population of the latter—a little less than five times the population per square mile; but, when we compare area with railway mileage, it is found that Virginia has only 3.22 square miles per mile of railroad in excess of France.

While, under the conditions of population in the two countries, the last comparison seems anomalous, we will not need to seek far for the solution. When we consider that France is credited with 130,000 miles of macadam or stone highways, as against 689 miles for Virginia, we can appreciate the facilities of transportation possessed in that country outside of its railroads. Thus we would have for France 1.57 square miles of area for each mile of macadam road; and for Virginia 58.23 square miles for each mile of such road.

Again, a comparison of the population of the two countries with the mileage of macadam roads shows 293.27 inhabitants for each mile of macadam road in France, and 2,403.45 inhabitants for each mile in Virginia.

The French nation has certainly given the world assurance of what may be done in the construction and maintenance of highways, and the thrift and prosperity of those people stand as an everlasting monument to their efforts in this direction.

I am well aware of the probable opposition in this State to any plan that carries with it an increase of taxation. Since that eventful night on the 16th of December, 1773, when the partisans of old Samuel Adams went down to Boston Harbor and cast overboard the cargoes of tea, because tea meant taxation, the average American has had a most decided distaste for any visible form of taxation. He prefers to take his taxes like the child takes his medicine—disguised by aromatic essences, sweets, and tinctures. He is, in fact, a species of sentimental ostrich, happy with his head in the sand, glorying in the homely saying, "Where ignorance is bliss 'tis folly to be wise."

Forty years ago little or nothing was known of the pathology of germ diseases. Bacilli and bacteria were unknown. The physician struck out wildly and impotently, fighting a recognized malignant, deadly force, with no knowledge of its nature, and no power to resist its effects. And so it is with us. We are battling against an irresistible force in the shape of an invisible but not unfelt taxation, and we are calmly taking our rest in the shade of this deadly upas tree, oblivious of its noxious exhalations. We are annually paying a tribute to our bad roads, more onerous in its nature and more certain in its exaction than the oppression which incited Americans to rise and declare themselves free men. Shall we, who proudly refused to be the minions of government, remain forever the slaves of conditions, fettered with the shackles of our own inaction, and trammled by the delusion of our hopes?

We plead poverty and inability to raise money for the betterment of our roads, and we have been annually expending an amount in money or labor which, under skillful and trained direction, would have placed our common roads upon a plane where at least they would not have been a reproach to our civilization.

As near as I can ascertain there was expended in labor and money on roads in Virginia in the year 1893 an amount approximating \$600,000. So it can be readily seen that we are maintaining our own roads at immense expense, a very small proportion of this money and labor being used in the construction of permanent high-

ways. The treatment may be said to be entirely palliative. Our roads are no better than they were the year before and year after year this patchwork goes on, with few permanent results.

Now, let us assume that during the past twenty years \$300,000 had been spent on permanent improvement each year, and that the average cost of this work had been \$1,250 per mile, we would have to-day 4,800 miles of permanent road, or 48 miles to each county in the State.

It is stated on good authority that in Union County, N. J., by reason of the improved system of road construction and maintenance, farming lands are estimated at an average of \$206 per acre, as against the average value of \$65 per acre for the entire State.

It is not necessary that we should take such an example as that to show what we are paying for our miserable roads, but from very conservative figuring it can be demonstrated that we are paying enough to build and maintain a thorough system of highways throughout the State.

The assessed value of land in Virginia for the year 1893 amounted to \$126,990,053. Now, it is certainly reasonable to assume that those values would be increased by not less than 20 per cent with a good system of roads, which would give an increase in value of \$25,398,010.60, interest on which at 6 per cent amounts to \$1,523,880.63. Now that amount of interest represents the increment of a value we should possess under the desired conditions and is, therefore, an annual charge against the State on account of bad roads.

I have figured from the Statistical Abstract of the United States for 1893 that our principal crops of corn, wheat, potatoes, and tobacco amount to 1,265,782 tons of 2,000 pounds. I omit all other products, as lumber, mineral, and other crops, as an offset against that part of the crops which may be consumed at home, and taking 2,000 pounds as an average load and 10 miles as the average haul, would give 12,657,820 ton-miles, which, at 25 cents per ton-mile, represents \$3,164,455 as the total cost of hauling all products to railroad or market. Now if under the proposed conditions of good highways, the average load can be increased to even 4,000 pounds, then we are again paying each year \$1,582,227.50 for our bad roads. But if we can haul the load of 4,000 pounds in four-fifths of the time required to haul the load of 2,000 pounds on the unimproved road, then we effect a saving in cost of \$612,891, and that amount must be charged to the account of bad roads.

Then taking the assessed value of all vehicles in the State at \$3,051,783, and estimating annual depreciation under present conditions at 10 per cent, it is perfectly reasonable to assume that under the proposed condition 5 per cent would cover depreciation, thus giving another charge of \$151,586.90.

And finally, taking the assessed value of horses and mules at \$13,495,932, and allowing that with good roads we can reduce the present cost of feeding and depreciation of stock to an extent represented by 3 per cent of value, we have \$404,877.96. Then we may sum up the annual cost of bad roads in Virginia as follows:

To interest on depreciation of land.....	\$1, 523, 880. 63
To additional cost of hauling.....	1, 582, 227. 50
To loss of time in hauling.....	612, 891. 00
To depreciation of vehicles.....	151, 586. 90
To depreciation of horses and mules.....	404, 877. 96

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Chargeable to bad roads ..... 4, 275, 463. 99

Prof. Eley has estimated that the loss per horse per annum on account of bad roads amounts in the United States to \$15, and figuring on that basis for the State of Virginia, we would have 290,567 horses at \$15, or \$4,358,505 as the cost of bad roads, or \$14.78 for each horse instead of \$15. I have thought his figures too high until I made these calculations, but I am now convinced that they are perfectly reasonable.



If my reasoning on this subject of the cost of bad roads is correct, we are losing in this State \$11,713.60 for each day in the year, or \$2.58 per annum for each unit of population. If we had the use of the money chargeable to bad roads we could construct 1,710 miles of the best class of macadam roads each year, and in fifteen years our road system would be on a plane with that of France.

According to these figures our bad roads are costing us \$2,478,918.97, more than the total tax collected in the State, which, in 1893, only amounted to \$1,996,545.02, or, considering the total taxable values of the State for 1893, we are paying a little more than 1.068 per cent on that amount.

This invisible but insidious tax is none the less fatal to our prosperity because it is not gathered by the tax collector. On its list there are no delinquents, and there can be no evasion of payment. It reaches every class, creed, and condition.

When the Roman emperors built thousands of miles of their magnificent highways all over Europe they were conferring a priceless boon upon unborn nations, but they were, in fact, simply emerging from conditions which threatened to destroy their empire and extinguish their greatness. But, nevertheless, those roads remain to-day as examples of the highest art in highway construction, and the pretorian roads that echoed to the tread of Cæsar's legions now resound under the wheels of modern ordnance.

It is a sad travesty upon our nineteenth century civilization that here in Virginia, the mother of States, where thousands of miles of difficult railroads have been located and built, requiring the best skill of the engineer and the unstinted treasure of the capitalist, the locus of the first practical system of electric railway, a world teacher in the art of tunnel construction, with geographic, geological, and climatic conditions supplemented by unparalleled economic resources, we are still in the very infancy of the art of building and maintaining our public highways.

"Though the mills of God grind slowly, yet they grind exceeding small;" and so, Mr. President, with the accumulated grist of our four hundred years, gained under the nether stone of experience, we are ready to rise and, with the same spirit which prompted our forefathers to wrest from King John the great charter of human liberty, we are prepared to-day to lay the corner stone for the creation of that equilibrium in our system of internal improvement which is no less essential in political than in natural economy. It is in evidence and attested to-day by the presence of representative men from every part of this broad commonwealth that the term of our bondage is closing and the day star of a brighter era has appeared.

I am filled with faith as to the result of the work of this Convention. It is the first time in the history of our State that such an assemblage, for such a purpose, has ever been convoked, and it has come to pass as a necessity born of conditions. I know my people and I honor their history and traditions which teach me that when once they have resolved themselves to the accomplishment of a purpose there is no looking backward until the goal is reached.

Through me, their unworthy representative, and my worthy colleagues, the Association of Engineers of Virginia sends you greetings and Godspeed in the great work you have undertaken, and I know that this Convention, carrying with it the good wishes of every Virginian who loves his State, will address itself to the task of reform in road laws with a resolute determination that recognizes no such word as "fail."

Gen. STONE. I can give you the experience of two New Jersey farmers bearing on the question of the cost of roads and the advantages of good roads. One farmer, when I asked him how he was getting on paying his taxes for new roads, replied, "I save more in repairs on my wagons and harness than the whole amount of my tax on the good roads." I asked another farmer how it affected him. He said, "I was opposed to it at first; thought it was going to be a

burden on me, but I find now, since we have had these good roads, I am paying off \$1,000 of my mortgage every year, whereas before I could not pay the interest on it." I said, "How do you figure it?" He replied, "I can figure it exactly; I used to have two teams hauling manure from town and produce into town at the proper seasons, and since we have had these good roads I have disposed of one team and am doing more work with the other one than I did before with both. The one team cost me about \$700 a year, and I am hauling out so much more manure with the other team that I am raising \$300 more of produce; so that it is really \$1,000 increase to me."

Now, these are sample cases which can be duplicated a thousand times over in New Jersey. The statement as to tax is entirely within the limit; there is no question about it. I have just been in Morris County, N. J., where they are raising half a million dollars to spend on roads. The farmers of the hill townships had opposed the bonding of the county; they thought, for some reason or other, the people in the valleys and towns were getting the advantage of them. So I thought it necessary to go into calculations to convince the farmers of the hill districts that they were not going to be imposed upon. I took their statements as to the amount of hauling they were doing and had done and what they could save if they could do away with the hills, which are needlessly steep and could be very easily avoided. With this done and the roads macadamized they concluded they could double their loads, besides saving time. I figured up that they had been hauling an average of at least half a ton per acre annually. A great many hauled wood, and the growth of wood in a thrifty forest shows an annual increase of about one ton per acre, so that they were satisfied that half a ton per acre was a low estimate for the hauling for each farm. They were hauling in the hill townships an average of 8 miles, at a cost of \$2 per ton, when it should have cost them only \$1 per ton, and so they were actually paying \$10,000 a year extra per township on account of the bad roads. They did not dispute it when they came to figure it out; the most intelligent of them acknowledged it; and they had been paying that extra tax for a hundred years or more, and yet wondered why they had not gotten rich. It was about 50 per cent more than all their other taxes.

The CHAIRMAN. You speak of half a million dollars being raised in New Jersey for roads. Will you state how that money was raised—where it came from?

Gen. STONE. Under the laws of New Jersey the board of supervisors, or freeholders, as they are called in that State, may pass resolutions to improve certain roads, and issue bonds to the amount of 3 per cent of the assessed valuation of the property in the county. They are issuing those bonds. And then, under the same law, the townships are pledged to pay one-third of the cost of the roads. In Morris County the limit is \$350,000—they have some other debt out. They are author-

ized to issue \$350,000 and the townships raise by a tax \$175,000, which is one-half as much more, and that makes \$525,000 which they are going to spend on the roads. They are able to borrow money there and get a good premium on their bonds at 4 per cent, as their credit is very high. They expect to get \$40,000 or \$50,000 premium on their bonds. They make them 10-40 bonds; that is, redeemable at any time after ten years but not payable under forty, so that they have the option of taking them up at any time after ten years if they can get a lower rate of interest, or desire to pay them off, and if they do not desire to pay them off they can let them run until the expiration of the forty years.

In that State, when they begin to build county roads, they appoint a county engineer, chosen by the board of freeholders, and he has charge of all the road-building in the county; and when they are built they become permanently county roads, so that the tax for maintaining them is in a measure taken off of the townships. They do not expect to add 1 cent to the rate of taxation, as they find that, in all cases where roads have been built, outside capital has come in, which has increased the assessments more than enough to cover the increase in expenses, and probably in eight or ten years their taxation will be diminished. The cost of repairs on these improved roads has been found in many cases to be very much less than the present cost of repairs to the dirt roads. Some of the roads I saw in Canandaigua have been for four years without any repairs, except some little rolling, done during the early part of the summer. These roads are in as good condition to-day as when first built. They will in a year or two require some surfacing, but that will be all. I went to inspect these roads in the middle of a January thaw to see what condition they were in, and I saw farmers hauling two tons of hay on a narrow-tired wagon with two horses over these roads, while the farmers along the other roads were idle, with their horses "eating their heads off" in the stable, because their roads could not be used at that particular time for hauling loads. So the farmers on the improved roads were saving from \$2 to \$5 per day on each farm, throughout the wet winter and in the autumn and spring, over their neighbors, who had not the advantages of improved roads; and they had concluded that these good roads had increased the value of their farms fully 50 per cent.

Prof. RANDOLPH. Between Christiansburg and Blacksburg the cost of hauling is about \$2 per ton; that is, a team of two horses with a driver can only carry about one ton of freight. With good roads, they could haul, as they have hauled in a number of cases around here, a ton of freight to each horse. In other words, we would reduce the cost of hauling one-half on that piece of road, which is about 7 miles long. That would be a saving of \$1 per team, to say nothing at all of getting the goods into market quicker. There are about 10 teams per day over that road—sometimes more, sometimes less. In other words, these 10

teams represent an extra cost of \$10 per day, or \$3,000 per year, taking three hundred working days in the year. This amount saved each year would in seven years build a first class macadam road over that 7 miles.

Rev. Dr. RAY. There are two sections of this State where good roads are to be found—the Eastern Shore of Virginia, in Accomac and Northampton counties. I asked Capt. Browne this morning what lands in his section were worth, and he said the lowest price was from \$15 to \$20 per acre, as I understood him. I know lands there that are bringing \$100 per acre, and I know that they have gone up in the last twenty years from \$10 to \$100. True, it may be in a measure due to their proximity to the markets, but the good roads have played no unimportant part, and hauling is done there now at a cost of about 20 cents a ton, while on bad roads in middle Virginia the cost is nearly \$1. Another section, Mr. President, is over in the Valley of Virginia. I have driven over those roads and looked at the green hills and magnificent mountains and have said to myself, “This is the finest country in the world.” I belong, sir, to a class of men who have a special right to speak on this subject of bad roads—the Methodist preachers. I have traveled all over the State, and, as Governor Huddleston, of Pennsylvania, said, when he was asked where he was brought up, “I was brought up all over the State of Pennsylvania; I was a Methodist preacher’s son.” [Laughter.] And, sir, I have been knee deep in mud sometimes while traveling over roads in this middle Virginia.

Now, don’t you know that lands about Staunton, Harrisonburg, and Winchester sell for \$100 per acre, while lands in middle Virginia, which, I dare say, if properly cultivated, would yield just as handsomely, bring only from \$2.50 to \$10 per acre? What does it mean? It means that in this middle section of Virginia the people have not given the proper attention to the road question, and yet it is a fine country, a fine section, with wonderful resources, as shown in the addresses made here yesterday, and the day before in the Immigration Convention—as fine a section as any in the State, and yet the lands are worth so little. Why, sir, there is a tidal wave of prosperity coming from the Atlantic Coast, there is a tidal wave of prosperity coming from the West, and the factor in that prosperity is in the good lands of the East and the good roads of the Valley of Virginia. All you have to do if you want to sell your lands at a good price and induce immigrants to come here is to put your roads in order.

Judge CHARLES GRATTAN. Mr. President: In the line of our brother, who has had so large an experience in perambulating the State, I want to state a fact that has long been known to me, and I suppose to others who have had the same opportunity. I was brought up, sir, in the county of Rockingham, my father’s farm lying on both sides of what is known as the Valley Turnpike—a macadamized turnpike running from Staunton to the edge of the county. That was one, and possibly the

only, good road we had at that time in the Valley of Virginia, and it was a well-recognized fact that the lands that lay upon that road and were immediately adjacent to it brought in the market at forced sale \$5 more per acre than lands that were some distance from it.

Maj. J. F. BYRD. This Convention knows that the people of Virginia are from one-half to three-quarters of a century behind the times, so far as good roads are concerned.

We have got to hit upon some plan to educate our people up to the standard of good roads, that they may understand that good roads are promotive of a higher degree of civilization, of morality, and of Christian life, resulting in an increase in the values of the lands of our country. I live in a county that is the highest above the sea level of any county in the State, known as Highland County, and I am right on its highest pinnacle. I raised 22 bushels of wheat per acre last year, which I had to feed to my cattle because I couldn't get it away—couldn't get it anywhere. I am 20 miles from a railroad, and I travel to that railroad, brother farmers, and pull my team over a grade of 12 degrees.

We must try and devise some plan by which we can get competent men to lay off new roads, and then we will want to devise some plan by which we can construct the roads without laying such a heavy tax right upon the taxpayer. The first thing we want to do is to lower the grade, and then improve the surface.

We have the resources and everything to make us a great country, but capital won't come here, because there is no way to get out of or into the State by the public roads; and after you get in there is no way of moving about, but when we once get in good shape I tell you we will have a country. [Applause.]

We have had some experience in our county with road machines. Several years ago we made a departure from the regular way of fixing the roads. There were three commissioners appointed by the legislature for the three districts in our county, and I was made commissioner in one of those districts. We bought three road machines. Col. Wickham was instrumental in this. We bought 18 mules, the finest we could get, and started in to work on the roads. The machines cost us, I think, \$135 each at the depot. I can not say exactly what the mules cost, but I think about \$3,600.

The first year we did not accomplish a great deal, because the work was new to us, but this is our third season and our roads have been greatly improved. We met with tremendous opposition at first; the people declared we were going to bankrupt the county, and declared that the supervisors would never be put back in office, but to-day, if it was put to the vote of our county whether we should abandon the road machines and go back to the old system, the men who advocated such a measure would be run out of the county. As to expense, it does cost more. Under the old system it cost, I think, from \$3,000 to \$4,000 per year. My district, I think, would show up from \$125 to \$150 per month.

We work four men in our district—two men as axmen to cut out the roads and put in underdrains. In that one district we have put in about 15,000 feet of underdrain, but we are getting something for the money we are paying out. In my district there are over 200 miles of road, but we do all the work with one machine, and by the end of this season I think we will have gotten over all the roads. So far as making good roads out of the dirt roads is concerned, I can show you roads which three or four years ago were almost impassable, and we have made good roads out of them now.

I believe that every county in the State can take hold of the road question, and while we can't afford macadamized roads we can have good dirt roads, with the use of a road machine, and can get our produce to market. I know that our road machines are giving satisfaction; and while we are not working as systematically as we ought to—there are some roads that ought to be mapped out by an engineer, for half of our roads are bad because of being improperly located—I think we have made a very great improvement. This matter of the appointment of a State engineer to lay off our roads, which I have heard discussed before, is certainly a movement in the right direction.

Mr. A. G. WILLIS, of Culpeper. I want to say a word along this line. I am from the Piedmont section, and the people there are very deeply interested in the subject of roads. It has reached that point where we are willing to be taxed to pay for the roads.

We are making some improvement in our county, just enough to give us a taste of what a benefit further improvement in the roads will be to us. We have a full delegation here—three in number—showing that we are in earnest. I am glad to see so much interest manifested. It looks as if the millenium was coming. Why, the idea of saving money and getting our products to market! it is almost too good to think of.

The difficulty that we are confronting is ignorance; that ignorance is of two kinds—ignorance on the part of the people as to the value of good roads, and ignorance on the part of the road-builders as to what is a good road.

It is necessary that there should arise in Virginia a public sentiment in favor of good roads. How is that to be brought about? This convention should decide. Now, there are many ways of doing it. One way is for each man here to go home from this convention and do everything he can, not only by talking, but by organizing public meetings and getting the newspapers in his section interested in the matter, and distributing the information and imparting the enthusiasm he acquires here.

I understand there is a different law in the various counties. In our county we have a road board consisting of the commissioner of roads and the road director. The commissioner of roads is the executive officer; he attends to all the duties and oversees the work; and it is my

experience that while each one of them is a very valuable man, he knows very little about the road business. My friend from eastern Virginia, who spoke about the road machines, has voiced the experience of Augusta. They are extremely valuable. In fact, it is hard to see how road-builders can do anything without them. It is necessary also that other improvements shall be made in the way of road machinery. All that will come, however, when public sentiment is educated up to the proper point. Now, some sections of the State have rock; others have none. There should be a certain system adopted for those roads. In some sections of the eastern part of the State I understand there is good gravel, which makes a very excellent road. There is another item which is to be considered—the question of crossing the streams—the fords. No road is worth anything unless the crossing of the stream is just as good as the road itself. We must have bridges of the most substantial construction; otherwise we are throwing our money away, and we will have to replace our work in a short while, and have all the expense to incur over again.

Augusta County expends \$22,000 a year on roads. That is partly a county levy and partly an appropriation by the board of supervisors. Each district has to raise a certain tax, which is paid out under the warrant of the commissioner of that district for work done immediately in that district; that money is not spent in the building of roads, but only in the improvement of the roads already built. In order to have that enormous sum properly spent we must have intelligent officers; they should appreciate the value of good roads, and know how to make them. It seems to me that one of the first efforts of this convention should be to put into the hands of the people information telling how to make good roads. There are very few good engineers in our State outside of the institutions of learning who understand road-building. Many engineers in this State have made bad roads, and we have a right to complain of it; but that does not mean that the assistance of the engineers is not necessary. It is absolutely necessary, because a man who does not understand the grading of roads can not get the proper width and location. For that reason we have got to have the best engineering talent we can obtain. Whether this can best be arrived at by having a number of engineers provided for different localities, or by having one engineer appointed for four or five counties to work under the supervision of a chief engineer, is a matter which should be settled by legislation, and it should be recommended to the legislature only after the maturest consideration of a plan which may be offered to this convention by a competent committee.

There is a practical demonstration bearing on Mr. Coleman's address which I wish to give to you. In Augusta County there is a road known as the "Middle road," built by the board of supervisors. I will state that Augusta County has not one cent of debt of any kind, and her people are absolutely opposed to incurring any. The board of super-

visors, under the able influence of my immediate predecessor in the judgeship, agreed to build this road. They made an arrangement by which a certain amount of money was to be paid each year. There was to be no bonded debt, but the contractor agreed to build the road, which work took nearly a year, as well as I remember. The second year he was to receive a certain portion of the cost. The board of supervisors were to levy enough tax to meet that payment, so as to have it ready. The third year they were to pay another portion, and the fourth year to pay it all. We are now this year paying off the last cent of indebtedness. The county has not had a bond out, and has got a macadamized road 16 miles long. This is a start. It was not intended that we should stop there. We expect before very long to get a road like this all the way from Staunton to the Highland line.

Some of the farmers along the line of this beautiful road, and especially those at the end of it, were violently opposed to its construction, in the first place, and then opposed to levying a tax to pay for it. It is remarkable now to go over that road and see the change of sentiment. Many men who at first refused to contribute one cent toward the building of the road now offer to come in and pay to keep it in repair and extend it to Rockbridge County. Now, our farmers made the mistake of believing that after this road was built that would be the end of it, and that it would need no more expenditure. On the other hand, there has been a great need of expenditure. No reasonable man can expect a road to be kept up of its own motion. We know that very often when a road is built and turned over to the county it is not in condition for use. It is absolutely necessary for the county to spend some money in putting the roadbed into practical shape and making it a benefit. Now that was never done with this road, and consequently there has been considerable objection to it, but you seldom hear any objection from anybody on the line of the road. It comes from other parts of the county.

Now, I ask that our friends here will, when they go home, try to impart some of the information and enthusiasm they have received here to their own citizens, and next year probably we will be in position to accomplish something that will be of immense benefit to the State of Virginia.

Mr. MURRELL, of Bedford. I have found during the last two or three years that the profit I was able to make during the summer was eaten up during the winter months, when I was obliged, on account of the bad condition of the roads, to keep my horses in the stable doing nothing, so that at the end of each winter I am just about where I was at the commencement of the previous spring, having saved nothing. I won't go into any statistics to show the cost of hauling now, as compared with what it would be with good roads, but I will say that I would be willing to have my taxes doubled if I could in that way have the benefit of good roads, and I am satisfied that there are many others who feel the same way.



With regard to the question of what constitutes good roads, the average Virginia farmer has not the remotest idea. I have made a study of the subject for several years, but I didn't know actually what a good road was until in Maryland, some time ago, I saw a wagon drawn by two horses, with a load of over 4,000 pounds, going along at about the same rate of speed we make with a light buggy. We could not have gotten along on our roads at all with that same load. A great many of our farmers will listen to you and agree to what you tell them about the advantages of having good roads, but they never fully appreciate what it would be until they see an illustration of this sort. They can not fully believe what you state. I think if some plan could be arranged by which our people could see what is going on in other States in the way of road improvement, it would result in more good than all the meetings that could be held to talk on the subject.

D. B. HARRIS, of Goochland. My county is one that is very poor, and our people can not afford to build macadamized roads. The amount of money we have to spend on our roads is at present about \$3,000 a year, and I think we have 300 miles of road, which is \$10 per mile, including bridge-building; and that is about as much as our people think they can stand, together with the other taxes. I am opposed to bonding our county for any purpose. If every other county in the State is bonded I would be opposed to bonding ours, and it is the pride of our people that we have no bonded debt. We recognize the importance of having good roads, but we believe in economizing the means we have and employing the best talent we can get to lay out the roads, and even with our small amount of \$10 per mile I think we can, with judicious management, eventually get good roads. Of course we would be glad of outside aid—Federal or State aid—but we can see that it will not do to put the rate of taxation any higher, because if we do it will increase our delinquent list, and possibly lessen the amount collected. A moderate taxation is as important to the welfare of our State as good roads. In many sections of the State of Virginia, without good roads and without a clergy, we are taxed higher than in other sections which have good roads and a clergy. That shows bad management.

We have done away with the system of free labor on the roads in our county, and have adopted a system which is yet in its infancy, I may say. We have adopted some new road regulations, and are improving our roads gradually. The first thing to be done when building a road is to build a good roadbed, making the face of it an oval shape, say from  $1\frac{1}{2}$  to 2 feet higher in the center than at the sides, for say a road 15 feet wide. We have bought a reversible road machine and six good mules to pull it, and have employed a man at \$25 per month to work it, and he has four or five men to go along and assist him. Those hands are paid 40 cents per day and rations, or 60 cents per day and board themselves. As far as we have gone we have obtained very satisfactory results.

The Chair announced the appointment of the following committees:

*Organization and legislation.*—H. W. Anderson, Roanoke; H. W. Wood, Richmond; O. A. Browne, Accomac; Judge Lyman Chalkley, Augusta; A. G. Willis, Culpeper.  
*Resolutions.*—Judge Charles Grattan, Staunton; Maj. J. F. Byrd, Highland; James E. Clements, Alexandria; A. Y. Preston, Botetourt; Dr. J. S. Apperson, Smyth.  
*Finance.*—Prof. Randolph, Blacksburg; H. A. Gillis, Roanoke; Charles T. Lassiter, Petersburg; C. E. Ashburner, jr., Henrico; Judge John Dew, King and Queen.

### AFTERNOON SESSION.

The chairman announced that the first order of business was an address on the subject of "How to procure the means to build good roads," by Mr. J. F. Jackson, editor of the Southern Planter.

#### HOW TO PROCURE THE MEANS TO BUILD GOOD ROADS.

By J. F. JACKSON,  
*Editor of the Southern Planter.*

MR. JACKSON. When asked to make an address it occurred to me that probably the one question which needed consideration more than any other was "How to procure the means to build good roads." Now, I look at this question from a different point of view from many other people, because of having had a wide experience in the old country. From the time I was born until I came to this country I was accustomed to the best of roads. In marketing crops the only question I had to consider was as to when I could get the best prices for them, for I could get over the roads with ease at any season. Such is the case throughout England and the continent of Europe. I was certainly astonished when I came to Virginia and saw the condition of what the people here called "roads," and what it cost them to keep them in that condition. I always believed that the people of the United States were so progressive that they would be ahead of the people of the old countries in everything, but I found that without exception the United States had the worst roads of any country in the world. There is not a county in the State, I believe, where material suitable to make good roads can not be found. The same kind of roads can not be made in all the counties, but some can be made of one material and some of another. We have many gentlemen who have made a study of civil engineering who are fully competent to point out how to make a road, and plenty of labor can be obtained. Therefore there is no difficulty about the material or the engineering part of it, but the great question that confronts us is how to get the means to build the roads.

Now, the people most deeply interested in this question are the farmers, and they are not willing to bear any further taxation in order to meet this difficulty. How, then, are we to go about to get the money which it will take to build the needed roads? If the question can not be solved, then we must remain where we are, and continue with the old system which has been in vogue in this State for two hundred or three hundred years.

I had a number of years' experience in road management in England, and I believe the English system would work well if introduced in this country. I strongly oppose a paternal form of government, but believe that the National Government has something to do with whatever materially affects the national prosperity, and I believe that nothing has a greater bearing on this prosperity than the making and maintaining of a good system of roads. I believe that the National Government and the State government should take a hand in this work. I do not want the Federal Government to extend its power one iota, except it is absolutely necessary to preserve order and see that the laws are properly administered, yet I do think that it can, in a legitimate manner, come in and help us in this question. We want national financial aid, with local administration, supervision, and execution of the work.

We want partnership in dealing with this question; it is not a question that affects the State of Virginia alone, but which affects the whole country and should be treated on a broad basis. If it is a national question we should have the assistance of the Federal Government, but we do not want that assistance in such a shape that it will bring upon us further ills in the form of political influence.

Now, the National Government looks after the waterways of the country and no one thinks it exceeds what is right. Why should not the roadways have the benefit of a little attention from the National Government? I do not want to go to Congress and ask for an appropriation in order that we may do this work, but I want the aid of the National Government, and at the same time I want to keep the matter of politics out of it. This can be done by the adoption of a system that has been in operation in England for more than twenty years. If the local authorities there want to build a highway or make waterworks in a village or make any kind of municipal improvement, and they have not the necessary money, the law provides a means by which they can raise the money without an extra levy. When the local authorities have satisfied themselves that it is necessary to have the work done, they give notice to the local government board in London and ask that an inspector be sent down to inquire into the matter. The inspector comes down, and everyone who wishes it is given an opportunity to be heard. After having satisfied himself that the estimate of cost is fair and reasonable, he inspects the location himself and gets all the information possible. If satisfied of the necessity and of the approval of the majority of the people he reports to the board in London that, in his opinion, the work ought to be done, that the cost will be so much, and that, in his opinion, a loan ought to be made for the purpose.

Permission is then given to the local authorities to proceed with the work, on their making to the national board a mortgage of the local taxes for the amount they desire, which is loaned them at one-quarter per cent higher than the rate at which the National Government is borrowing money. The National Government then borrows the money in the open market and re-lends to the local board. That quarter per cent covers all the expenses of the supervision of the loan by the Government, so that it does not cost the National Government one cent.

Now, how are these loans repayable? The law allows these loans to run for a period of seventy-five years in case of permanent improvements. It requires a very small amount laid aside each year in order to pay the whole debt in seventy-five years. A \$500 loan for the period of fifty years at  $3\frac{1}{2}$  per cent only requires an annual payment of \$21 to extinguish both principal and interest within that time. Now, take seventy-five years and see what you get. Millions of money are loaned by banks, by trustees, and others having funds for investment, because they know these bonds are absolutely safe, and the money to pay them is going to be on hand when they are due, and they are not going to be bothered to find another security for fifty or seventy-five years to come.

I believe such loans here would be just as popular as they are in the old country. The money is not going to be thrown away; it is to be invested in a security which is absolutely good, and which is going to enhance the value of every acre of land where it is expended. It is the same thing that the chamber of commerce of this city has done; it has borrowed the money to erect this magnificent building, which has enhanced the value of its own property as well as everybody's else around it. Now, what is the risk of borrowing \$1,000,000 or \$500,000,000 if you like, on the security of the national faith, if it is going to enhance the value of property, and its payment to be secured on the property, the value of which so be enhanced?

In my neighborhood in England we built a road under circumstances similar to these. We wanted some £10,000 (\$50,000). We got the money at  $3\frac{1}{2}$  per cent, not all beforehand, but as the road progressed. We executed a mortgage of the taxes for the amount we needed, and then sent to the local board the certificates of our engineer that the work was being done, and they sent us the money as we went

along; and after we had completed our work we had a small amount left on hand. We had then a magnificent macadamized road. Every yard of land along that new line of road became building land within five years afterwards; instead of being sold at so much per acre, it was sold at so much per yard.

If you go to Congress and ask them to make an appropriation for this work, you are going to have continual political squabbles, and complaint that assistance is being given to one State and not to another, to one county and not to another, and so on; and politics is going to be interjected into it all the time. Not so with a loan. If a county can only give security for \$1,000, let it borrow that amount; if it can give security for \$100,000, well and good. Such a system would help the rich and poor counties equally, in proportion to their resources, and it enables those counties to develop their resources to the utmost limit. We have a few counties in this State that can borrow money at 5 per cent, and we have many others that couldn't borrow a dollar at 6 per cent, or anything like it. Why? Well, those that can borrow at 5 per cent happen to be rich counties, and, locally, there is a demand for a certain amount of investment. What the money men require is a security which can be handled on the stock exchange at any time. That is the only way in which these large loans can be dealt with. They must be made so that they will be national, or at least State, loans in their character, and convertible into money when required. I believe that all the money needed for the purpose of making and improving the roads could be got by the State at  $3\frac{1}{2}$  per cent.

By writing to the clerk or board of supervisors of each county in Virginia I have ascertained what it cost the State to maintain its roads for three years prior to 1892. The average annual expenditure was in actual cash, for road purposes, \$356,332. In addition to that, I estimate that the average annual value of the statutory labor which has been required of the farmers, taking the value of the labor at \$1 per day, was \$413,994, or a total outlay of \$770,326. And what have we got to show for it? Nothing. Three-quarters of a million expended for roads every year for years past, and yet we have nothing to show for it!

I gave it as my opinion years ago, and the courts have since so decided the question, that statutory labor was illegal, and therefore, in making the following calculations, I eliminate that item.

There is an annual average expenditure by the people of this State to maintain the roads of \$356,332 in cash. In this there are no contributions from the cities.

Now, assuming that we have some provision by which the cities could be called upon to assist the counties—say if they paid one-third as much as the counties, which would be about their ratable proportion—that would amount to about \$118,000, which, added to the \$356,000, would make a total of say \$475,000. Now, what sort of a loan could you get on that basis? It would be equal to a loan of about \$11,000,000 at  $3\frac{1}{2}$  per cent, with which to build and improve roads in Virginia.

I believe that roads can be built in Virginia for an average of \$1,000 per mile, and that it will cost very little to keep them in order after they are built. Even supposing the State expended \$11,000,000 on the roads, the present taxation would pay the interest and repay the principal in fifty years. We have been persistently spending this immense amount of money on our roads without getting anything permanent, and it is incomprehensible to me why we should be willing to continue it when we have the means of stopping it. There is nothing that stands in the way of adopting such a method as I have proposed, except the peculiar prejudice that some people have against borrowing money with which to make permanent improvements. Now, I can not for the life of me understand that prejudice. You can never build turnpikes and highways until you get the money to do it. If you expect to get permanent improvements without their costing you anything, you are expecting impossibilities. Suppose we borrow \$10,000,000 and spend that on road improvement in the counties—that is \$100,000 apiece for each county—the people in those counties will get a large share of that money; labor will be needed as well as

material, all of which will be gotten and paid for in the counties. I believe that there is no other way of getting over this difficulty.

At the conclusion of Mr. Jackson's address, which was received with much applause, the Chair announced that Mr. C. E. Ashburner, of Henrico, would read a paper on the subject of "Our Highways: Their Construction and Maintenance."

## OUR HIGHWAYS: THEIR CONSTRUCTION AND MAINTENANCE.

By C. E. ASHBURNER.

GENTLEMEN: I am no friend of dirt roads, but dirt roads, properly constructed and maintained, are a vast improvement on what we now have. I will endeavor to give you my best advice on this subject, and to show you how we can spend our \$600,000 annually to good advantage.

Roads of dirt, with surfaces unimproved by art, are very deficient at all times in the important requisites of smoothness and hardness, and in spring and fall are almost impassable. They are, however, all we have; and, unless the people of the Old Dominion can be persuaded to adopt some better kind, we must do all in our power to make them as good as possible.

The faults that can not be overcome by surface must be mitigated as far as possible by our grades, thereby making a road more nearly what a road ought to be. The minimum grade allowed should be 1 inch in 10 feet, and our present heavy grades should be in all cases reduced to 3 or 3½ feet per 100, either by winding around the hills or cutting them down and filling the valleys, at the discretion of some experienced engineer.

All roads should be properly formed—at least 30 feet wide, with a side slope of 1 foot in 20 feet. A greater slope than this will cause every one to drive along the central ridge, cutting the same ruts with their wheels, thereby causing more damage in one day than can be repaired in a month. Deep side ditches should be cut and kept clean. These ditches should be at least 3 feet deep and 1 foot wide at the bottom with a minimum slope of 1 inch in 10 feet. This alone will often have a wonderful effect upon a bad road.

We have often heard the remark, "The road is heaved by the frost." We should say, "The road is badly drained." Frost will never hurt a road, but the fact is that water soaks into the ground, freezes, and expands, thereby opening the pores of the earth, and again melts under our midday sun, and then sinks a little farther, only to freeze again each night. This naturally "heaves the road," but had the road been properly drained no amount of frost could have possibly heaved it.

When the grade is small a 4-inch tile drain in the center of the drive will be of great service. All trees and shrubs should be cut away from the sides of the drive to allow the sun and wind to dry the roadbed as quickly as possible.

Should your soil be of clay, you can greatly improve the surface by covering it with 6 inches of coarse sand; if your soil is sandy, use clay as a covering. This is, of course, if your clay or sand is within reasonable distance. In such a case, only cover half your road, leaving the sand road for wet weather, and the clay drive for summer.

I will now discuss the present use of road scrapers. Gentlemen, the new idea of county teams and scrapers is the greatest curse ever imposed upon a traveling public. Scrapers may be economical in building roads (I have my doubts on this point), but for repairing they are worse than useless. This is about what happens: The road boss rides upon his scraper, his assistant drives the team, and between them they get all the mud, grass, weeds, and muck that has been washed into the ditches back into the center of the road. At first this grass, etc., seems tough, but do not be deceived by it; it will soon decay and form the softest mud imaginable. A road-

maker should not, however, go to the opposite extreme and use large stones to fill holes. They will not wear uniformly with the rest of the road; they will produce hard lumps, cutting two holes in the place of one—one on each side of the unbreakable stone.

The plow which is so often used to tear our roads to pieces should be left in its proper place—on the farm. Its work, though large in quantity, is very bad in quality; it undoes what time and travel have done; it tears apart the earth that nature has bonded. The result is a good place in which to plant corn. When a road gets into ruts and holes, do not use your scraper, plow, etc., but give it what it needs; that is, more material. The utmost care should always be used in selecting material. Always get it as gravelly as possible, and absolutely free from vegetable matter. Grass, roots, etc., will cause mud holes.

I have now said all that is necessary about this wornout and muddy subject of dirt roads, and will turn my attention to a higher grade of roads, namely, those built of gravel. Gravel is very difficult to select. It is either too round from the washing of rivers or creeks, or has too much earth intermixed when taken from pits. This latter kind is, however, preferable, since it can be screened. The cost of this operation will be more than repaid by the superiority of the road built from screened gravel over one the gravel of which has not been screened. All gravel should be screened twice; first with a screen of  $1\frac{1}{2}$ -inch mesh, rejecting all that is too large to pass through it; then with a  $\frac{1}{2}$ -inch screen, rejecting all that passes through it. When spreading, do not make it more than 4 inches thick at a time. Allow traffic to pass over it for some time, keeping ruts filled in by hand rake. When this has become well packed, put on another layer of same thickness, and treat in a similar manner. You will then get a road far superior to any other gravel road in our State. Do not be persuaded to put large stones at the bottom. Big stones are just like the big men in this world—you can not keep them down; they will get to the top in spite of everything.

Another great trouble with our roads arises from the fact that there is no unanimity of action on the part of our supervisors. During one term the officeholder may plan some really useful work and commence upon the same (generally somewhere near his own farm). The next gentleman is positively assured that the expenditure of the taxes near his own home is of more use to the people in general, and consequently leaves the foundation laid down by his predecessor to work out its own destruction, or aids the said destruction by using his scraper to heap mud upon it.

I have heard a great many suggestions as to taxes, bonds, etc., but if we are to remain satisfied with dirt roads I would simply say, "Collect the road tax in money instead of labor, and put the same in the hands of some competent engineer." Should any one county be too poor to afford a competent man, let two or more counties join in getting one; but, above all things, get a man known for his ability and honesty. The engineer should have as full control of all roads as the chief engineer of a railroad has along his line; he should direct all work, locate all roads, and at regular intervals inspect all roads and bridges in his district.

And now, my friends, you can hardly expect me to advocate a thing in which I do not believe; so I will ask you to excuse me for leaving first the dirt and then the gravel and moving along to macadam. We have stuck in the mud of the dirt road, traveled slowly on the gravel, but now I will endeavor to make good time on the macadam. As I said a year and a half ago, to have macadam we must have money. Now to raise this money I would suggest:

First. Let the road tax be paid in money instead of labor. This labor system, besides being unconstitutional, is a huge farce.

Second. Let a poll tax for roads be levied on every male citizen or alien, whether property holder or not.

Third. County bonds at long time and low rate of interest, with tax on property or poll tax to pay interest and provide a sinking fund.

Fourth. Let the State make an annual appropriation to assist the counties by paying one-third of any improvements a county wishes to make.

Fifth. We should claim national aid for our roads, as we do for our rivers. A few smart business men bring pressure to bear on our representatives in the case of the rivers. Why should not the same be done in the case of the roads?

My own opinion is in favor of bonding the various counties; but I would leave the choice of these five suggestions to men better versed in finance than I am.

I remember once reading an article which proved that 28,000,000 tons of freight were hauled over the railroads of Massachusetts every year; and that one-third of this amount (a little over 9,000,000 tons) passed over the county roads for an average distance of 4 miles. This is equivalent to 36,000,000 tons hauled 1 mile. Allowing a saving of 5 cents a ton on account of macadamized roads, you will see this makes an annual saving of \$1,800,000 to the State. I do not know the amount of freight hauled over Virginia roads, but if macadamized roads will save money in Massachusetts, I ask you why they will not do so in Virginia?

I do not hesitate to say that there is no one living in this old Commonwealth who is not directly or indirectly benefited by improved roads.

Directly: The farmer who can carry four times the present load on a macadamized road; that is, using one horse instead of four, marketing his produce at one-fourth the present cost, hauling back four times the amount of fertilizers, etc. This is a saving merely in team, to say nothing of repairs to wagon and harness. By the improvement of roads thousands and thousands of dollars could be saved in Virginia; many an acre worked to feed those extra horses could be used to provide for man; dollars used to feed horses and repair vehicles, etc., could provide greater comforts at home. How many thousand dollars are spent every year in changing the grades and location of track on our railroads? Why is this done? Simply to lessen the power and time required to move freight. Our railroads are run by our best business men; our roads run themselves.

Indirectly: Those who live in the city are benefited, in that they can buy country produce cheaper. Gentlemen, farmers of Virginia, I know what you are saying: "Farm produce is too low now." I agree with you; but I am unable to tell you how to prevent supply and demand regulating prices; but I can tell you how to cut down the enormous cost of transportation.

And now my advice to you is to go ahead and raise your money. There are plenty of good engineers in old Virginia who can build you good roads for less than \$2,000 a mile.

Thanking you for your kind attention, and wishing you success in your good work, I will no longer detain you.

Mr. Ashburner was followed by Mr. John Graham, jr., who addressed the Convention as follows:

### THE USE OF CONVICT LABOR ON PUBLIC ROADS.

JOHN GRAHAM, JR.

Without the proof of experience or investigation, the idea of using convicts upon works of public improvement is at first attractive and tempting. It is considered that to a very large extent convict labor, being wageless labor, is therefore very cheap, and because the laborers are kept thoroughly under control, strikes, absences, and dissipation are prevented, so that the percentage of laboring value obtained from convicts is larger than that given by free labor.

It may be true that there are some classes of public work upon which convict labor can be employed to advantage, but as far as it can be applied to the construction or maintenance of public highways, it is, in my opinion, neither desirable nor economical. While the purpose may be excused upon the plea of necessity, or by the value of great accruing advantage otherwise unobtainable, no one can say with

sincerity that it is desirable that large bodies of condemned felons, guilty of every class of crime, should be exposed to public observation and contact. It is not to the interest of the community, from a moral standpoint; it is not wholesome. The establishment of a penal colony is usually considered disadvantageous to any section of the country, even when every safeguard is taken to secure the seclusion of the convicts. A criminal should be removed from among those whom he has injured, and kept in durance, particularly those criminals who have been convicted of the more serious crimes. He should not be allowed to associate with the general public on any terms until his time of punishment has expired. It is humiliating and disgraceful for him to be exposed to the public view as a convict, and it is degrading to a greater or less extent to those who are brought into contact with him.

Convicts working on public roads would occupy a prominent and conspicuous position in any community. The methods which would be adopted for their supervision and maintenance would inevitably bring them into far more intimate relations with the public than when in the penitentiary, the effect of their punishment would be lessened thereby, and their influence upon each other and on those with whom they came in contact would be greatly increased.

The establishment of numerous convict camps along the country side would be the reverse of beneficial to the younger portion of the population, and it would be distasteful to all. When such camps are established, the other distasteful attributes of a prison are also permanently organized—the guards, the punishments, the service, and all the requirements of forcible restraint. All these are neither good to hear of nor to see, and it is the inherent recognition of this feeling which gives to most of us a shock when we see in the beautiful Capitol Square of Richmond the convicts working in their striped clothes and with all those evidences of moral degradation represented by their condition.

What I have said so far applies only to the moral aspect of the question. I have stated my belief that convict labor is not economical on public roads.

My experience, it is proper to say, in the use of convicts on public works is not very large, having been gained during the construction of the New River Railroad (now the New River division of the Norfolk and Western), of which I had charge as chief engineer. At the beginning of the construction a limited number of convicts were obtained from the penitentiary in accordance with the existing law, and were employed in grading at various points along the railway line. Upon the acquisition of the New River Railroad by the Norfolk and Western, the further employment of convicts was not considered advantageous by Mr. Kimball and myself. They were returned to Richmond and the railroad completed by free labor.

The method of working convicts upon public roads would depend somewhat upon the character of country through which the roads pass, and its geological and physical formation; but in the main, I apprehend the manner of organizing the labor would necessarily be very much the same as that adopted on the New River.

The convicts were furnished by the penitentiary and placed under the supervision of an officer appointed by the superintendent of the penitentiary, who was responsible to the authorities for their proper maintenance and for the observance of the rules and regulations adopted for the government of convicts engaged upon public works. The convicts were established in camps at convenient points along the line of the railroad. Each camp consisted of two prisons, substantially constructed of logs, facing each other, connected by a covered passageway, in which at night stood a guard, who could observe through the sight holes in the heavy doors the movements of the prisoners within. About forty men were confined in each camp, twenty to each room or prison, which was 20 feet square. This allowed plenty of space for the men for sleeping accommodations. The camps were built in the most desirable locations, always near fresh spring water; the rooms were well ventilated and were kept scrupulously clean. The cook houses and guards' quarters were built adjoining the prisons.



All the work about the camps, including the cooking for the convicts and guards and the maintenance and care of the prisons, was done by what are called "trusty convicts;" that is to say, men whose terms had nearly expired and who were therefore considered to be free from a desire to escape. These men were not required to do other work than that needed about the camps.

The grading forces were divided into gangs of about fourteen men. Each gang was in charge of a foreman, who directed their labor, and was guarded by two men, who were armed and maintained a constant surveillance while the work was going on. The hours of labor per day were regulated by the rules of the penitentiary, as well as all other important matters connected with the convicts' service. The men were marched out to the work in the morning at the stated time under care of the foreman and guards, their midday meal was either carried with them or brought to them by the camp cooks, and they were returned to the camps in the evening. It was found not economical to have the men work farther from the camp than 3 miles. In addition to the working foreman and guards there were day and night guards, who remained on duty at the camps constantly, although all guards and foremen were required to live at the camps and could only absent themselves by leave from the captain or superintendent.

The officer in charge of the convicts on the New River Railroad was exceedingly capable and efficient; the discipline and general condition of the convicts were always excellent under his care.

The superintendent of the Richmond penitentiary appointed a resident physician, who was also subject to the rules and regulations established by the penitentiary as to the character of the attendance given by him.

All the expenses of the convicts' maintenance, as I have stated above, in fact, every item of cost, including the cost of transportation from the penitentiary, was defrayed by the railroad company. The State of Virginia, in the beginning, undertook to refund to the railroad company an amount each month equal to the cost of the maintenance of the convicts while in the penitentiary, based on the figures shown by the superintendent. My recollection is that this was afterwards repealed.

Generally speaking, the life of a convict engaged on public work is a very healthy one. He has good, clean, nourishing food in abundance, regular and wholesome exercise. He is hygienically well cared for, and he is obliged to live a regular and careful life, free from dissipation or exposure. On the New River I do not recollect any cases of contagious disease, nor a death, except of one man who died of consumption, which he had contracted before he arrived on the work. Nevertheless, there were always one or two men who were off the work and staying in camp because of some trifling ailment, often shammed.

The desire to be the reverse of unkind by those in charge procured for the convicts more consideration than would probably be given to free labor, and all their little troubles were sufficient grounds for them to claim indulgence. Chafed hands, sore feet, etc., were made much of, and usually had to be passed on by the "doctor."

From my notes I find the cost of feeding and clothing the convicts on the New River amounted to 32 cents per day per capita. This sum included the cost of maintenance of the "trusty" men and that of the guards and foremen, but included nothing else. There were various other items of expense, which I will show later.

On the New River I instructed the superintendent and the camp purveyors to provide plenty of food of well-selected variety for the men, and to see that everything was good of its kind. I was at pains to see that all purchases were of this nature, that the convicts received the benefits of the supplies, and that there was no jobbing of any kind in the purchase or distribution, nor unreasonnable waste. Beyond this I attempted no rigid economy in the issue of supplies, and it is possible that the cost of maintenance, under similar circumstances, could be somewhat reduced from the figure I have given.

The statement following shows about the actual cost per day per capita for the total cost of convict labor in New River:

Transportation to and from penitentiary .....	\$0.03
Feeding and clothing .....	.32
Guarding .....	.20
Medical attendance .....	.01
Escapes and expenses of same .....	.02
Incidental expenses .....	.01
Total .....	.59

It would appear that the total cost per day of each laboring convict was 59 cents. It must be borne in mind that the cost of 32 cents per day, of feeding and clothing, covers the maintenance of the sick in camp and the cost of living of the whole organization on nonworking days—Sundays and stormy days, etc.—and also the loss, by reason of the maintenance of the cooks and helpers—nonworkers on the grading. This was on a railroad line where the work was continuous and easy of access and the camps were not often moved.

Escapes of convicts usually take place with the “trusties.” These men with but a short time longer to remain, after years of detention, will sometimes be seized with an apparently uncontrollable desire for liberty, and will frequently go off, with almost a certainty of being retaken.

On a public road where heavy work is avoided by strong curves and grades the expense of camp establishments would be greater; in fact, the whole expense of working the convicts would be increased. Therefore, it is fair to suppose that the cost per day would not be less than an amount represented by wages paid of 59 cents.

It must be remembered, too, that convict labor is practically unskilled on public works, and from the very requirement of enforced restraint a very large proportion of the work on roads must be done by free labor; that is to say, the hauling of material, construction of masonry, and all that kind of work performed by a small number of men which would not pay to guard. In a word, the ability of convict labor is restricted. It is practically slave labor, plus the cost of guarding, and I fancy I can make the statement without fear of contradiction that slave labor is usually regarded now as more expensive than free labor.

It is the reasons that I have given above that bring me to the conclusion that, in a country where free labor can be employed for 60 to 75 cents per day, it is not economical to work convicts, at least under the present regulations adopted by the State and the requirements, as I know them.

It seems to the writer that whatever method is adopted for the improvement of the public highways, the basis must be intelligent design and responsible supervision, and the work must be performed in a scientific and excellent manner.

In considering such a plan it will be advisable to bear in mind the sparsely settled condition of many of the counties of the State at the present time, the poverty of these counties in available funds, and the consequent comparatively small amount of travel over their roads. At the same time, it will be necessary to provide for the heavy travel over the roads of thickly populated counties, and the highways leading to the larger cities.

Most of us who are engineers and road builders have a pretty good idea of how public roads should be constructed, with sufficient funds at our disposal, and it would not be difficult to establish standard plans for public-road construction. It is much more important to devise a scheme to provide the means, and one which will suit the varying requirements of our State.

The best public roads are probably in England, France, and Germany. The methods for constructing and maintaining them are very possibly the best yet

devised, because they have been improved during several centuries to provide for a constantly increasing population. I would suggest the advisability of studying the systems in vogue in Europe in order to obtain assistance in arranging a plan that can be properly accepted by ourselves.

As an example of the value of a well-constructed public road in this State, I will mention the old highway which leads through the Valley of Virginia, by Roanoke and Christiansburg, to Bristol. I have followed this road for many miles at various points and have always been struck with the well-considered location and the excellence of its construction. Laid out by competent intelligence and conscientiously built, it remains to-day, for its length, the best road I know of in Virginia, despite the fact that practically nothing is done to maintain it; and it has given a greatly increased value to all the land through which it passes.

Dr. C. R. CULLEN, of Henrico. Having traveled for about thirty years over the worst kind of roads in Hanover, I am prepared to say something about the subject. In the State of Georgia, I found a different system from that which we have in Virginia. They adopted a law by which the county convicts are made to work on the roads, and now you will see the finest macadamized roads all around Macon and Atlanta, built by convict labor. I was there twelve months, noticing the operation of this convict labor. With thirty convicts they, in a few years, macadamized the roads leading into Macon, and were then engaged in making crossroads. These roads allow a one-horse team to carry a ton at all times of the year, while previous to their having been put in condition they were almost impassable. I think if this system was adopted in Virginia it would save a vast quantity of money raised by taxation, and you would be able to make great improvement in the roads, particularly if the short-term convicts in the penitentiaries were engaged in crushing stone at points near to the railroad, to be used on the roads; macadam roads could be built from the railroad in either direction, say for 12 miles.

That system of convict labor has been operated in Georgia with success. It commenced with a few counties, and now it is extending all over the State. I asked what was the effect of the law on the number of convicts. Before this system was introduced into Georgia, the same condition of affairs existed there as in Virginia. The county jails were crowded, and were nothing but schools of villainy to teach boys and young men how to carry on their nefarious occupations; but now the number of convicts has been reduced one-half, and they are principally stragglers who come into the State and engage in petty larceny, and they are put to work on these crossroads. The amount of petty larceny in the State of Georgia since this road-making law has been introduced has been greatly reduced, and if the same system was adopted in this State I have no doubt we would have better roads, at a less expense, and considerably less villainy. If we undertake to borrow the money to build the roads, the cost will be considerable, and it will be a long time before it is paid off.

Judge CHARLES GRATTAN. I have listened with great care and attention to what has been said by our friend who has just taken his

seat, and also by Mr. Graham, on the subject of convict labor. In the first place, from a moral standpoint, there is an objection to the employment of convicts on the roads of Virginia. Now, I am not one of those who believe that the community in general is to be taxed in order that you shall be tender to the feelings of the convict, and I think one of the most unwise things that the State of Virginia ever did (and they did it from feelings of sentimentality) was to abolish the whipping post. [Applause.] It was done to gratify a morbid sentimentality which I do not think should have been countenanced by the State, as the whipping post did more to prevent crime than anything else that has ever been done by the State. I believe that instead of these convicts being a disadvantage to the community in which they may be working, they will act as an object lesson to those with whom they may come in contact, and would have a good effect on those who were disposed to commit crime, when they saw how crime was punished. These county convicts would not be left in the community year after year, as are the penitentiary convicts who work in the Capitol Square, but they are passing by; they go from one community to another; the people see them, and they are gone.

We are debating the question here as to how we are going to get money to build our public roads, and we are all divided on that question. We have—I don't know how many—convicts in the penitentiary, but they are just a drop in the bucket. In every jail in the State there are convicts who are doing nothing but eating the bread of the people who earn it by the sweat of their brow, and they like it. They do nothing but gamble all day among themselves. They will gamble for the clothes they wear, and as judge of the corporation court of Staunton I have had to issue an order for the purchase of a pair of breeches for a prisoner in order that he might be brought into court to be tried. Make it as hard for the criminal as you can, and you won't have so many of them to board. Let them know that the hand of justice is going to inflict punishment upon them; that they will have to labor hard and well, and you will not have as many murders, robberies, and other crimes committed. I have seen convicts working in my county; we had them there building this very road that Judge Chalkley was telling you about to-day. All that road was built by convict labor, and it was a success.

In the opinion of some, convict labor would be useful in certain sections of the State but not so in other parts. I grant you, sir, that in some of the counties in the Tidewater section, where the population is sparse and the roads do not need continuous labor in any one section, it might not be as profitable as it is in other sections where the labor would be more continuous in one locality; but however that may be, the idea is that the counties in the State should compete for and hire these convicts, paying what they can afford to. If one county can afford to pay more than another for them, well and good; that county

will get them. No county need employ convict labor if it does not want it, and unless it is profitable for it to do so. All we want is just to have the privilege of going into the markets and hiring the convicts in the penitentiary, and using those we have in our own jail. If we can have some legislation of that sort I think it would be a good thing, and I think it would be well to have the members of this convention give expression on that point, and to say that the convicts ought to be used on the public roads of the State, and that the counties should be entitled to go into the market and hire that labor from the State.

Mr. HUMPHREYS, of Rockbridge. I would like to say that I have a good many relations living along the line of the Middlebrook Turnpike, and the working of convicts was very objectionable to the ladies in that community. They were in continual terror on account of their chicken roosts and were very much worried in other ways. I was also an engineer engaged in the building of a railroad of which C. R. Mason & Co. were the contractors; they employed a great number of convicts in this work, and they also were a terror to the community. I think a great many men are sent to the State penitentiary when they ought to be kept at home and put to work. I agree with what has been stated about putting to work the criminals in the county jails. In every county almost there are good quarries where the convicts might be put to work crushing stone for road purposes. I think the middle ground would be the best to take, probably, and that it would be a good thing to take the men who are in the county jails and put them to work right where they belong, thus making it a terror to idlers to remain in the county and live by petty thieving.

Now, I would like to say something about how to provide money. That is the most serious question, as we all recognize. The farmers know they want good roads, but they also know that they don't want to pay any more taxes. Mr. Jackson claimed that \$600,000 or \$700,000 was thrown away annually by the people of the State in fixing up the roads; that they are no better at the end of the year than they were at the beginning. I think the question must arise in the mind of everyone what condition these roads would be in if the money had not been spent on them. Our county only pays \$10 per mile of road, and my experience as an engineer, in riding over the roads of the county, is that the money is judiciously expended; I don't believe it could be expended any more judiciously, and if all the balance of the money that is raised is as well expended in other counties as it is in ours it is not wasted. I think it could be more profitably spent if more road machines and rollers were purchased and the work done under a little more intelligent management; and I would like to see a small handbook gotten out by this Convention giving the best information on the subject of road improvement, and have that book distributed among the farmers throughout the State. It must not be too long, however,

as it might frighten them and they would not bother about reading it; and it ought not to start out by telling them that they are all fools and don't know anything about making roads.

Mr. T. C. CUMMINGS, of King William. I don't see the use of springing the same old "chesnut," by saying that we need better roads. I think we are all a unit on that point. Of course we need them, but don't send convicts into my county; we don't like them. We have enough good, honest men who want work, and if it costs 59 cents a day to work a convict we had better give that 59 cents to some poor, honest man in our county who is looking for and needs work. We can not get enough rock in our whole county to make a mile of road, but several years ago we bought three road machines—one for each district. We employed a man at \$5 per day to superintend the work of each machine; he was to furnish six mules and a man to drive. I have reckoned up the cost of these roads; we work over 100 miles of road, and it has not cost us over \$15 per mile. Of course they are not in first-class order now, but I feel confident that at a cost of \$50 per mile we could get all the road we wanted. In putting those roads in order, we follow the machine and put in our culverts.

Mr. MURRELL, of Bedford. Two years ago Bedford County decided to try convict labor, and it proved so eminently successful that last year they tried to increase the number. Our roads that have been worked by the convicts are now so greatly improved that they are commented on by our neighboring counties. Campbell County, which adjoins Bedford, has been so impressed with the improvement of the Bedford roads that they too have passed resolutions asking for convict labor, and so far I have personally heard of no objections on the part of the ladies to the convicts working on these roads.

A DELEGATE. I was not fortunate enough to hear the paper read by Mr. Graham, but since hearing the subsequent remarks on the subject of convict labor I thought I would like to say a few words, especially in reference to what the gentleman from King William has said. I think he said the convicts cost 59 cents per day each. I think that is the root of the evil. I think what we want is a State supervision. We want unity in this matter. The gentleman from Highland has said that the rich counties can have good roads, but most of our counties are poor. Now, sir, it would be a good investment for the State, I think, if it would take supreme control of this question, in aid of the counties, and appoint an engineer to take the place, in a measure, of the highway commission of Massachusetts—an engineer who should lay out general plans for the roads, and at the request of the various counties put to work such a number of convicts as could be profitably employed upon those roads.

I think you, Mr. Chairman, struck the keynote of this discussion in your remarks this morning when you said every able-bodied convict should be at work on the highways of this Commonwealth; but the

farmers of this State should not have to pay 59 cents per day for the labor of each convict. It would well repay the State of Virginia to give the counties the convict labor free and require the counties merely to furnish the material to put upon their roads. The State should not only furnish the convicts, but should guard and feed them, as they do while they are in the penitentiary. If that were done, Mr. Chairman, the State of Virginia would soon reap her reward in the increase of values of the real estate. The counties could very well furnish the material—stone, gravel, or whatever they might have—though they could not afford to pay for the convicts at the rate of 59 cents per day; and under some general supervision a system of roads could be introduced into this Commonwealth which in the course of ten or fifteen years would change the whole face of the State. The counties of Virginia should be encouraged to solicit this labor, and it should be so arranged that they would not be put to any more expense than could possibly be helped. Some portions of the State are poorer than others, but it is to the interest of all that even the poorest counties should have good roads.

Gen. STONE. I would like to say something in regard to the experience of New York State with convict labor. Of course this question has its moral side; but it also has its business side. In the experiments made at Clinton Prison about 500 convicts were put to work on the public roads. They found no difficulty in controlling them; nobody approached them and nobody was injured by them; but they did find that the expense of guarding the convicts on the public roads and the expense attending the recapture of those who escaped, together with other incidental expenses, made it cost 79 cents per day for eight hours of work; and the State of New York will never resume its road work by that method. This leaves the question open as to what other method can be used for the employment of State convicts. The plan mentioned by Dr. Cullen and Mr. Humphreys has already occupied a good deal of my attention; that is to let the State convicts work by themselves, independently of the county convicts, in preparing material to be used on the roads by the county convicts. Every able-bodied man can do the hand work required for quarrying, and crushing by machinery four to five tons of stone per day and the actual cost of that work, viz, for explosives, oil, repairs, and incidentals, outside of the feeding of the convicts, amounts to only about 6 cents per ton for the stone, so that the actual cost to the State above the cost of keeping its convicts would be only 6 cents per ton, if the crushed stone were given free to the counties.

Now, the State could very well afford to give that as its contribution toward road improvement; and if the State of Virginia would establish a number of such quarry camps, buying or renting the quarries, and putting stockades around them, the convicts could be guarded there just as cheaply as in the penitentiary and just as safely. They would

be just as much secluded from contact with the public, and would be in much better health and condition than if kept in prison, and they would not be competing with honest labor to any damaging extent, certainly not with any mechanical labor; and it would encourage the counties to go to the additional expense of preparing the roadbeds and putting the stone upon them. I am satisfied that many of the railroads in the State will haul this stone from the quarries to the different points along their lines at the bare cost of the hauling; and you will find that you can build roads in many parts of the State where you have no stone at all as cheaply as they are now being built where the stone is plentiful, that is, under \$1,000 per mile.

The use of county convicts is another question, and I don't know anything better than for each county to have its own way in this regard, as is the case in North Carolina. The people of Mecklenburg County are so well pleased with the use of convict labor that they have built 40 or 50 miles of good road with it, over which they can now haul ten bales of cotton with the same teams that before hauled two bales; and at least a dozen other counties in North Carolina are taking up with it to-day. They say that they can find no local objection to it. Of course I don't care to enter into that question. There is a very strong prejudice in places against working convicts in public, but there can certainly be no objection to working State convicts in quarry camps, where they can be preparing the necessary materials for roads.

Mr. GRAHAM. I stated in my paper that there was an objection to working convicts on the public roads, because I did not think it could be done economically. I agree with Gen. Stone in what he says, that there can be no objection to the working of convicts where it can be done economically. It can be done in quarries; there is no question about that; but to work them on public roads, I don't think that can be done economically, and that is the whole gist of the question. I think it better and cheaper to employ free labor on the public roads. Convict labor is a restricted labor; you can only work the men in gangs; you can't send one man to work here and another one there, as they can not be properly guarded in that way, and you can only use them to do the roughest sort of work. But in quarries, I hold Gen. Stone's view, that it can be done to advantage. Now, there are a great many counties in Virginia in which there are no materials to make the roads, and the material would have to be carried a long way. Now, one of my friends here undertook to criticise me as to the moral aspect of the question. I think I can say that it is a matter which can be guided only by individual feeling, and I do not urge it upon this Convention. He seemed to take it for granted that what I had to say about the moral aspect was with reference to the way in which the convicts were treated. Now, anyone who has had any experience with this matter knows that the convicts beg to be sent out on public works, because they find that to be the lightest punishment.



Prof. RANDOLPH. A gentleman here this morning made an excellent point, in my estimation, in speaking of the effect of grading roads improperly. That question of the location of a road is one of the points where the engineer is particularly valuable, and there are some other instances where the services of an engineer are equally as valuable—notably in the construction of bridges—in masonry construction. In my own engineering practice I have been called in consultation more than once in regard to bridge work. I remember, in one case particularly, a certain bridge had not been up six months when I was sent to examine it, to see if it was safe. I reported that in its then condition it was not safe. The piers were of the cheapest sort of masonry, and if there had ever been any cement used, it had all washed out, and when I got there the ice was sweeping down the stream, and had struck the bridge-work, and had listed nearly all the masonry from the bed of the creek up to 6 or 8 feet. I have seen numbers of cases right inside of a town of 10,000 or 12,000 inhabitants, where a piece of masonry was put up which under no circumstances should have been allowed to remain. All this was done without any engineering supervision at all. Then, again, I have seen improvements made which have cost a great deal more than they would if the work had been done under the supervision of an engineer. That is another point where the services of an engineer are valuable—in the economical management of things. The engineer is familiar with the cost of bridges, with the cost of masonry, etc., knows the best methods of construction, and in many cases he has saved his salary three, four, and five times over, and that is a point which I wish to bring out in connection with what the gentleman from Highland has said about the grading of our roads. Now, as to draining a road, the draining of a dirt road is comparatively simple, but the economical handling of the material for the construction of a macadam or telford road calls for engineering of high ability.

Mr. MUNDAY, of Botetourt. I think we have progressed in our county in everything except roads; we have increased in stock and grain, but we have as miserable roads as can be found anywhere, and perhaps worse in many cases. The road question has been an absorbing one with us in the past, and I think we will find it to be so for a long time to come. You will remember that when these roads were first laid out there were not many people who had carriages, and they got around mostly on horseback. Now, when you come to change these roads you will find a good deal of difficulty and expense in locating them in the proper places. How that is to be overcome I am not able to say, but if you build graded roads it will have to be done. Now, as to convict labor: the Richmond and Alleghany Railroad was built principally by convict labor. When they were first brought there the people were very much alarmed, and thought there would be trouble, but as it turned out they worked very successfully, and there was very little trouble with them, and I think convict labor could be used to advantage on our

county roads. We have got to support these convicts, and if it could be arranged in any way that they could be used in the construction of roads, it ought to be done, as I think it would be a great advantage to the people.

Mr. ANDERSON, of Roanoke. We are expending about \$600,000 per annum on our roads, as I understand it, and we are receiving practically no benefit. I know from my own personal observation that in many cases the roads are being injured by the work that is being done upon them. There could be raised in the State about \$800,000 yearly for road purposes by the imposition of a small tax on each \$100 of real estate, and with that amount of money spent in intelligent work the result would soon be seen in short stretches of good road, which would serve as object lessons to the people of the State. Now, with this amount of money to spend, it would seem that the first thing would be for the State to assume control of the principal highways. We have some highways that extend through different counties, from one end of the State to the other, and the different counties, have different methods of working those highways. If the State had control of these roads the State engineers could change their location if thought proper, could build them according to standard plans, and could have bridges of a standard pattern, and the State highways would soon become excellent object lessons to the counties through which they run. Then by a tax on vehicles, etc., passing over them, the State would soon raise a sufficient fund to put the roads in a reputable condition, at least.

In reference to the subject of convict labor, I have conferred with the people in several counties, and Prince Edward, Bedford, and a number of others are very much pleased with their experiments in that line. I received a letter this morning from the clerk of Bedford County, and while he could not give me the exact cost to the county by working convicts, he said the people were very well pleased with the result of the experiment. I agree with the views expressed by Gen. Stone, that the best way to use convict labor would be in quarries; but I do think that convict labor should be used in our State on public work, as far as practicable. I understand that we have about 900 convicts in our State penitentiary, the great majority of whom are making shoes, and are thus entering into competition with the various trades. As it is now, we take negroes in the penitentiary and teach them trades, and when their term of imprisonment has expired they come out and are ready to compete with honest men who have been obliged to get their knowledge in institutions teaching these mechanical arts. I know of but one way in which convict labor could be equitably used, and that is in the construction of public highways, the money to be raised by means of a State tax.

Maj. BYRD, of Highland. I am satisfied that Mr. Jackson struck the keynote in his address on "How to procure the means to build good roads." We all know that we want good roads, but the great query is,

How are we to get the means to construct them? Mr. Jackson said: "Let us borrow the money on long time; the State will get it from the National Government at 3 per cent, and will give it to the several counties at  $3\frac{1}{2}$  per cent; we will create a sinking fund, and after awhile we will have enough money in that sinking fund to pay back the original debt, and nobody will be hurt." Now there is elegant common sense in that. That is the only way that I can see possible; it is the only way I can see to construct roads throughout the State.

Now, there is the construction of the road and the maintenance of the road. If you have these tremendously heavy grades, a great deal of damage will be done to the road by the waterspouts and great falls of rain in the summer time. You know when water has a great fall it rushes along very rapidly and tears the road all to pieces. Don't you see that a heavy-graded road will cost more in twenty years to keep in order than it would have taken originally to have built it with an easy grade? Here is the point we want to get at, and in which we are deficient.

Now, my idea about the convicts is this: You talk about slaves. Well, I am acquainted with the times of slavery. I was the owner of slaves; I knew their expenses, and at every turn I had to foot the bill, and I worked those people to the best advantage. Well, here is a convict; you may call him a slave. Has not the State of Virginia got to furnish all his wants? It is nothing but slave labor for the time being. A gentleman here said something about the convict and the henroost. Now, we were talking in our county about getting some convict labor to build a portion of a new road which was to be constructed there, and the women were not at all alarmed about their henroosts. It is my opinion that convict labor can be used, if not too much is paid for it, and, as one of our friends here has said, the State of Virginia should help to defray the expense. Of course I know that convict labor is not as good as hired labor; you can not get as much out of it, but still you can get good out of it if properly managed.

Mr. H. W. ANDERSON. Mr. President: The committee on organization of a permanent "Good Roads Association" has been in session this afternoon, and thinks it best to submit its report now, so that it may be considered during adjournment. The committee has thought over the matter very carefully, and as an experiment it has been thought best to submit a brief draft of a constitution and by-laws and plan of organization, and to leave the matter of the work of the association, when organized, in the hands of a general board, as provided for in this constitution. It is the idea of the committee, and I believe of those here generally, that after the State Good Roads Association has organized, it will be the duty of that organization to see that subordinate associations are formed in the different counties, in order that enthusiasm in the subject may continue to be aroused. No provision has been made, however, for the organization of these subassociations, as that

has been considered beyond the power of this committee. With regard to the appointment of a secretary and treasurer, it has been considered that in order to make that office effective, the secretary should be a paid officer, but as no financial arrangements have been made we have left that also in the hands of the general board. I will now read the report of the committee:

#### CONSTITUTION.

##### ARTICLE 1.—*Name.*

The name of this organization shall be the Virginia State Good Roads Association.

##### ARTICLE 2.—*Objects.*

The objects of the organization shall be to awaken general interest in the improvement of public roads, suggest methods of building and maintaining them, secure the legislation, State or national, that may be necessary for their establishment and support, and to conduct or foster such publications as may serve these purposes.

##### ARTICLE 3.—*Membership.*

Any citizen of the Commonwealth of Virginia who is interested in the general improvement of the roads of the Commonwealth, may become a member of this association upon the payment of an initiation fee of 25 cents, and a fee of 25 cents each year thereafter, payable at the time of the regular annual meeting.

##### ARTICLE 4.—*Officers.*

The officers of the association shall be a president, a first vice-president, ten second vice-presidents—one from each Congressional district of the State, all of whom shall be elected by the association—and a secretary and treasurer, who shall be elected annually by the general board.

##### ARTICLE 5.—*Government.*

SECTION 1. The management of the affairs of the association shall be vested in a general board, composed of the president and the eleven vice-presidents. They shall fix such rules for the conduct of the business of the association as they may deem proper. Any vacancies in the general board may be filled by the president. Five members shall constitute a quorum.

SEC. 2. There shall be an executive committee, composed of the president, first vice-president, and the secretary and treasurer, who shall control the affairs of the association when the general board is not in session.

SEC. 3. The president shall, at the annual meetings, appoint the following standing committees: On finance, five members; on legislation, five members. The committees shall perform such duties as may be assigned to them by the executive committee.

##### ARTICLE 6.—*Amendments.*

This constitution may be amended at any regular meeting of the association by a vote of a majority of members present.

##### ARTICLE 5.—SEC. 1.

Upon motion of Mr. Anderson, section 1, article 5, was amended as follows: "Any vacancy may be filled by the general board."

Adopted as amended.

On motion, the report was laid on the table, to be taken up at the conclusion of the programme at the night session.

Judge CHALKLEY. I move that a committee of five be appointed to take into consideration and recommend to the Convention the names of those whom they think would be suitable as permanent officers of the association to be organized after the draft of the constitution is passed upon.

The motion was adopted.

Dr. Cullen offered the following resolution, which was referred to the committee on resolutions:

*Resolved*, That the employment of State and county convicts in making roads, crushing of rock for macadamizing, and the transportation of the rock to localities adjacent to the railroads at the expense of the State, takes precedence of all other questions.

### NIGHT SESSION.

Mr. H. A. Gillis, in the absence of Mr. C. C. Wentworth, read the latter's paper on the subject of "Highway bridges," as follows:

#### COUNTRY ROAD BRIDGES.

By C. C. WENTWORTH.

Part of the making of a good road lies in making the bridges good. A good bridge is one that at a reasonable first cost is strong and durable, accommodates the traffic, and requires the least yearly expenditure for its maintenance. The good appearance of the finished bridge is also to be considered; but for ordinary county road bridges that good effect in looks which always follows the execution of a well-planned engineering work may be relied on to fulfill this desideratum. A neatly designed portal is generally used to ornament the structure. It should be entirely devoid of the very slender open ironwork that is often found on portals and which is always disfiguring.

It may be stated that since iron structures can be built at almost as low a first cost as wooden ones, there should be as little wood used in the bridge as possible. Even the joists that carry the flooring should be of iron or steel; timber appears at present to be the best adapted material for the flooring itself. If metal joists are used, which are simply rolled beams, the cost of the bridge will probably be not increased beyond what will be the amount expended in the first renewal of the timber joists. It is an easy matter to take up and renew a floor plank that shows signs of decay, but to renew or even examine the timber joists is a difficult undertaking.

The supports for the ends of the bridge should be of stone whenever stone can be procured. The plan of using iron cylinder piers is to be avoided if possible. Masonry ought to be made of reasonably well-shaped stone laid up in real cement mortar. The cement must set hard in a week or less. If the stones used are hard and durable their shape is of little importance, provided they are all held together in a solid mass by good cement. In order to make good cement mortar it is absolutely necessary to have not only good cement, but also clean, sharp sand. By looking after these points, a wall can be had at a low cost that will stand indefinitely, as far as the masonry is concerned. If no good stone can be procured, then iron cylinders of from 2½ to 5 feet in diameter are used. These are made of iron plates not less than one-fourth of an inch in thickness, bent into a cylinder and riveted; each pair is also braced together across the bridge. These cylinders are filled with concrete. A good plan is to bolt them to a platform of timber placed low enough to insure its being always wet, so that they can not settle or be pushed over.

For short spans, up to say 30 feet, rolled beams can be used with the floor plank laid directly on them. For longer spans there is no better form of bridge than that

known as the Pratt truss. These are generally through bridges, or what are called half-through or pony trusses, the latter being used for spans up to about 80 feet. For very long spans a modified form of Pratt truss is sometimes used, which has the ends of its top chord somewhat inclined, instead of being level, which trusses are known as elliptic, or Baltimore trusses.

In pony-truss bridges the sides are from 6 to 10 feet in height, so that there is no room for overhead bracing to keep the top chords in position. This is the weak feature of a pony truss, and is to be guarded against by making the vertical posts with a rigid connection to every floor beam, so that by their stiffness they hold the top chord in place, the top of each post being connected to the top chord. There ought to be a post at each end of every cross floor beam, and the inclined end post should extend straight from the end of the span to the top of the first vertical post. There is a kind of truss used sometimes that has the end post meeting the top chord at a point several feet from the top of the first vertical. This form should be entirely discarded, for the reason that every panel point of the top chord should have a vertical post to support it and keep it in line. It makes no difference how much the end post is inclined, provided the height of the side truss is kept one-sixth to one-tenth of the span. It is a good plan to make the vertical posts of a pony truss about 2 feet wide at their lower ends where they connect to the cross girder, and taper them up to the top, where they are made small enough to enter the top chord. The 2 feet of width of the base makes it convenient to connect them rigidly to the cross floor beam.

Through Pratt truss bridges are used for spans longer than 80 feet. These have inclined end posts, but as the trusses are high enough to admit of cross bracing overhead there is no need of the same dependence on the vertical posts to keep the top chords in place, so that the first vertical is made a tension member. The head room over the floor to the underside of the portal bracing should be not less than 14 feet.

The floor joists of all county road bridges ought to be proportioned to carry a live or rolling load of 100 pounds to the square foot of floor surface. This will provide for any heavy single load that may be met with on such roads, so that it can go anywhere on the bridge with safety. As it is not at all likely that a great number of such heavy loads will happen to be on the bridge at one time, so as to cover all the floor at once, the cross floor beams that come at every panel point may be proportioned for a lighter load, 80 pounds per square foot of floor surface being sufficient for them. If the cross girders, or floor beams, are 15 feet apart and the roadway 12 feet wide, the capacity of each floor beam will be, by the above rule, 14,400 pounds, or say a wagon weighing 6 tons. If the bridge is packed full of cattle for a length of two panels, or say 30 feet, this is also provided for, and is the heaviest load that is likely to occur.

The trusses that carry the cross floor beams and joists of the roadway may be proportioned for a little less live load than the floor, for the reason, again, of the extreme unlikelihood of the whole bridge being fully loaded at one time. For bridges of 100-foot span, 80 pounds per square foot of floor is enough for the trusses. For 125-foot spans, 75 pounds is enough; for 150-foot spans, 70 pounds; for 175-foot spans, 65 pounds; and for 200-foot spans or over, 60 pounds is sufficient. In each case the live load for the joists of 100 pounds and the load for the cross floor beams is to be 80 pounds, as before.

The length of the panels into which a truss is divided depends on whether metal or timber joists are to be used. If of timber, they should not be more than 15 to 18 feet long, as long sticks are generally hard to get for renewals; and the longer the panels the more timber there is per foot run of bridge to renew. If metal joists are used there is no reason why panels of 20 to 23 feet long should not be used, and such panel length will be found to be economical; as then there are fewer panels, and fewer pieces for the bridge builder to make and erect. And in this way the cost of

a bridge with long panels and metal joists is little if any greater than one with short panels and timber joists.

Timber joists should not be spaced more than 2 feet apart, and the floor plank should not be less than 2 inches in thickness. With joists 2 feet apart, the following sizes are proportioned to a live load of 100 pounds to the square foot of floor surface:

3 by 10 inch for 12-foot 3-inch span.

3 by 11 inch for 13-foot 6-inch span.

3 by 12 inch for 14-foot 9-inch span.

3 by 13 inch for 16-foot span.

3 by 14 inch for 17-foot 3-inch span.

3 by 15 inch for 18-foot 6-inch span.

3 by 16 inch for 19-foot 9-inch span.

These spans of from 12 feet 3 inches to 19 feet 9 inches may of course be short span bridges of that length or the panel length of a truss bridge.

With steel joists spaced 3 feet apart, they may be used for the following spans or panel lengths, these being for the ordinary light sections rolled of the given depths.

Rolled beams 5 inches deep for 11-foot span.

Rolled beams 6 inches deep for 13-foot 6-inch span.

Rolled beams 7 inches deep for 16-foot span.

Rolled beams 8 inches deep for 18-foot 6-inch span.

Rolled beams 9 inches deep for 21-foot span.

Rolled beams 10 inches deep for 23-foot 6-inch span.

Rolled beams 12 inches deep for 28-foot 6-inch span.

Rolled beams 15 inches deep for 36-foot span.

With these spans the beams will deflect under the extreme load, but not enough to be objectionable for highway travel. These beams rest on the cross-floor beams at the panel points, and these latter for ordinary bridge spans may be made of rolled beams also. For bridges with a 12-foot-wide roadway 12-inch beam will answer for panel lengths up to 17 feet; for a 14-foot roadway up to 13 feet; and for a 16-foot roadway up to 10-foot panel lengths. A 15-inch rolled beam will answer for panel length up to 27 feet for a 12-foot roadway, to 20 feet for a 14-foot roadway, and to 15 feet for a 16-foot roadway. These floor beams may be either suspended from the under side of the lower chords, or connected to the vertical posts above the lower chords. A good bridge can be built in either way, and one is no stronger for carrying travel than the other; for every point of a bridge is suspended in one way or another, and the point is to make the mode of suspension strong enough for its duty.

The floor plank should be laid squarely across the bridge, and never in more than one thickness, as the space between will hold water and dirt, which hasten the decay of the floor. To keep the hubs of the wheels from striking the trusses there should be a line of guard timber bolted to the floor on each side of the roadway, which will hold the wheels at a safe distance. This, which it is well to have, makes what is known as a hub plank unnecessary, for a more unsightly object than a hub plank, warped out of shape and of no use, is hard to find. Also the abomination known as a lattice hub guard may well be discarded, as it is too low for a hand rail and too high from the floor to prevent a small animal from going under; and as a means of keeping hubs from the trusses, except by creating fear in the mind of the driver lest he should by chance hit it, it is not a success.

Just what to provide as a means of preventing a traveler from falling off the bridge is one of the unsettled points in the building of highway bridges. Five or six lines of iron rods from three-eighths to three-fourths inch in diameter strung through the center line of each truss are cheap, neat, and effective. These can be joined together by threaded pipe couplings and tightened up against the end posts, through the center of which they pass. A wooden fence is as unsightly as the hub

plank, and is always out of repair. A gas-pipe rail is better than the timber fence, but more expensive than either it or the iron rods mentioned above, while being no more effective than the latter.

The width of the roadway should not be less than 12 feet, and this only for bridges of less than 100 feet in total length. Where longer than this two teams are apt to meet on the bridge, whereas on short spans one team can keep off while the other is crossing, if necessary. For longer bridges it should be 14 feet in the clear, while a width of 16 feet in the clear is more desirable. A sidewalk is very seldom necessary on a highway bridge.

Now that we have determined the general dimensions of the bridge and the load it is to carry, the next thing is to see that the structure will carry the loads for which it is designed. When iron first took the place of wood in bridge construction the iron seemed to everyone to be a material so much stronger that the result was that too little iron was used, and many railroad and highway bridges had to be rebuilt for this reason. When steel took the place of iron the same mistake was made, and engineers are now beginning to use steel more as they would iron, which is its proper use in highway bridges. The steel used is not all like the steel in a razor or a hand-saw, and the nearer it resembles iron in its properties the better. High-grade steel is too brittle to use in such structures, and if steel is subjected to high working stresses the bridge built of it is no stronger than one of iron, while the steel bridge is actually less rigid than the iron one under passing loads.

The working stress suitable for a tension member of a highway bridge is 12,500 pounds per square inch of the area of the cross section of the member, whether of iron or steel. This is one-fourth of the ultimate capacity of iron, and one-fifth of the capacity of soft steel, in tension; so that, while the deflection under a load will be the same in either case, the steel structure will be the stronger as far as the tension members are concerned.

Compression members should be strained 10,000 pounds per square inch of their section. This is about one-fourth of the ultimate capacity of either iron or soft steel in compression for very short columns. For long columns this working stress has to be reduced by one of the usual formulas for the purpose—Gordon's, for instance. As an illustration of the working of the formula for reducing the allowable stress on long columns the following may serve, as the columns are generally made of two channels latticed for the vertical posts, and with the addition of a cover plate for the top chord and end posts.

If a post is 1 foot long the allowable stress is 10,000 pounds per square inch. If made of two 5-inch channels the allowable stress becomes only 5,000 pounds per square inch, if the column is 21 feet long. In the same way two 6-inch channels become worth only 5,000 pounds per square inch at a length of 25 feet, 7-inch channels at 28 feet, 8-inch channels at 33 feet, 9-inch channels at 36 feet, 10-inch channels at 39 feet, and 12-inch channels at 46 feet.

As a general thing, the diameter of the pins that connect the members of a bridge will run from one-third to one-half the depth of the channels used in the chords.

It is manifestly impossible to go into such detail in the limits of a paper like this as will enable the services of an engineer to be dispensed with. As in medicine, the doctor must be relied on. The point is for business men to determine the doctor's ability and reliability.

Mr. D. C. Humphreys, C. E., followed with an address on the subject of "Stone and shell roads." Before entering on the presentation of the subject, Prof. Humphreys said:

"The speaker to whom was allotted the subject of dirt roads rather regretted that that was given to him, because he was not much of a dirt-road man. I am a dirt-road man, and think dirt roads are the only ones practicable for Virginia just now, and I think they should be made



as good as it is practicable to make them. I believe, however, a system of stone roads should be begun and carried on as rapidly as it is practicable to get the money to build them."

### STONE AND SHELL ROADS.

By D. C. HUMPHREYS, C. E.

Macadam roads are made by covering the earth foundation with broken stone, each so small that its longest dimension will pass through a  $2\frac{1}{2}$ -inch ring.

There are to-day many disputed points in road-making; but as this is hardly the place to enter into such a discussion, I shall try to tell how a good macadam road can be made and what we may expect of it.

#### GRADES.

The ideal road should have such easy grades that a brake will not have to be applied, nor will the horses have to hold back, in going down hill. A horse with light vehicle should be able to go at a trot up the steepest hill.

As a mean of experiments made on average-size wheels, it has been found that on a good level macadam road a pull of 65 pounds will draw a wagon weighing 1 ton (2,240 pounds). If this wagon be placed on a slope which falls 65 feet in 2,240, it

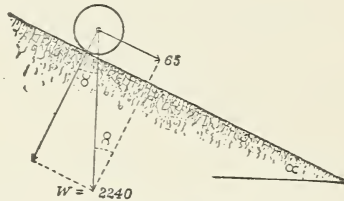


Fig. 1.—Showing resistance of incline road.

will just not move; or, if started, will run slowly down the hill without increasing its speed. This gives us a slope of 1 in 34 as the maximum desirable slope, or nearly 3 feet per 100.

Up such a grade a horse would have to pull 65 pounds per ton resistance on level; 65 pounds per ton resistance due to slope;  $\frac{65}{2240} \times 1,000 = 29$ , lifting his own weight; total, 159 pounds. If he were worked ten hours per day he could only average about  $1\frac{1}{4}$  miles per hour. At the average rate of  $2\frac{1}{2}$  miles per hour, he could pull 1,300 pounds up such a grade working for ten hours. This is based on the estimate that a horse can exert a pull of 100 pounds on an average for ten hours at the speed of  $2\frac{1}{2}$  miles per hour.

In many portions of this State it will not be found practicable to limit grades to 3 feet per 100; but I think no grade over 4 degrees, or 7 feet per 100, should be allowed, if it can possibly be avoided. On such a grade a horse would have to exert a force in pulling 1 ton (2,240 pounds), 65 pounds resistance on level;  $\frac{65}{2240} \times 2,240 = 156$  pounds resistance due to grade;  $\frac{70}{2240} \times 1,000 = 70$  pounds resistance in lifting his own weight, making a total of 281 pounds.

In pulling such a load a horse can not quite average 1 mile per hour for ten hours, and should therefore be allowed to take his time in going up such a grade. In going down such a grade brakes should be applied or the horse would have to hold back.

The foundation should be a good dirt road, sloping from the middle toward each side in the same way that the macadam surface will slope. This dirt road should be smoothed off and well rolled. If it is wet, marshy ground it should be subdrained with terra cotta pipe. As the subject of dirt roads has been allotted to another, it is not necessary to dwell on the most important subject of a good foundation for

macadam. Unless the foundation is one that will let the water drain off it may become muddy, in which case it will give way by the mud being forced into the interstices of the macadam and the lower stones of the macadam sinking into the mud, so that a heavy wagon may break through the metal into the mud, as I have seen it do in one of the principal streets of a city of 350,000 inhabitants.

The importance of a dry foundation is seen when, after a severe freeze, there comes a sudden thaw. The builder of macadam roads feels that if his road will stand that, it will stand anything. It is thought that if Macadam had built roads in this country where, in the Northern States especially, the frost goes into the ground much deeper than in England, he would have found it necessary to lay a foundation after the manner used by Telford.

#### MATERIAL.

For the lower layers of a macadam road, which compose the foundation, any hard rock, which is of irregular shape and will resist frost, will do. This is a very important point for economy, because with the surface coating, which has to resist the wear, we can not be too particular.

This road metal should be, according to Mr. James Owen (see Transactions Am. Soc. C. E., Vol. XXVII, p. 609), "composed of igneous, metamorphic, and sedimentary rocks (using the old nomenclature), and their relative value is probably in the order classified." \* \* \* The rocks usually used are trap, syenite, granite, occasionally gneiss, and the different formations of hard limestone. \* \* \* The varying use of these rocks in the different localities should depend entirely on the question of cost. Taking a broad view of this question, the writer would say that it would be more economical to haul trap rock 300 miles by rail than to use granite or limestone found at site; or haul granite 200 miles rather than use limestone; and that limestone is only economical or desirable in the locality where it occurs."

On account of the increased railway traffic which would come from good roads, railways would be justified in making special rates for broken stone.

While what Mr. Owen says about the distances it pays to haul better material rather than use limestone may apply to roads where the traffic is very heavy, it would not apply to roads where the traffic is light.

#### SIZE OF STONE.

Macadam considered it important that all stone should be of nearly uniform size and as nearly cubical as possible, no stone exceeding  $2\frac{1}{2}$  inches in its largest diagonal. On some roads he did not allow any stone weighing more than three ounces to be used (equal to cubes  $1\frac{1}{2}$  to 2 inches in longest diagonal). The harder the stone the smaller it is necessary to make the pieces, as it does not pack together so easily as the softer stone. The sizes for the largest stones admitted are still about the same as used by Macadam, but he insisted that all small pieces, splinters, and dust should be excluded; while the most recent practice recommends the use of the fine particles for a top-dressing.

#### APPLYING THE STONE.

If the whole road is not to be covered, a space 12 feet wide for a single roadway or 16 feet wide for a double roadway should be dug out of the center to a depth not less than 6 nor more than 10 inches. Macadam's practice was to put on a layer 3 inches thick, then throw it open to travel. After that was compacted he put on another layer of 3 inches. After this in turn was consolidated by travel, if the road was subject to heavy traffic, he put on still another. This method of compacting the road is very hard on horses and vehicles, and if the wear on them is estimated as a part of the cost it turns out to be very expensive.

The road will not become firm until enough dust has been worn off the stones or carried on to the road by the wheels to cement the stones together. Moreover, the

result will not be satisfactory in dry weather. In England there is always enough moisture to allow the consolidating or cementing of the stones. In this country, at most seasons of the year, it would be necessary to supply the moisture by a sprinkling cart in order to get Macadam's results. It is almost necessary to have a good roller and to roll the road at times when it is moist. The small particles, dust, etc., from the stone crusher should be saved to be used for a top-dressing.

#### ROLLERS.

Steam rollers are not in favor on account of original cost, and cost and annoyance of operation. The larger the diameter of the wheels the better. The pressure need not be more than 165 pounds per linear inch. The roller should be reversible, and should have iron boxes which can be loaded with rock to increase the weight for final rolling. They should be capable of being operated by four horses for new macadam on heavy grades; by three horses on the level, and by two horses after the macadam has been well consolidated. Such a roller will cost about \$360.

#### CROWN.

Since most of the travel will be in the center of the road, that part should be elevated. For a 16-foot roadway 4 inches elevation is desirable. To get this, a road when finished should be 5½ to 6 inches higher in the center than on the edges. Water should never be allowed to run along the center of the road; running water will invariably loosen the road metal.

#### GRAVEL.

In many places in the State gravel beds occur. This gravel may be used instead of broken stone and in some cases the best of roads will be obtained.

Where gravel, which has the property of cementing readily, can be obtained, it should be used as a top-dressing for the stone road. River gravel composed of round pebbles is not to be recommended.

#### TELFORD.

The telford road is used in places where the traffic is heavy. It is the best of broken-stone roads, and differs from the macadam by having a foundation of large stones, set with broadest face down and with longest dimension running across the road.

#### COST.

Such a roadway, as constructed on one of the St. Louis boulevards, has a top-dressing of 6 inches of macadam and 4 inches of gravel, and costs 12 cents per square foot; \$7,000 per mile for 16-foot roadway; \$5,250 per mile for 12-foot roadway. Macadam (about 10 inches thick), finished on top in the same way, cost 9 cents per square foot; \$5,250 per mile for 16-foot roadway; \$3,940 per mile for 12-foot roadway. As these roads were subject to very heavy traffic, they were of more substantial construction than would be necessary in most places, but it is not far out of the way to say as a sort of average that a good 12-foot, or single, roadway will cost \$3,000 per mile; a 16-foot, or double, roadway will cost \$5,000 per mile.

#### REPAIRS.

The cost of repairs is harder to estimate, and varies inversely as the care and labor used in the original construction. One writer mentions a 4-inch macadam road which had to be repaired the next year after its construction, while a 12-inch road which had been subject to much heavier traffic had done without repairs for nineteen years, its condition being still good. It was bad policy, however, to allow this road to go so long without repairs; the old adage, "a stitch in time saves nine," is peculiarly suited to the maintenance of roads. They should be constantly looked after and continually mended, no ruts being allowed to form. The softer the material the greater the importance of frequent repairs.

## SHELL ROADS.

Where shells can be obtained they may be used in the same way as broken stone or gravel. Being composed largely of carbonate of lime they become very firm and make excellent roads for all purposes. They wear more rapidly than a good stone or gravel road and do not stand heavy travel very well. They require more repairing to keep them in good order.

In concluding I would like to say that "what is worth doing at all is worth doing well," applies with peculiar force to macadam roads. A good dirt road is better in most cases than a poor macadam. I would also call attention to the common mistake of considering the road made when the macadam is all on and the road thrown open to traffic. It is absolutely essential that the formation of ruts be prevented while the broken stone is being consolidated. The best way to do this is by frequent rolling and occasionally filling up such ruts as the roller does not close. After the road is consolidated ruts as a rule will not be formed; if formed, the process will be slow, as the rut then has to be worn into solid rock.

A good macadam road is always in good order and all sorts of loads may be hauled over it in any kind of weather, sometimes dusty enough, at others muddy enough, to interfere with pleasure, but always ready and in good order for business.

The writer is of the opinion that the construction of good roads is from a sociological point of view, a matter of great State and national importance. Good roads promote attendance at school, church, political speakings, and other meetings which result in intellectual culture. This would make the country more attractive, check the drain to the towns and cities, and give us a more intelligent and homogeneous people, on whom we could rely for the perpetuity of our free institutions and our form of representative government. The end can best be accomplished by encouraging a healthful emulation among the counties. Once started, the prosperity of good road counties will bring all others into line.

Each county should, in my opinion, begin by getting a good county engineer, who should be county surveyor and have charge of all county public works, such as bridges and roads. A man with the proper sort of professional pride, who would know how to profit by the experience of the engineering profession, should, if satisfactory, be kept in office long enough to profit by his own labor, and not be removed for lack of good work in politics.

The secretary read the questions which had been prepared by Capt. Orris A. Browne, of Cape Charles, as follows:

I would suggest, as a part of the order of business, that the roll of the counties in the State be called, and one member from each delegation be requested to reply to the following queries in short, direct answers:

1. Under what system are the roads worked in your county? Is it effective?
2. Is it better than enforced labor?
3. What amount of money (including all sums) was spent for roads in your county prior to the decision of the courts which abolished enforced labor, and what was the condition of your roads? How many pounds was considered a load for a pair of horses to pull 10 miles—good horses weighing 1,100 pounds?
4. What is the cost of the roads since the decision? What is the condition of the roads now, and what is a load under circumstances stated in the prior question?
5. How many miles of public roads are there in your county?
6. Do the officers in charge of the roads in your county appreciate the necessity of keeping water off the roads, or, in short, do they keep the roads so shaped that they will shed the rain?
7. Has your county purchased road machines or scrapers? If so, do they give satisfaction?
8. Does your county own team, horses, mules, or steam power (to work the road machine)?

9. If your county has road machine and does not own team, at what cost does it hire team per day, and is it satisfactory?

10. If your county has no road machine, can the roads be made smooth and to shed the water with ordinary spades, shovels, or hoes, or any other implement worked by hand, and if so, at what cost per mile?

11. Has your county employed convict labor from State penitentiary, or criminals in jail to work on the roads? If so, what did it cost per mile to make roads with such labor, and was it satisfactory?

12. What work has been done in your county in making macadam, telford, or shell roads, and what has it cost? How do these roads compare with the roads not so made in lessening the cost of hauling?

I suggest these questions because it will bring out the experience of all the different plans that have been adopted in Virginia, and those of counties that have taken the initiative in road-making will help those that have not. I hold that experience is of much more value than reasons and theories.

Mr. H. A. GILLIS. I think those questions are very good ones, and the answers to them will be of vast interest to the State at large. It seems to me it would be one of the most important duties of the State Good Roads Association to send out this list of questions, and, when answers are received, compile the same and put the information in proper form for distribution. Such information would be very valuable.

With regard to some of the matters which have come up before the Convention, I have been out of the hall nearly all day engaged on committee work, and have not had an opportunity of expressing my views. There is one matter which we ought to take into proper consideration; that is, we ought to have more public spirit in regard to our roads. I have heard several gentlemen say that if they are going to be taxed they want all the money spent in their own county. That is not the proper spirit. We are not going to make the State amount to anything if we are only "county citizens." Suppose a man invests \$1,000,000 in a certain piece of property—of what account is it if it stands in the midst of a desert? I don't think we will ever accomplish anything with that sort of a spirit. If we are going to have roads that are to be worth anything to us, the work must be systematized; and I agree with what one of the gentlemen stated here to-day, that the principal roads should be made State roads. I think that the State should have general supervision over the most important of the public highways, and the counties can run just as many roads into those principal ones as are needed and as have the means to build.

Mr. T. C. CUMMINGS. Mr. Chairman: I did not intend to say anything more, but I think the gentleman who has just spoken has hit the keynote. The engineers look at it from an engineering point of view, and I think the road work will have to be looked after in that way. These important roads will have to be taken hold of by the State, and the less important ones worked by the counties. I don't think anything should stand in the way of the establishment of State roads, taking as State roads certain thoroughfares that extend through the various counties from one end of the State to the other. I think some

committee should be appointed to look into this matter of State roads.

There is one point I made a note of. I think it was Mr. Ashburner, in his remarks on dirt roads, who made light of the plow. If any gentlemen here have any idea of getting the ordinary road machines in their counties, they will find that the plow is an indispensable adjunct—not to break up the main roadbed, but to operate along the sides. In the summer time, when we have to do most of the work on our roads, the ground gets very hard, and we take a railroad plow and run along the edge in order to loosen up the dirt. I was a little surprised that an engineer should discourage the use of a plow in road-building, and I think if he were to see the way they build dirt roads he would be satisfied that the plow was indispensable. I think that any county buying a road machine ought certainly to buy a plow, as it will be found indispensable; it will save half the cost of running the machine.

Mr. ASHBURNER. My friend from Hanover and I agree as to the utility of the plow, and differ only as to the proper place for its use. I say on the farm, and he on the road. I think if he will put a man to work on the edge of the road with a shovel and pick, he will find that it will answer just as well as the plow and result in a better lasting road.

Capt. BROWNE. We are here to consider our necessities, and to place this old State in the line of march with the progressive procession. Good roads is one of the urgent necessities of the people; it is the most important question before them to-day. The change in the tariff, the money legislation, and all the other laws that are claimed to have been enacted for the benefit of the people are not, all combined, of such vital interest to the people as the one question of good or bad roads. All that has been said before this Convention by those who have preceded me will aid others in the great work of road improvement. It is a Herculean task to start the work. Any one of the plans will answer, if it can be gotten in operation; any of them will make roads. The difficult task is to get the people to think that they can have good roads, that it will be a paying investment, and that they will be a better people for having them. I differ, however, with most of the plans submitted. I am confident that the work must start with the people in each county or magisterial district. It is useless to expect action to come from the State at large. The legislature will not make the move, though the members of it deplore the existing conditions they will take no step to remedy matters.

I have frequently been before that body from the State board of agriculture on the question of roads, and have failed to secure anything, and I do not believe that this Convention can hope for more. The effort must be with the people, and not on Capitol Hill. The people must have the means to start when they are ready, and the nearest place for them to lodge the whole question of road-making is with the

board of supervisors in each county; or, go further, and allow each supervisor to start road-making in his own district on his own plan. The question is not the building of roads so much, as it is to teach the people they can have good roads. "As a man thinketh so is he." If we think we can not have roads, we will not have them. On the other hand, "Where there's a will, there's a way." The legislature could do much to help this cause, but it will not. The next best thing for it to do is to authorize the board of supervisors to levy a tax to make roads. Then if the supervisors will appoint one superintendent of roads for their county, to carry out its orders, the responsibility of road-making will be as concentrated as possible.

The superintendent of roads should be employed by the year, and should have no other occupation. If he has, the roads will suffer. If a county is too large for one person to superintend all the roads, assistants could be employed; but it is absolutely necessary that the authority should be vested in one person, managed by the board of supervisors, who are directly among the people. The county court should have no hand in it; road making is executive work, not judicial. It may be contended that the supervisors in some counties would do nothing. This may be true as to some counties, and it would remain so until public spirit demanded something better. It would require but one or more persons in each county to put general road-making in motion by making a good piece of road here and there, thus demonstrating to the board the advisability of going a little further, and the counties more backward would be led on by those who were going ahead. It is, therefore, necessary to give each county and magisterial district the right to start at once; all will not get off together. The race for good roads in Virginia may be very much strung out.

Wherever there is public spirit enough to demand good roads in a county they will be secured, and the demand will grow and increase and be taken up by one after another of the counties. Members of this Convention must take home what has been learned here by an exchange of views, and get the people interested. The question of good roads comes home to me with great force, for I have in Northampton good dirt roads to haul over, and in another county bad dirt roads. I put four carts, each one with a mule to it, on the scales, and the loads which were hauled over the Northampton roads averaged 2,466 pounds; in the other county, 800 pounds is the universal load in delivering produce. In Northampton the tax for road purposes is 10 cents on the \$100, and in the other county, where the roads are bad, the tax is 20 cents on \$100 worth of property. This difference is owing to the adoption of improved methods, which reduce cost and give much advantage. Northampton has a road equipment consisting of one road grader, plows, carts, hand implements, six mules (two have recently been added), one superintendent for the whole county, who employs five laborers, and has a tent in which all can shelter.

This outfit has been directed to improve the worst parts of the roads first. In this way it has been in every part of the county, and has become popular everywhere; the people are unanimously in favor of it.

The work was commenced April 16, 1894, and to September 30, 1894, it had made  $17\frac{1}{2}$  miles of road. During this time there were one hundred and forty-four working days, but the force has been idle 20 per cent of the time owing to lack of teams. The superintendent says it will require ten mules to keep the machine going easy all the year round, so that during this time no more than half the necessary power has been employed. (This will soon be remedied, as all see the necessity for it.) The road made has cost \$55.17 per mile. This can be reduced half by addition of four more mules. The monthly expense has been \$175.75. The purchase of four more mules will add to the capital invested and the current expenses \$40 a month, but then the work will be doubled, so that it will be safe to say 75 miles can be made in a year, and that is half the roads in the county. The equipment has done much substantial good, more than five times its cost, \$1,011.24; still more in what the people have learned from it.

Gen. STONE. What is the character of the soil generally?

Capt. BROWNE. It is more sandy than anything else; all you have to do with a road of that sort is to keep the water drained off of it.

Mr. ASHBURNER. You don't use plows to work the roadbed with, do you?

Capt. BROWNE. I work up the sides of the road with it. Now there is one thing about dirt: the metal, or life, or something, goes out of it, and you have got to have some new soil sometimes. If you don't fill up a hole when it is wet, the dirt that you put in is not going to incorporate itself with the hole. If you fill the hole up when it is dry, and the walls of it have been made hard by wheels sliding in and coming out of it, the next wheel that comes along is going to push the dry dirt aside. But if you will fill it up wet and pack the dirt down, it will consolidate. Now the dirt road is the road for the people of Virginia to deal with. We will get these other things afterward. I have done a little shelling, and have found that I could make very good roads with shells, and very economically.

Gen. STONE. Have you any sawmills in your neighborhood which haul large quantities of lumber?

Capt. BROWNE. Yes, sir.

Gen. STONE. Do you find that that is damaging to the roads?

Capt. BROWNE. Yes, sir; cuts the road up tremendously.

A DELEGATE. Do they have narrow or wide tread wagons?

Capt. BROWNE. Generally wheels of  $3\frac{1}{2}$  to 4 inches tread. Hauling is a great expense where you have to make two horses do the work of one, and therefore a section of the country where there is a great deal of hauling done certainly ought to have good roads. I think I will



shorten my front axles a little, so that the back wheels will track just outside of the front ones.

Dr. E. T. BAKER, of Richmond. I represent the League of American Wheelmen. I think our friend from Accomac made a very good point when he said that the people thought that what was good enough for their "daddies" was good enough for them. Now that is just the trouble, and we must educate the people and get them to understand the advantages of good roads, and then how to keep them in order. I think that one of the most important factors in maintaining a road is to have a broad-tread wheel. A wagon should be a road maker instead of a road breaker, as has been very aptly put in a journal I have read, which gave points as to the road laws of the different countries, and especially in France, where they are supposed to have the best roads in the world. There they have the tire measuring from  $3\frac{1}{2}$  to 10 inches broad. You can imagine what effect a tire 13 inches broad would have. Then they have the axles of different length, the front axle being several inches shorter than the rear one; the consequence is that instead of having a rolling surface of say 20 inches (10 on each wheel), they have a rolling surface of 40 inches. Of course, not all the wagons have such broad tires; the width of the tires is calculated according to the carrying weight of the vehicle. We can very readily understand that in wet weather the roads are very easily cut up by narrow-tire wheels.

I think it has been clearly demonstrated that wide tires are the best for keeping the roads in order. Then systematic work is needed. I believe in a county road commission, and all that sort of thing, but it seems to me that they always lack the means to employ a sufficient force of hands to work the roads properly. They will work a certain piece of road and leave it in an unfinished state, and jump somewhere else on another piece of road. Then a rain comes and the narrow-tire vehicles break up the road, and they have to go over it again. I think, with systematic work and with proper width tires, the roads can be kept in good order.

Mr. WILLIS, of Culpeper. I think it has been demonstrated here that we need a change in our road system, and also that roads can be made with road machines. We have been using road machines up in Piedmont Virginia, for ten or twelve years, but we find that in our soil, when we raise it with the road machines, in freezing weather we will cut through just as deep as we did before, and it requires an entirely different working from that in the lower lands. I have been engaged for thirty years in lumbering and have run a great many teams, doing a great deal of hauling. I have made good roads, digging up stumps, and making them in every conceivable way, and I would not like to have undertaken to have used in my country the class of wagon referred to by my friend here—with a broad tread, as he puts it. I have found that if I got stuck in the mud or wet soil that I could get out easier with a narrow-tire wheel; of course I would go down deeper, but there

would not be that accumulation of mud and friction that I would get with a wide tire. However, I did not start out to say much on that subject. We, in the Piedmont section, find it necessary to have a different system, as our road machines are not altogether sufficient. There are a great many places in our roads where we need rock and other material, and it is necessary for us to have a greater amount of money than we have had at our command.

I will state this, however, that there has been great improvement made in our roads during the last three or four years, especially during the last twelve months, since we abolished the old system of working the roads, and we find we are now doing better work and our roads are in much better condition than under the old system. I would rather depend on the road tax than have a system of free labor; but we have got to recognize this fact, that some sections require different work from others. There seems to be almost as many varieties of opinion about the roads as there are men, or certainly as many as there are sections. We are so anxious in our section to have better roads that we are willing to adopt almost any plan that will give us better roads. My own idea has been for some time that while we could not expect anything from the legislature, we would at least have the privilege of spending some of our own money; that is, of issuing county bonds if we thought necessary, and also of using convict labor if we desired it. Those counties that do not want convict labor need not use it, but let those who do want it have it. We are going to have better roads; we are determined upon that. We will work around our own doors now, but we hope to get good roads in all directions sometime sooner than we are apt to with the present slow progress.

Capt. BROWNE. I would like to move that the report of Mr. Bond, which is now in the hands of the secretary, be printed with the proceedings of this Convention, without being read at this time.

Motion agreed to.

#### ORANGE COUNTY ROAD NOTES.

The annual appropriation for roads in Orange County is \$1,500.

Extra appropriations made for bridges when necessary.

Condition of roads bad, but gradually improving.

A fair load for two good horses on average road is one ton of 2,000 pounds.

It will cost a little more to keep our roads in order since the decision of the supreme court with regard to enforced labor, but the roads are improving much more rapidly. I think the enforced labor system tended to retard improvement in roads, since, so long as we had the enforced labor, it was very inefficient, and it made it hard to get an appropriation of money.

We have about 400 miles of public roads in Orange County.

Some of our overseers take interest in their roads and realize the importance of keeping the water off, while others do not.

We have two road machines.

County owns no team of horses nor steam power.

We pay \$4.25 per day for four-horse team and driver and 75 cents per day for man to manage road machine.

Orange County never used convict labor.

On motion of Mr. Coleman, the Convention then went into the consideration of the report of the committee on organization of a permanent association.

On motion of Capt. Browne, the constitution as amended was adopted as a whole.

Mr. H. W. Anderson then presented the report of the committee on recommendation of permanent officers of the association as follows:

#### REPORT OF COMMITTEE ON NOMINATIONS.

Your committee, appointed to nominate officers for the Virginia Good Roads Association, would recommend the following for the first year:

President, Hon. J. Hoge Tyler, Montgomery County.

First Vice-President, Hon. S. Wellford Corbin.

Second Vice-Presidents.—First Congressional district, Capt. O. A. Browne, Northampton County; Second Congressional district, Richard B. Tunstall, Norfolk; Third Congressional district, C. E. Ashburner, Henrico County; Fourth Congressional district, Col. Thomas F. Goode, Mecklenburg County; Fifth Congressional district, R. I. Anderson, Pittsylvania County; Sixth Congressional district, H. W. Anderson, Roanoke, Va.; Seventh Congressional district, H. L. Lyman, Albemarle County; Eighth Congressional district, Frank Hume, Alexandria County; Ninth Congressional district, Henry C. Stuart, Russell County; Tenth Congressional district, Judge Lyman Chalkley, Augusta County.

Mr. S. W. Corbin declining the office of first vice-president, because he thought the duties might conflict with those he had assumed as president of the State board of agriculture, nominated Mr. H. W. Anderson, of Roanoke, and Mr. Anderson was then elected first vice-president. This created a vacancy in the position of second vice-president from the Sixth Congressional district, for which Mr. Anderson had been named, and Prof. Randolph, of Blacksburg, nominated Mr. H. A. Gillis for that office. Mr. Gillis was thereupon elected.

On motion of Prof. Randolph, the following resolution was adopted:

*Resolved*, That the thanks of this Convention are due to the Chamber of Commerce of the city of Richmond for courtesies extended; also to Mr. R. A. Dunlop for the very able and efficient manner in which he has performed the duties of secretary of this Convention.

A vote of thanks was also tendered to the chairman for the able manner in which he had presided over the Convention, and to the members of the press for their accurate publication of the proceedings.

On motion of Prof. Randolph, the convention then, at 10.20 p. m., adjourned sine die.



