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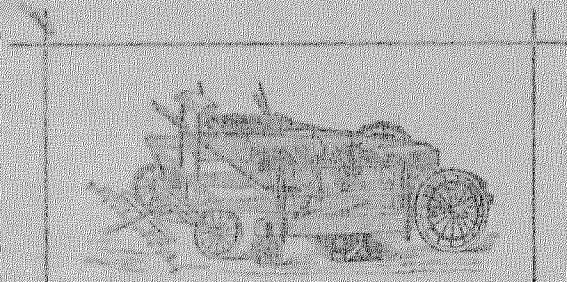
The Wauchope Grader and Ditcher.

ROAD-MAKING.

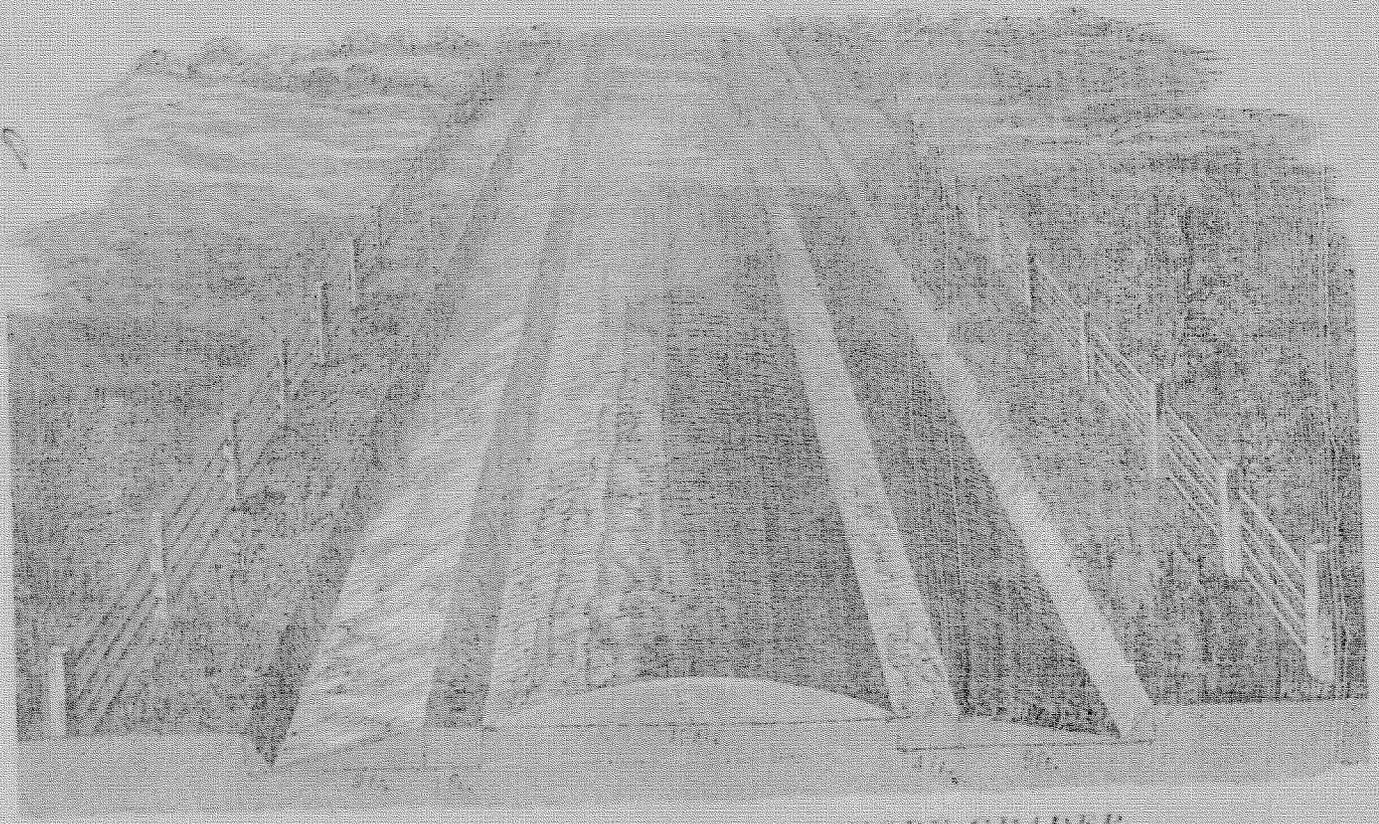
EARLIER ROADS.

AND HOW TO BUILD THEM.



WHAT EVERYBODY WANTS TO KNOW.

HENRY Field, Printer, 190 and 192 Clark Street,
Chicago, Ill.
1913.



Earth Road as made by the WATCHOPE GRADER.

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Earth-Roads, and How to Build Them.

The value of the farming lands of a country are determined, first, by its proximity to markets; second, by the inherent richness of the soil; and, third, by the improvements in fencing, drainage and buildings. Given all these, and there can be no permanent prosperity, and agriculture must languish, without good roads; and the farther the lands are from markets, and the richer the soil, the greater the necessity for superior roads; for in the first instance, the cost of hauling is great, and in the second, the bulk of products makes it necessary to have such roads as will bear the transportation of heavy loads.

What, then, is the reason, with such self-evident facts to support the proposition, that one of the first endeavors, in the settlement of a country, should not be the establishment of the road lines, and the building of the best roads the nature of the soil will admit?

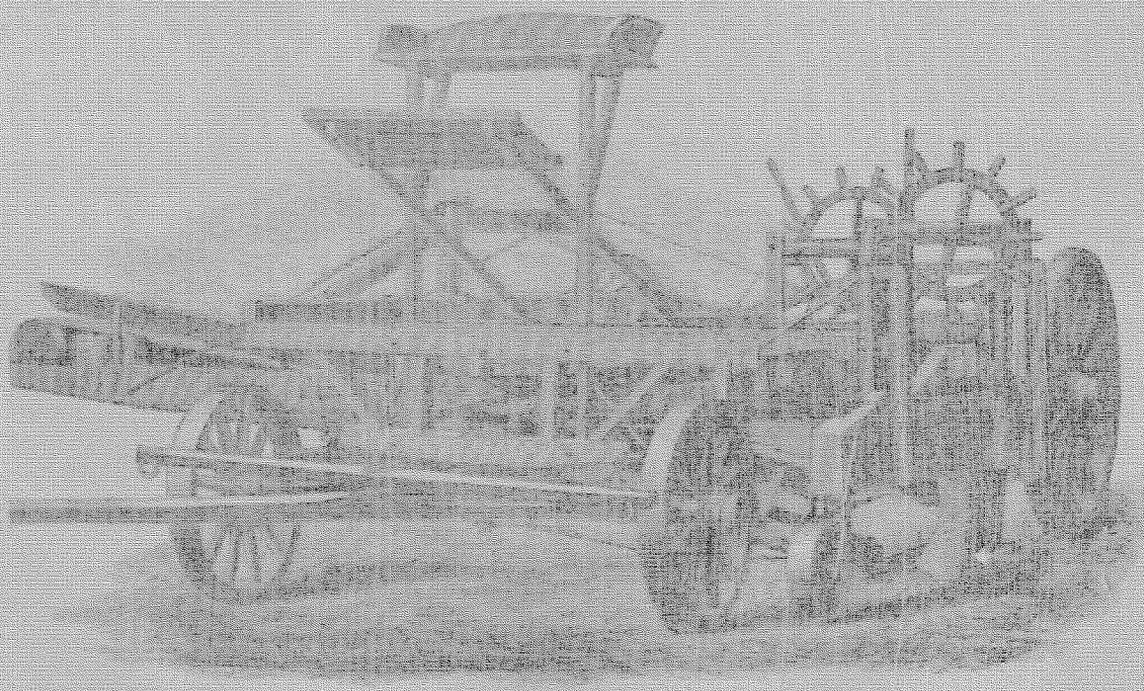
There are several reasons. The principal one, however, is that we have been getting and holding fast to ideas on road-making sent to us from England before the advent of railroads. We have been taught that there can be no good roads without stone or gravel foundations, and stone or gravel metaling or covering. We have been especially taught that good roads cannot be made in a *prairie country*.

GOOD ROADS CAN BE MADE

in any prairie soil. There are only two simple things wanting: A good, uniform and continuous grade — and drainage.

Yes, there is one thing more wanted — a knowledge of the proper manner of doing the work.

There is not one man in ten who can take a plow and scraper and



Side View of WAUCHOPE GRADER, showing Plow.

CHAPTER II.

WHAT THE PEOPLE SAID.

In correspondence with Mr. W. R. Parmelee, I found the usual width of their road beds to be 18 and 20 feet, and that the contract price for making the roads complete, is from 24 to 48 cents per rod. These roads are 20 to 24 inches high at center, above the level, running to nothing at the sides, or with ditches as may be desired, and so graded that there is a continuous slope to the bottom of the water way at the edge next the fence. So that the road bed and even the sides of the grade make a good road. The roads made in this way are nearly three hundred feet broad, and stand ever for better than roads made by the plow and scraper, and have done more to drainage the country, and are a great saving, over by any other means whatever.

MR. SHAW, OF ANDOVER, OF SAYS:

Under the unanimous opinion of the people of that town should be satisfactory of the superior excellence of the machine. It was here (Lake Wear port). It has great durability in combining in uneven surfaces of the ground, and works in a comparatively light manner. Proof of this may be seen in the great Lawler ditch, or water way, to carry the water of the extreme eastern line Iroquois river.

NOTE.—This ditch I examined and found to be as well executed as it could have been done with shovels; perfect in its slopes and curvatures, many miles in short, and varying in the depth of the cut from 8 to 12 feet. The ditch, on an ave. is 10 feet on the bottom, and 20 to 40 at the top, and with beautiful curves to avoid sharp or uneven cut making a good road-way on each side, and yet the whole forming no serious obstacle to crossing with a team, anywhere or everywhere.

Mr. Shaw continued. Three machines will cost about two cents per rod per day, easily in compact soils, and they have done a little yards. They will also load for ninety to one hundred cents. Have seen no reason than loaded in good manner. The power required is eight horses and two men.

CHATTANOOGA OR CORRUGATED GRADER, CLIPPER, CONSTRUCTION OF MACHINE.

In making roads over uneven surfaces where drainage is one of the requirements, it is necessary to deepen the ditches through the ridges or knolls, for narrow passages once made, they will soon come to the required capacity. Size of road beds from 18 to 24 feet width of ditch from 2 to 3 feet, and the depth from one and one-half to two and one-half feet. The soil is thrown from the ditch directly into the center of the road, by means of the extension machine, and the excavation completed, the road bed is quickly trimmed up with an eighteen inch timber, drawn diagonally up and back over the road, and requiring no further labor.

MR. J. S. CHAMBERLIN.

MR. JAMES DUNCAN, ASHTON, ROAD COMMISSIONER.

said that machine was not a good one, was imperfect in some respects, had been rebuilt from an old machine, and the timber was full of the old bolt holes; had

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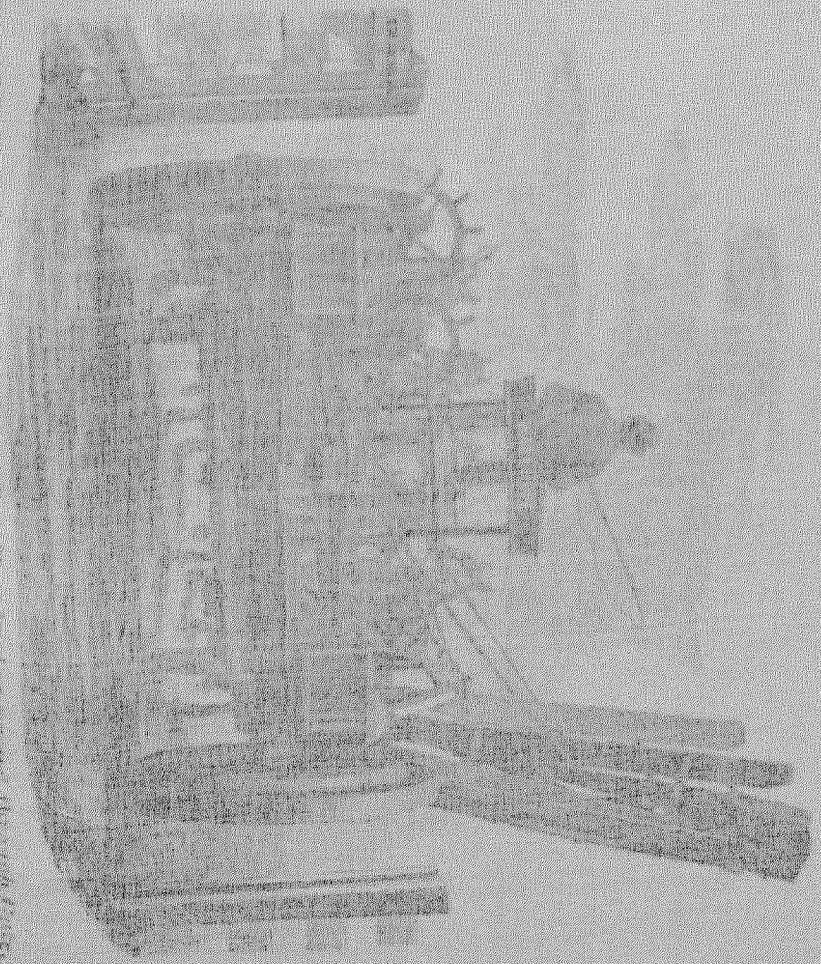
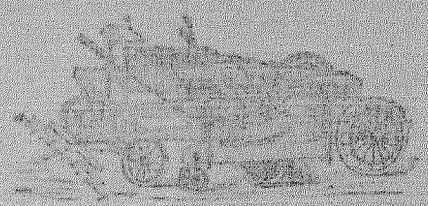
* To build this road with plow and scraper would cost at least 75 cents per rod. Thus 1,800 rods of road would cost $1,350; so you have in building this amount saved $900, besides the machine at $75, giving a total sum of $975.





CHAPTER IV.

THE VALUE OF DRAINAGE.

In relation to drainage, and in answer to a question upon the subject, the editor of the agricultural department of the *Chicago Tribune*, after giving the information required, tells the following good story in illustration of its value, in connection with good earth roads. And we will add: We know the parties referred to, and that the machine which accomplished the work spoken of, was THE WATEROUS TRACTION AND DITCHER. The story is as follows:

AUROTOS OF DRAINAGE.

In part "The Farm and Garden" in spite of a good story told us last fall by one of the prominent citizens of the northern part of your county (Iroquois) which fully tested the value of drainage better than we ever heard before, and is too good to be lost.

An honest, old-fashioned, and ignorant man, one of the first settlers of Iroquois county, was finally driven out of that region by the fever and ague—the result of the flat nature of the land, before scientific drainage rendered most valuable, one of the finest for cultivation in the State.

He gathered away to another State and locality, stricken with disease—himself and family—leaving his land, because he could find nobody to buy it, and selling it afterwards for a mere nominal price. At last, by dint of hard labor in a good country, he accumulated a little money.

In the meantime, enterprising and energetic men—and among them one capitalist—recognizing the wealth lying dormant in those flat lands and marshes, had settled on them. They undertook a thorough system of roadmaking and draining; and where once were lakes intersected by flakes, marshes and ponds waded by herons and cranes, or crowned by water-fowl natural to the West, and that prairie, water-soaked until the July and August sun sorely evaporated the stagnant moisture, with here and there slight knolls, the general characteristics of this and other prairie regions with the building of the Illinois Central Railroad, gave some indication of what might be done by its—next—new fertile fields, smiling farms, fine houses, good barns, best cities, towns, and all that goes to make a rich and rising country, are found throughout that region.

Well, after the lapse of years, the old pioneer, hearing of the rich country into which his old swamp grounds had been transformed, and like the Queen of Sheba, desiring to behold to come and see for himself. He did so and in his travels met and fell into conversation with a well-known landed proprietor

EARTH ROADS IN ILLINOIS.

Relating to this matter the same editor timely says:

"The subject of roads and road-making has, for the last few years, attracted much attention in the West, especially the prairie regions thereof. The modern system of railroads, doing away, as it does, with the travelling of goods for long distances, has rendered expensive main thoroughfares for wagons a thing of the past. What the West now wants is a system of first-class earth roads, that shall bring the farmers of the State into easy communication with the nearest railroad station—a system that, while it shall give good and complete earth roads, over which heavy loads may be hauled during the principal season of delivering farm products, shall at the same time effect, as far as possible, the drainage of the country. This, I am well satisfied from evidence in my possession, is now perfectly feasible through the perfection of machines that, while making good roads at light cost, are also capable of cheaply making ditches of any size, up to a width of 20 feet, and a depth of 4 feet. It is a subject that should command the attention of every farmer, and especially of every Road Commissioner in the West."

THE VALUE OF GOOD ROADS.

Upon this subject the *Prairie Farmer* has the following:

"However rich a country may be as to the quality of its soil; however genial may be its climate; however abundant water and timber may be, or however ample may be its water power or coal fields, for the development of manufactures, still it must, of course, remain without true prosperity until its productions are brought into easy and cheap communication with the markets of the world.

"The condition of Illinois, Wisconsin, Iowa, Missouri, Indiana, Ohio, Michigan, and other Western States, is well known to all the older settlers of the country before the network of railroads—in some of these States, as Illinois, for instance—had brought the average distance of the farms of the State within twenty miles of this system of transportation, which lessens distance in such proportion as the speed is increased.

"Every settler in these States, far away from railroad communication, knows the disabilities he labors under, when for weeks at a time the roads—many of which are mere markings upon which roads will eventually be built—are simply impassable for loaded teams; and which for fully nine months in the year are so rough that 2000 pounds are considered a good load for a strong team; when every farmer knows that prairie tracks, when dry, are among the best and finest natural roads in the world, and upon which two or even three tons may be hauled with ease, by a good and true pair of horses.

Every farmer in the county united would immediately find employment for his teams, until the worst places can be graded, the gutters and crossings be taken out, and the town house repaired in accordance with the requirements of the law. The contract system, wherein after the labor and expense of advertising premises to make completely ends out the matter.

Why are there here good roads? Until enterprising persons, there is nothing to tax to build them with. As the country settles up, road-making, under the old-fashioned system of working with one plow and scraper, under the supervision of the town officers, is attended with great expense, and by the time of fall the roads require, generally speaking, as much labor done upon them as they did in the spring. Hence, the great necessity for some other system of road-making, which will be more economical, and at the same time more effective.

This proposition may be regarded as self-evident, when the internal defects of the soil, generally speaking, and the requirements in the matter of drainage, etc., and the wealth of the community is considered. Unfortunately, however, the people of the country do not realize the fact that to be economical and effective, the roads are under the supervision of men who understand their business. For while two or three citizens of intelligence, the engineer, and the surveyor, from their proximity to market, realize sufficient tax to be raised to make their road fully equal to the requirements of market, the remainder, ignorant of these facts, refuse to vote the requisite amount of taxation, and the result is that the road fails, from want of the requisite amount of working done, that we have mentioned.

One of the great advantages of the prairie region of the West, is in the gently undulating surface, rendering drainage easy when once the roads have been laid out and graded. The same feature has also enabled railroads to be easily and cheaply built; but while capital has been freely expended in this direction, comparatively little has been done to improve the ordinary dirt roads, except in those localities where improved means for this purpose have been brought to the attention of the road superintendents and other public men, backed up by the community, has led them to investigate the subject, and being convinced, they have put those improved machines in operation, and thus saved their towns from one-half to two-thirds the previous outlay in this direction, according to the quantity and quality of the roads built. Instances have been cited to us where towns have been so graded as good roads, on section lines by contract, at a cost of less than fifty cents per acre, to the farmers adjoining, and instances could be cited where the road commissioners have furnished the machines, and farmers putting on their teams, the work has been accomplished at a cash outlay of five cents per rod for the roads graded, or for a tax of five cents per acre on the farms in the towns.

It is not generally known that machinery has done as much for road making as for any other of the labors connected with agriculture. This, however, is true. It is also the fact that while farmers have eagerly availed themselves of improved machinery in doing the actual work of the farm, they have not seconded their town officers as a rule, in the application of machinery, fully as perfect for the purposes of road-making as are reapers, mowers, horse rakes, etc., for the purpose of haymaking and harvesting.

To illustrate this subject, we have procured a fine illustration of a roadway, as made entirely by machinery, requiring the labor of only two men and eight horses to grade, in a superior manner, fully one quarter of a mile a day. This

Side View of Wheelbarrow Grader and Ditcher.

continuous road beds that would answer the requirements of heavy travel. It will at once be seen that, given the cost of the machine, and the value of the labor of the men and teams, the cost of road making may be estimated to within a fraction of the expense. Indeed, a machine will pay for itself two or three times in a season, or once in thirty days.

The question of good or bad roads is really one of the most vital questions in every community, and one that interests every farmer especially. It is also a question that the officers of a town cannot afford to put off, it being their duty to investigate and post themselves in the case. The profits of the farm, allowing that the farming has been good to-day, depend directly upon the cost of transporting the crops to market.

How then shall we go about the improvement of our roads? Examine the roads in your locality, ask yourself the question: Are they as good as the nature of the soil will admit? If not, how can they most economically be made so? Ask your road commissioners to investigate the subject of road making by machinery, as to the relative cost between this system and the old fashioned way?

We believe that any town whose inhabitants own four reapers, may also, afford to own a road-making machine, provided it will save, in making roads, as much as the reapers do in harvesting. We will go further, and say that every farmer who owns four or five reapers and mowers, may also afford to own a machine that will excavate ditches, make roads, throw up ridges for hedges, and do other work of like nature, at a cost of three cents per cubic yard of earth moved. We have seen this, and are credibly informed that it can be done even cheaper. At all events, the subject is worth the careful investigation of every man interested in good roads; for without good roads, the people of no locality can be uniformly prosperous or successful.

THE VALUE OF ROADS.

The Western Rural, in an article on the subject of roads, says:

Before the advent of railways it was absolutely necessary that the road ways of a country should be as perfect as possible between prominent cities, to the end that the various commodities for the use of the inhabitants of a country might be transported as quickly, and with as little wear and tear of horses and vehicles, as possible. Indeed, it has been found, as civilization extended, that no system of wagon roads was sufficient, and hence, canals were built when practicable, to connect important points, wherever nature's water source of sufficient capacity to float vessels did not already exist. Nevertheless the farmer who lived one hundred miles or over from water communication often found himself compelled to devote his attention to such crops as might be driven to market on foot, for the reason that the carriage on grain often consumed nearly or quite its value, leaving nothing for the trouble of raising and preparing it for market.

This became seriously oppressive to the inhabitants of the prairie region of the West, where stone or gravel, for metaling roads is found only at comparatively long intervals, and with the crude appliances for building earth roads in former years, it was found impossible to make

ROADS AND ROAD-MAKING.

The same journal, in a subsequent article on this subject, says:

There is no one matter of the largest living to the public welfare of the West, of more importance than the building of first-class earth roads. There is another item to which attention is needed in which half the cost of hauling is due to bad roads, and which, if remedied, would do much to relieve the burden of the farmer. Not only would the profits of the producer as well as the value of land be largely increased, but towns and cities would reach much enlarged dealing, and their interests also be largely benefited by the enhanced prosperity.

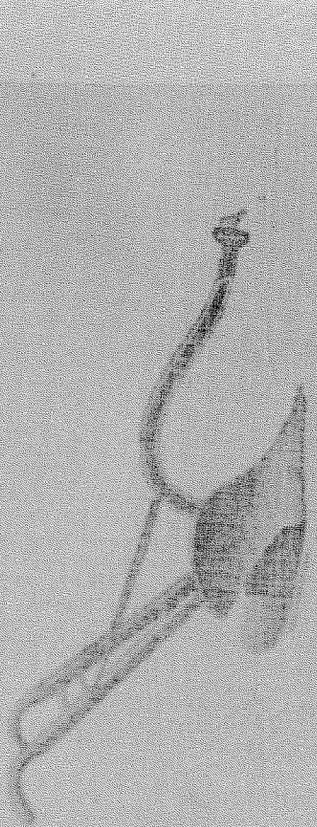
A prime reason why roads should be one of the first subjects engaging the attention of those in authority is that they are valuable for the money per mile, and so greatly increase the value of real estate wherever established. The wonder is that the important and long-ago ascertained fact is not better known and more generally appreciated.

It is true that under the old system of working roads with the plough and scraper, or with the plow and scraper, as we have always known it, it is impossible to construct public roads which would cost not to exceed a tax of fifty cents per rod on the farms. That we know to be the fact. But in our extended trip through Central Illinois lately, we encountered more than a dozen Road Commissioners, and in every instance, in the densely settled parts of the land of that section, who alleged that the cost of building first-class roads, by the best methods, would not exceed twenty-five cents per rod, and that annually had been taxed as low as twenty cents per rod or even less.

Let us figure the problem in this county. There are thirty-six sections of land in a township, and there are four rods per section line would require one hundred and seventy-two miles of road to build. That at fifty cents per rod, would be $27,520. There are in the county one hundred and seventy-six Congressional townships, which means that the price of these roads as well as yours, is just one-half as many dollars as there are acres.

It is not, however, our object at present to enter into the details of this matter. We shall proceed to relate. During the trip we have named, the most perfect system of road working was in the town of Livingston, Iroquois Co. Here the town trustees have assessed the Commissioners one dollar a head on each township, the farmers furnished the teams gratuitously, with which to dig their own roads. They have built twenty-eight miles of road. This could not of course, be done in the

Earth Road as made by the WALCHOPE GRADER.



CHAPTER V.

HOW CHEAPLY ROADS MAY BE BUILT.

The journal last quoted from has figured the problem correctly, so far as it goes. Let us go a little further. Mr. Mackin, of Grimes, has given testimony, showing that under the plan adopted in his town their roads cost from 15 to 18 cents per rod, and, as further says, "they made *big* roads." Mr. Hemenway, of Clinton, says that the correct price with them, of making roads complete, the road bed 18 to 20 feet wide, with the grade 20 to 24 inches high in the center and with berms as may be desired, and with a continuous slope to the bottom of the ditches, so that the whole surface, including the sides of the ditches, form a good roadway, is from 24 to 42 cents per rod.* And this must, of course, include everything — investment, wear and tear, labor, and profits to the contractor.

Now for figures:

The work can be done by contract at from 20 to 42 cents per rod. There are 23,040 acres in a Congressional township of land. If we must complete and perfect roads on each sectional line in the town, there will be required 72 miles of road, equal to 23,040 rods — or just the number of rods of roadway that there are acres in the town. To build this road, will add, at the highest price, 42 cents per acre, at the lowest price, 24 cents per acre, to the cost of the land. Is there a farmer owning 160 acres of land in a township, who would not willingly give $52.80 (80)* to have a good and complete road made in front of his farm. Not only this, but on every section line running in both directions entirely through his town.

But again, Mr. Mackin says, *they built big roads* for 15 to 18 cents per rod. This makes the cost only $24.00 to $28.80 per 160 acres of farms.

Let us extend our figures a little further. Mr. S. H. Hemenway says, $8.00 per day will hire 8 horses and two men; that $1.50 per day will pay for wear and tear of the Watrous Grader, including oil. This

* $52.80 is the average cost, as between 24 and 42 cents.

makes $8.00 per day as the total expense of running the machine. He further says it will average 4 miles of road per day. Now, 4 miles of good road can be made per day, when everything is hired, at a total cost of 111 cents per rod, or per acre of farms, or for a total outlay of $177.60 for each 160 acre farm, is there any better investment that the tax payers, the owners of farms, and other business men, can make to increase their aggregate wealth?

HOW TO SECURE VALUE.

Each 4 sections of land fronts on one mile of roadway, and each 4 sections would pay for grading one-half of this road, under any system that can be devised. We have shown that by contract even with machinery, the work would run $4.75 cents per rod, and with the plow and scraper, it will cost from 75 cents to $1.50 per rod, the latter price for a good road as built in this way.

Is there a man owning a 160 acre farm, who would not willingly put on the necessary teams for two days to secure his share of his mile of road, the town furnishing the machine? We think not, especially when he comes to know that it reduces his tax to a mere nominal sum. As it stands, under the old system, the tax has to be paid year after year. What do you get for it? A little grubbing here, a little scraping there, and with roads never good, and in 99 cases out of 100, a perpetual scandal to the town, its inhabitants and its officers.

But let us now figure and find the least cash cost at which the roads of a town can be graded, in a complete and substantial manner, by the use of THE WHEELER GRADER AND DITCHER.

ROADS MADE AT ONE CENT PER ROD.

The town buys the machine. This is the capital employed. They hire a man and two horses at a cost of $4.00 per day to go with, and work the machine. Repairs, as we have already shown, will, at the outside, cost $1.00. Here we have $5.00 per day as the cost of doing the work. The farmers, as we have also shown, are willing and eager to donate the additional team work, while grading in front of their farms. $5.00, therefore, in cash outlay, grades 80 rods of road. The cost per rod, including wear and tear, is 5 cents per rod, or $8.00 for making a complete road between two 160 acre farms. No, it is something more. We have allowed for wear and tear, but not for interest on the cost of the machine. The interest on $675.00 for 1 day, at 10 per cent., is 18.48-100 cents, or nearly 18½ cents. Thus the cash outlay for building 80 rods of road, would be $5.18½, and the cost for building a road between two 160 acre farms, $8.20; or, 5.1-5 cents per acre of land owned by each individual. Thus, grading an entire township, both ways, on each section line; and, giving one front on a good and complete roadway.

Team of HORSES, GRADING, showing Plow.

But again it is not expected that a township will be graded in a single year. Nor is it to take ordinarily about five years. Then this tax, slight as we have shown it to be, even if all were worked in one year, is really extended over the five years. Thus to get the yearly tax for five years, we must divide by five. Now we have shown that under the system of donation of towns, it costs but five cents per acre of land in a township. Thus the total actual cost for each 160 acre farm would be but $1.60 per year for five years, and then after that there would be no road tax to be ready for the town would own the machine, and a very slight outlay of labor by the inhabitants would keep them in repair.

Now for results. Let the machine run in the fall, plow your furrow and the machine will cast it directly where you want it, in the ruts or the center of the road. Then as fast as the frosts can, you repair your roads, driving up one side and back the other, and the operator will easily elevate earth over the top of the culverts without difficulty, and it is the only machine that will do this.

For this, great as we have shown it to be, is not all. With these superior and continuous roads, you also, have made superior and continuous drainage on every section line, and the same machine that has made your roads, will also cut ditches at the rate of 5 miles a day to convey the water to the nearest water course. It will also cut drains through meadows, or other fields, that present no obstruction to the mower or reaper, or to the passage of teams. Is there a farmer who could not afford to give the cost of making these roads for the advantage of the drainage alone? No!

Can any town afford to be without THE WATSON GRADER AND DITCHER?

No one. Except, perhaps, those localities where the inhabitants plod on from year to year without a proper machinery of any kind whatever.

These facts and figures must commend themselves to any intelligent, thinking business man. Examine for yourselves the amount of money yearly raised for the purpose of roads in your town; and the amount of good, or should such be built, under the old system. *Then remember, that if we do not prove upon actual trial in your town that* THE WATSON GRADER AND DITCHER *is capable of making 1-4 mile of good road in a day, that there is no cost to the town for the trial, whatever.* Then figure how much additional money this machine will enable you to spend on bridges and culverts, and other improvements. Then figure how much the inhabitants of a town could earn at their regular work—one being obliged

Fig. 1.—Road Plough as used by the Author.

[illegible] and work it, so that the task of making good and [illegible] roads, extending through and from one township to another, and at a comparatively nominal cost, can be made a success.

But in working roads upon any plan and especially by machinery, you must work understandingly. That if you buy a machine and put one man on it to-day and another man to-morrow, you will fail. A steady man is as necessary as a good machine, and I am still to find no community to buy a machine unless they intend to employ a steady man, and team, to work it; for thus the man understands the machine, and will do more work in one day than can be done in five or three when continual changes are made.

If additional testimony is wanted, visit the towns of Auburn, Cohasset and Douglass, in Worcester Co., Mass., containing 30,000 population and 120,000 rateable property, one of the worst towns for roads in the State, and see what Tue Wayrorn Improver has done in the short space of seventy days, and in determining what is now one of the best sections of Illinois, visit the vicinity of Champaign, Illinois, and see what has been done there with Tue Wayrorn, and what it has done for that locality. Or, go to the town of Compromise, where Commissioners built, last year, after the first of August, 30 miles of good road without levying additional tax. Indeed, some of the inhabitants did not work their tax at all, because the machine did not reach to their vicinity until autumn was too far advanced to work.

Many other localities might be mentioned if space would allow. In fact our references for machines are Every man who has Tue Wayrorn. You can easily secure possession that will do you can have, at the lightest possible cost, the best system of Earth Roads in the World.

"Oh!" says one Commissioner, "we are too poor. Our town cannot afford to spend $65 for a new machine. Rich towns ought do it."

Can't afford it, indeed! It is those towns who have but little money that *can afford best* to buy a machine, for the poorer you are, the greater the necessity to save money by using the best improved machinery, that works at a mere nominal cost, thus making one dollar go as far as ten would under the old system. You put a part of your road tax in the machine, and the balance more or less to work it, and in a short time you have good roads, at a cost of about one-tenth of the sum you ordinarily expend. Thus you soon have complete roads.

declared themselves perfectly satisfied with the work, as stated by all who used it.

The one-half mile of swamp was graded, and the road was built at an actual cost of seventy cents per ton, including the carting of stones. "And now," said the Commissioners, "all we have to do is to build one hundredth part of such road, and the machine has paid for itself."

A SIMPLE SCHEME WAS

Mr. Phinney, near Chongaloo, having seen the work of the machine offered his team that he would donate his teams a number, and furnish men and teams to build four miles of road, the work to be done adjacent to, or between his farm and the city. The machine was bought, and he fulfilled his agreement, and thus offered to make four miles more, stating his extreme profit.

Not He could not get the chance for a long while. Every farmer was now anxious to furnish teams and get the machine. The consequence is, that this locality has good roads, and at almost no expense to the towns.

SOME WORK BY CONTRACT.

We often find men who remark like these: "Our town is too poor, or the people won't like it if we buy a machine. But some men to buy one, and we'll let him the contract to build our roads.

Yes, that would be a good thing for the contractor, and every one doing so, and getting rich. The contract price paid for building the roads, may be, will absorb your entire tax in for or twenty days. He then goes to another town and gets their money. Yes, it is a good thing for the contractor. Let us see. 30 rods of road a day for ten days is 300 rods. This, at 80 cents per rod, a fair contract price for a good road, is $240, about enough to buy a machine. You buy one, paying a part down and get time on the balance, have a man and two horses to draw the machine about and superintend it. The farmers are glad to donate teams to work in front of their farms, and thus, in one 30 days, allowing for bad weather and delays, your machine has paid for itself, and without additional tax to the people. And at the end of the season you find that you have more graded than would have been accomplished in 10 or 15 years under the old system. Not only this, but you have drainage and good drainage and good roads where you have farmers.

The fact is, that under the old system of making roads, a town might become bankrupt. Under the new system, with Tax Warrants Granted and Deeds, the farms of a town are soon DOUBLED AND TREBLED IN VALUE.

CHAPTER XII.

WHY WE HAVE BAD ROADS.

The assertion is true, that under the old plan of working roads by warning out the inhabitants with plow and scraper, that but seldom in three years was a mile of road built in a year; and it is a good town that builds a mile. Each Congressional town has 72 miles of road to grade, allowing that they are only built on the section lines. It is easy to see that a man would get old and gray before the roads of his town were made. Before the last miles are graded the first are worn out.

Why?

Because the roads, as usually built, are built at haphazard.

ONE REMEDY.

what is every one's business is no one's. As the following incident will show. Traveling in one of the first counties settled in Northern Illinois, we found a man who, by long years of hard labor, had amassed a fine property. The house was handsome, well-painted, and, as well as the fences, in good repair. The barn was ample and well painted, and the stock looked thriving; but there was a horrid mud-hole not far from his house, and the roads, generally, were bad. So the following colloquy ensued:

"Good morning, Mr. ———. Fine day. Good weather for planting corn."

"Yes, excellent weather, but I had to go to town yesterday, and the roads were very bad. Somehow the water and mud is hard to dry up."

"How long have you lived here?"

"Oh, all my life nearly. My father took up the land at government price, and he and myself have worked mighty hard to keep the farm together and improve it."

"You must indeed have done a good deal of work here. Your buildings are first class, you have a nice orchard, hedges and fences in good repair, plenty of trees, and the land is really nice. Why don't you have better roads?"

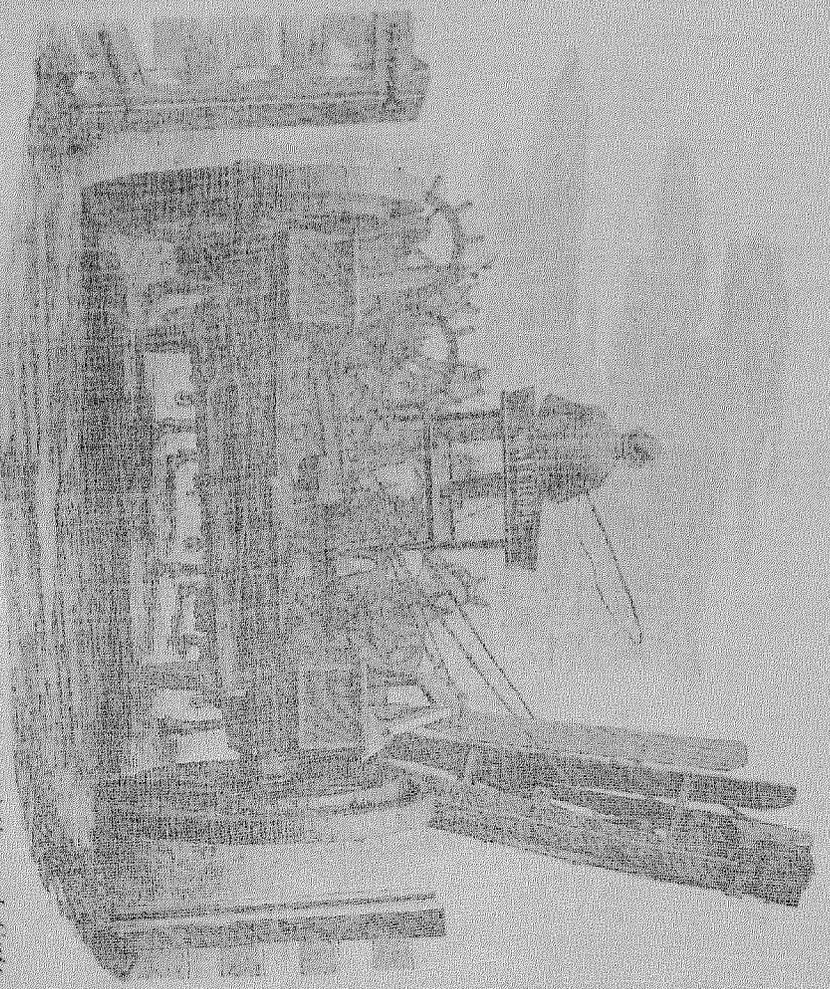


Fig. 1.—A Good Road Scraper.—Passed through Gates.

"Oh, that is not my business. I pay my taxes. If we don't have good roads it is the Commissioners' fault, I suppose."

"Who are your Commissioners?"

"Well, Mr. Smith, who lives in the timber down at the run, is the nearest one. I wish somebody would punch them up."

So we traveled along until we found Mr. Smith, a really intelligent man, but one of that sort who did not rely upon himself.

So said we: "Mr. Smith, I want to sell your town a machine, THE WAGGONER GRADING AND DITCHER, for making roads."

"Really, now, we Commissioners have been talking about that very thing only the other day. We tried this Spring to get the people to vote that we should buy one. We ought to have one. Perhaps they will do it next year."

"Mr. Smith," said we, "if you wait for the people to vote a machine, you will never have one. They have elected you and your colleagues to attend to this matter, and expend the tax to the best advantage. You must satisfy yourselves as to the merits of the machine."

"If you think you can save money for the town, it is your duty to do so; and you cannot save money faster than by making good roads, by a machine that words nearly automatically, and at a merely nominal cost. Why! the people will willingly supply teams to grade roads with THE WAGGONER in front of their own farms."

"Grade in front of their farms," said the Commissioner. "Why, we have hard work to get them to work out their tax, let alone giving anything."

"Very true, Mr. Smith," said we, "and no wonder. Plowing and scraping is hard work, and when a man sees how little is done at night no wonder he is discouraged. But show him a machine as easy to work as a mowing machine—a machine that will easily make 80 rods of first-class road a day, and that in the best possible manner, the case would be different. With THE WAGGONER GRADER AND DITCHER you might have admirable roads, and when one of your townsmen wanted a plank or team to repair a broken bridge, he could get it under the system I am advocating. You have perfect and continuous roads in place of bad ones. People are attracted to your town on account of the excellence of its roads; farmers and others can haul heavy loads to market; every one is satisfied and anxious to loan his team to make or repair roads in front of his farm, and the people no longer groan under onerous taxes, the results of which they cannot see.

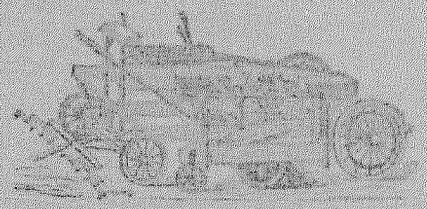
"Here is one of my contracts. You will see that the guarantee I

make it full and complete. You are fully convinced of the value of the machine, suppose you go with me to the other Commissioners and have this thing fixed up right here."

"Well, I guess I will. We have wanted one for a long time."

And so the thing was accomplished, the machine was sold, and that town built, from the first of August until the close of the season, 20 miles of good and substantial road, and with no extra tax for the people.

Now, in relation to the contract, this will be furnished upon application, and then an agent will be sent to set up the machine and show its work:—



CONTRACT.

FOR WHEELOQUE GRADER AND DITCHING MACHINE.

THIS AGREEMENT, Made and entered into this ____ day of ____, 18__, by and between I. Edwards of the city of Ottawa, County of Cook and State of Illinois, and ____ Commissioners of Highways in the Town of ____ County of ____ and State of Illinois.

WITNESSETH, That the said Edwards hereby contracts and agrees to sell to the said Commissioners one of the Wheeloque Graders and Ditching Machines complete and ready to be used made and of good materials and capable of excavating and shaping to be well made and of good materials and capable of grading and ditching, say a mile of ordinary prairie road per day, in fair order, and to be drawn by ____ horses, and operated by ____ men, and to do as much work as can be reasonably required of it by the engineer, and connecting with horses and drivers such as are usually employed. And the said Commissioners of Highways hereby agree to purchase said machine and to pay for the same the sum of $____ said amount to be paid as follows: $____ in Cash and $____ in Town ____ per cent payable ____ and bearing interest at ____ per cent per annum.

It being understood that the said Edwards or his representative shall set up and operate the working order, and prove by its use its capacity of doing the amount of work herein above specified, the said Commissioners refusing to supply the necessary help and teams however required by the said Edwards or his representative, and upon trial the machine shall be found capable of doing the work herein claimed, then the said Commissioners shall at once receive said machine, and complete the purchase by payment as herein provided also by paying the freight on said machine from Chicago to ____

But if said machine shall be found defective or incapable of performing the work as herein claimed, the said Commissioners shall not be required to receive said machine unless said defect shall be remedied by the said Edwards and its capability finally proven; but if it shall be shown that the said machine is incapable of doing the amount of work as herein claimed upon this contract *shall be wrong both and Commissioners* the said Edwards agrees to take back the machine and pay all freights and expenses incurred.

IN WITNESS WHEREOF, we hereunto set our hands and seals this ____ day and year above written.

Witness, ____ [Seal.]
____ [Seal.]
____ [Seal.]
____ [Seal.]

Thus you see that you have no risk in the trial of the machine. It is brought to you, set up, and tested. If it does what is claimed, you certainly cannot afford to be without it. If it does not accomplish what the contract calls for, you have nothing to pay, but you have a quarter of a mile of good road built for nothing—a thing of real value—and which cannot be hauled away with the machine. So you are that much ahead.

machinery can be used, build and repair its roads for one-half the expense of the ordinary way with the plow and scraper.

The following is the premium referred to:

To the township that shall build the greatest number of miles of earth road, made during the year 1875, a premium of $100.

Statements to be made to the Secretary of this Board by the first of January, 1876, giving full information on the following points: Soil; method applied in road construction; width of road between ditches, giving the width and depth of dirt put on the road bed; width and depth of ditch outside road bed, and cost per mile of road.

The whole to be verified by affidavit of the township road of commissioners, or three supervisors of any congressional township, as the case may be.

Very respectfully, S. D. FISHER, S. B. T.

Which is to be the banner Town of Illinois, for new roads, for 1876?

CULVERTS — GOOD AND BAD.

One of the most important things in road making, is providing sluiceways, or culverts, at proper intervals, so the water may readily pass under the roadway, from one side to the other, to keep up the continuity of the drainage; for if water be allowed to stand in the ditches, the roadway must remain moist, and consequently soft.

One of the greatest nuisances are the rough and uncouth wooden abominations, miscalled culverts, often like Shakespere's image with those "a mile too wide." When these ditches receive the accumulated waters of fields, as when the roadway crosses natural water courses, substantial culverts, or bridges, must be provided; but when the accumulation is simply the drainage of the road, with perhaps some addition from the adjacent land, simple sluice ways are all that are necessary, and these should be built after the road is graded.

BUILD CULVERTS AFTER THE ROAD IS GRADED.

Grade the road as wanted before you build your sluices, then excavate to the desired depth, level the bottom accurately making it concave to fit the convexity of the tile, lay them carefully, pack the earth firmly around them, until they are so securely held that they cannot move; lay a plank upon the soil, say from 4 to 6 inches over the tile and then fill in the earth so that the grade may correspond with the rest of the road. Thus, there will be no danger that the most heavily loaded teams will injure the tile, and there is no reason why they should not last as long as the road itself.

CAST IRON RULES NOT REQUISITE.

It has also been objected by those who have studied works on drainage, where certain cast iron gradients, if I may be allowed to coin a term, being determined on by the engineer, every slope of the various undulations must be cut away and the materials used to fill the slight hollows, so that the road when finished should present a continuous line of equal rise and descent, like a railroad. Indeed, railroad engineers are beginning to find out that it is cheaper to run over many natural grades than to cut through them; and hence, railroads have become practicable where once it was thought it would not pay to build them.

It has also been found, in practice, that the ordinary undulating surface of our prairies forms no obstacle to the continuous running of roads, and that the grades may follow the surface, unless in exceptional cases where a sharp, high ridge may intervene. These may require some cutting, but far less than has generally been supposed. As a rule, the grading may be made continuous over hill and dale, and very seldom will it be found necessary to deviate from a straight line to avoid obstructions.

NO ENGINEERING REQUIRED.

Therefore, no engineering is required. Nothing but a Watchman, a Grader, a good driver, a set of flags by which to drive, sufficient team, and a man to operate the machine, and the work may go on continuously at the rate of a mile to a mile and a half per week of road completed, perfect in its slopes and drainage; through valleys and over the gentle slopes that are everywhere found on our grand prairies. The very fact of the superior drainage which this system of roads would give to prairie farmers is, in itself, one of the most eloquent pleas possible for its general adoption. But, valuable as this one point really is, it is but an integer of its final value to the West, and almost insignificant in comparison with the development that would follow, and the wealth that it would create in the State, were the system of building first-class earth roads by this machine generally adopted.

ROAD BEDS GENERALLY TOO NARROW.

How to do this to the best advantage is the question?

One of the mistakes, and a very pardonable one when the work must be done with the plow and scraper, is that the road beds are commenced too narrow. Thus, when it becomes necessary to widen them, as invariably it must, in order to accommodate increased

Plow of Steel Grader Being Drawn.

DOCUMENTS AND TESTIMONIALS.

The following Documents and Testimonials will speak for themselves:

[illegible] Fireman's Canyon, August 5th, 1874.

J. MORA MOSS, Esq., Gen'l Supt. S. J. & K. R. C. & I. Co., Stockton, Cal.

Dear Sir:—In answer to your request, I have examined the work done by the Weaver Grader, and by the 10 Fresno scrapers, and am satisfied with the results. I have had both machines at work on the hardest kind of ground that we have to deal with, and the actual working results were 880 cubic yards in 9 hours, at a cost of $24 for men and teams, or about 2½ cents per cubic yard.

It is a sandy loam, and with the improved form of plough, I am satisfied the machine will work up to 1,000 cubic yards a day.

For all roads, main canals and for levees, the larger machines are necessary.

I consider that Mr. Edwards has proved his case, and that the principle of the machine is one well adapted for grading and moving earth for canals, ditches, roads, and levees, and is likely to be of great value to this State.

Yours truly, H. M. FRENCH.

Chief Engineer San Joaquin & Kings R'r or Canal & Irrigation Co.

THE SAN JOAQUIN AND KING'S RIVER CANAL AND IRRIGATION CO. }
CHIEF ENGINEER'S OFFICE, August 4, 1874. }

As an Assistant Engineer of this Company, I have watched the work done by the "WEAVER GRADER AND EXCAVATING MACHINE," superintended by Wm. J. Edwards, 627 South Halsted St., Chicago, Cook Co., Illinois, while grading and excavating our ditches, levees, etc., for this Co., and pronounce the same to be the easiest and cheapest method of removing earth, whether on railroads, canals, or any other public and private works, and should decidedly advise any person in charge of large or small works to give the WEAVER MACHINE a fair and unprejudiced trial, and they will see for themselves.

This machine having, by my measurement, this day removed 880 cubic yards of earth in 9 hours, at a cost of $24, or rather less than three cents per yard of earth. The soil being hard alkali adobe soil. CHAS. K. SHEARD.

CANAL HEAD QUARTERS FIREBAUGH'S TOWNSHIP, FRESNO CO., CAL. }
OFFICE OF S. J. & K. R. C. & I. CO., FIREBAUGH'S, CALIFORNIA, }
August 5th, 1874. }

Having examined the work and working of the WEAVER GRADER AND DITCHER manufactured by J. Edwards, of Chicago, am fully satisfied that they

we will allow same with scraper, for it is harder work. It will take one team to plow; that leaves three teams to the scrapers; each team, if well managed, and the earth is convenient, will put up four rods, sixteen feet wide, fifteen inches thick, per day, making a total of sixteen rods per day, counting plow; and making our road cost $325.00 per mile, compared with machine worked at $93.00 per mile, making a balance in favor of machine of $232.00 per mile. So you can readily see that you need to make but little over three miles till the difference pays for machine.

I hope you will excuse this tedious report. Yours respectfully,

N. B. ODELL, *Com. of Highways.*

We, the undersigned residents of Ashkum, of the town of Ashkum, do hereby certify that we have read the above certificate and having seen the work done by THE WAYNESBURG GRADING AND DITCHING MACHINE, do, without hesitation, pronounce the same to be true in substance and in fact.

JAMES NOTTINGHAM, *Merchant.*
OTTO V. WOLCOTT, *Farmer.*
HARRISON I. PAYSON, *Merchant.*
A. J. LAKE,
H. I. PAYSON, Sr., *Supervisor.*

CLINTON, ILLINOIS, July 1, 1870.

We, the undersigned, do hereby certify that we have a thorough knowledge of the practical workings of THE WAYNESBURG GRADING AND DITCHING MACHINE, manufactured by J. W. EDWARDS, of Clinton, Illinois; that we have examined its merits, as a labor-saving machine, in its capacities as a grader and ditcher, and form our judgment upon a careful investigation and inspection of the work performed in this township during the past two years, since its introduction here; and that we do, without hesitation, aver and declare it to be the very best machine now known to us for the purpose for which it is designed, and declare it to be, to the best of our knowledge and belief, without any competitor or rival known to us as a good grading machine.

S. B. WALTON, *Supervisor.*
M. B. PARMETER.
TAFT & GAGE, *Hardware Merchants.*
WALTON & HOOPES, *Lumber and Grain Dealers.*
J. HARLOW, *Editor Clifton Weekly.*
I. VAN DUZOR, *Dealer in Agl. Implts.*
JOHN BETINGER, *Dealer in Boots and Shoes.*
SMITH & GAGE, *Merchants.*
W. W. TAFT, *Town Clerk.*
F. H. SPINK, *Merchant.*
E. SILL, *Agent I. C. R. R.*
JOSIAH RANDALL, *Carpenter.*
A. H. SOUTH, *Sheriff, Iroquois Co., Ill.*
C. GAGNON, *Merchant.*
F. W. HOWE, *Land owner.*

I, LOUIS HENROTIN, a Notary Public in and for the county of Iroquois and

State of Illinois, [illegible] county, [illegible] being duly sworn, according to law, deposes and says that he used THE WATSONVILLE GRADER AND DITCHER last Spring, in grading the Chicago, Danville & Ohio River R. R., and that with it he has excavated and put in the grade [illegible] cubic yards of earth in one *day*, actual measurement. He further states that the daily average of earth moved with said Machine varied from [illegible] to [illegible] cubic yards.

[illegible]

Subscribed and sworn to before me, this [illegible] day of September, 1872.

[illegible], *Notary Public.*

We, the undersigned, residents of the county of Lewis, state of Iowa, do hereby certify that upon the presentation of W. J. Edwards, of Iroquois county, Illinois, we were induced to purchase of said W. J. Edwards, proprietor of THE WATSONVILLE GRADER AND DITCHER, MACHINE, upon the assurance that said machine would perform all that is claimed for it in the circular now in his possession and before us. We have used the machine and have carefully kept an account of every [illegible] of earth [illegible] by the machine on a grade and ditches, and we unhesitatingly state that the said machine [illegible] from fifty to the [illegible] of said W. J. Edwards, as set forth in his circular, and for the purpose for which it was designed. We recommend said machine. And we refer to the [illegible] who have used [illegible] during this day graded and ditched [illegible] contract, averaging [illegible] cubic yards to the rod. And we further state that [illegible] day of March, to [illegible] days, actual working time of said machine.

F. M. [illegible],
[illegible].

We, the undersigned, citizens of Marquette, Iowa, do hereby certify that we witnessed the trial of THE WATSONVILLE GRADER AND DITCHER MACHINE, owned by the within certificate, the most essential object of the statements therein made and set forth, and that they are correct and true in substance and in fact, according to the literal meaning thereof, and not in any way misrepresented; and that we are acquainted with the signatures subscribed to the above certificate and know them to be genuine.

LEANDER HYDE,
H. HOWARD,
A. SHERMAN,
J. B. BAKER,
C. W. CAREY.

GILMAN, Ill., September 30th, 1871.

I have put up with THE WATSONVILLE GRADER, on C. C. & S. R. R., 1252 cubic yards of earth in 2½ days.

T. B. CALDER, *Contractor.*

PAXTON, Ill., September, 1870.

I hereby certify that I have used THE WATSONVILLE GRADING MACHINE on the L. B. & M. R. R. with complete success, often handling 300 cubic yards of earth per day; and for railroad purposes it is superior to any other in use.

J. A. BAICH, *Contractor.*

STATE OF ILLINOIS, }
Cook County. } William Morrison, being duly sworn, according to law, deposes and says that he used THE WATSONVILLE GRADER AND DITCHER last Spring, in grading the Chicago, Danville & Ohio River R. R., and that with it he has excavated and put in the grade [illegible] cubic yards of earth in one *day*, actual measurement. He further states that the daily average of earth moved with said Machine varied from [illegible] to [illegible] cubic yards.

WILLIAM MORRISON.

Subscribed and sworn to before me, this 16th day of September, 1872.

J. P. KELLER, *Notary Public.*

PIKE, Kankakee Co., Ill., June 1, 1870.

We, the undersigned, do hereby certify that we were present to-day at a trial before the Road Commissioners of this town, and the public generally, of THE WATSONVILLE GRADING AND DITCHING MACHINE, made by W. J. Edwards, of Clifton, Iroquois Co., Ill., proprietor of the said machine, and purchased by the Road Commissioners of this town, upon a warranty of the said W. J. Edwards that said machine would ditch and grade eighty [80] rods of prairie road in ten [10] hours. We hereby express our satisfaction with said machine, and also our astonishment upon witnessing the said grader this day, to find that *over two hundred rods of good grade road well ditched had been completed* inside the time in which said W. J. Edwards had agreed that it should grade and ditch but eighty [80] rods. We, therefore, most cordially recommend THE WATSONVILLE GRADING AND DITCHING MACHINE as, beyond comparison, the best machine we know of as a practical working machine, for the purpose for which it is designed.

AZARIAH [illegible],
PHILIP KAMMER,
F. C. [illegible],
JAMES D. LEE, *and others.*

Road Commissioners.

We, the undersigned, Road Commissioners of the town of Ashkum, do hereby unhesitatingly recommend THE WATSONVILLE GRADER AND DITCHER as an invaluable machine to our town, and find that in our heaviest grades we had the dirt taken from the ditches on each side of the road and deposited in the best possible manner on the road bed, at an expense, by contract, of less than two [2] cents per cubic yard.

ARNOLD EARL,
JAMES DUNCAN,
Road Commissioners.

We, the undersigned, Highway Commissioners of Squaw Grove Township, DeKalb Co., Ill., having purchased for our township one of THE WATSONVILLE GRADERS, hereby certify that we deem it fully capable of doing all the work the proprietor claims for it, and we unhesitatingly recommend its use for road and ditch-making in the several townships in this State, fully believing that the interests of every citizen in the township will be promoted by the purchase of one for public use.

PETER BISH,
H. M. MALTBIE,
CORNELIUS TAYLOR,

SEPT. 1, 1873. *Highway Commissioners, Squaw Grove Twp., DeKalb Co.*

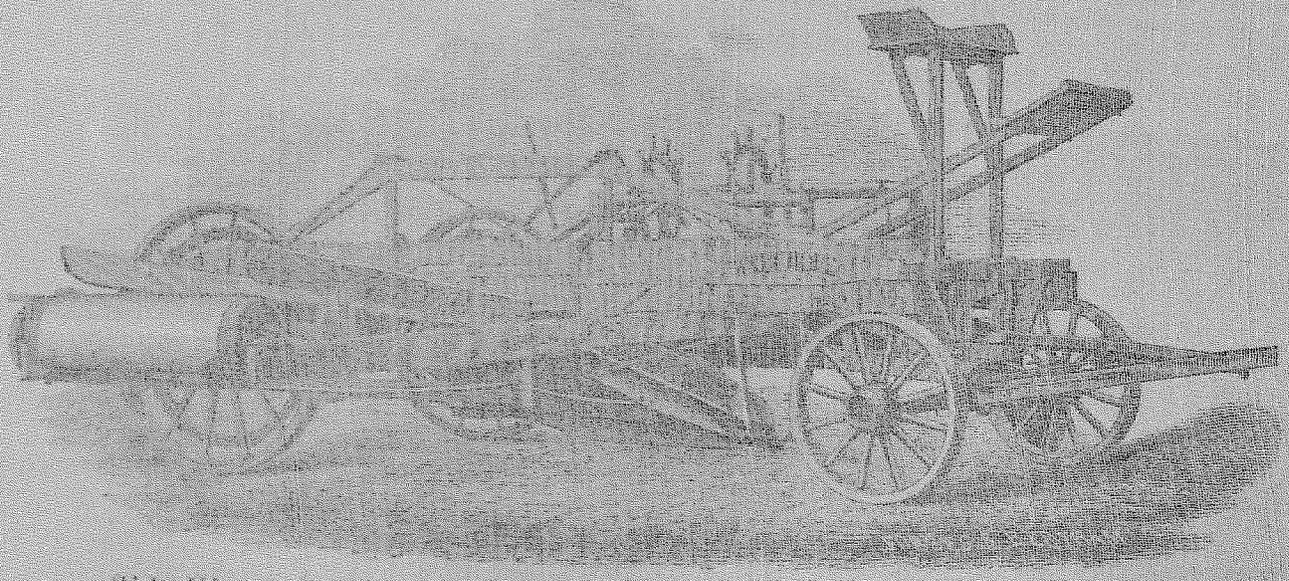
CAUTION TO THE PUBLIC.

Hundreds of these machines have been sold and are in operation in various States, and wherever they have been used they have given entire satisfaction, and we unhesitatingly refer to any person who have used our machines, for a full corroboration of the statements here made.

CAUTION. — All persons are hereby warned by me from purchasing any machine purporting to be a Bevel Grinding and Finishing Machine, having a screw and side clamper, with apron or endless belt, unless they obtain from the Western Patent, as it is known are infringements upon my patents, and will certainly be prosecuted to the full extent of the law. A word to the wise sufficient.

J. EDWARDS,

Montgomery and Schroeder, Nos. 620 and 622 Dearborn St.,
CHICAGO, ILL.



Side View of WAUCHOPE GRADER, *showing the Carrier or Belt.*

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

10th June 1878, No. 2,433 W.

General Account.

Read the following:—

No. 66. Despatch from the Right Honorable the Secretary of State for India.

PUBLIC WORKS, No. 7.

INDIA OFFICE, LONDON, 18th April 1878.

MY LORD DUKE,—Enclosed herewith are copies of letters and some printed papers received from Mr. R. M. Brereton, M.I.C.E. They relate to two American inventions, the Wanchope and Slusser machines, by which Mr. Brereton while engaged on engineering operations in California was enabled to save greatly in labor and expense, and which his personal acquintance with India where, as Your Grace is aware, he was formerly employed on the Great Indian Peninsula Railway, induces him to believe would be very serviceable in that country also.

2. Mr. Brereton's professional experience and reputation may not improbably induce your Government to regard his recommendations favorably, and if it is in consequence determined to give the Wanchope and Slusser machines a trial, arrangements might be made for obtaining one or more specimens of each direct from America.

I have, &c.,

GATHORNE HARDY.

His Excellency the Most Noble
The Governor in Council, Fort St. George.

From R. M. BRERETON, Esq., M.I.C.E., to the Under Secretary of State for India, dated 3, Manchester Street, W., 1st March 1878.

Your letter, dated 13th December 1877, asking for information concerning the Wanchope and the Slusser machines for excavating and moving earthwork would have been attended to by me sooner had I been in possession of my papers and references on the subject, but these I had left behind in California.

2. I beg to forward for the information of the Marquis of Salisbury such descriptions of these machines as I have been able to obtain by post, and I will obtain later on still further information and forward the same to you. I have used these machines extensively on large irrigation works, roads, and railroads, and have found them most economical and useful. They are only adapted for alluvial or loamy soils, and should not be thought of for excavating and moving earth in hard ground.

3. The Wanchope machine will cost about £100 in America; it can be worked with horses, mules, or large bullocks of the Mysore kind. I generally worked these machines with eight mules and two men and have excavated and moved over 1,000 cubic yards of earth in ten hours. I use the Slusser machines for making dams and heavy embankments, for which the

Wandlope machine is not applicable. The Slusser machine requires two strong mules or bullocks and one man, and will excavate and move on the average 100 cubic yards per diem. I did a very large amount of earthwork in California with the ordinary and revolving Australian scraper which is a most useful machine. It requires two mules or bullocks and one man to work it. The ground is first ploughed up with a large steel plough worked by six to eight horses, mules, or bullocks, and then these scrapers are put to work to scrape and carry the earth into the embankment or out of a cutting. These scrapers will move from 35 to 50 cubic yards per diem. The cost in Chicago varies from £9 to £11 per scraper according to size. I forgot to state that the cost of the Slusser machine is about £50 in America.

4. The rates of labor and cost of food in California are far higher than in India. I paid from 10s. to 14s. per diem for labor and 2s. to 4s. per diem for each pair of mules, and yet a large percentage of the earthwork done by the Wandlope machine cost less than a penny a cubic yard.

5. In alluvial soils, like the majority of the large valleys of India, I am confident all these machines could be worked with wonderful results in saving of cost of labor and time.

6. I am inclined to think that if the Government of India should decide upon trying these machines in India they would be consulting their interests by having the plans of these machines overhauled by a competent engineer in America, so that they may be built of suitable material to stand the dry weather of the hot season.

From R. M. BRERETON, Esq., M.I.C.E., to Colonel HYDE, R.E., India Office, dated 35, Manchester Street, W., 16th March 1878.

I was thinking over what you said about labor being so cheap in India that there was not so much object in introducing labor-saving machinery. Labor in India is certainly cheap in comparison with European countries, but I did not consider it cheap for India when the habits and means of the great masses of the people were considered. Over twenty years ago I did a good deal of earthwork in the Deccan at one anna per cubic yard, when the women and children carried the earth in baskets on their heads at a cowrie a basket.

2. When the necessities of India in the way of irrigation, roads, and railways are considered in connection with means at the disposal of the Government, surely if the cost of a large percentage of the earthwork that must be done can be reduced 50 per cent. by the use of machinery, this should be done.

3. Without the use of the machinery the earthwork cost me in California from 12 to 16 cents per cubic yard by manual labor.

4. In regard to certain soils becoming as hard as a brick through the heat of the sun, I had the same difficulty in California as I had in India. In California it only rains during three months in the year—January, February, and March. In black soil and other clayey soils I used to keep the ground broken up with the plough, and as fast as the loose portion was removed, the plough broke up the new surface, and this method succeeded even in the driest and hottest weather, when I have registered 118° in the shade for days together. In sandy or loamy ground it was not found necessary to break up the surface ahead; of course I would only recommend the use of the American machines in such ground as can be ploughed in the ordinary manner and in such districts as mule, horse, or bullock power could be got. The Mysore and Nellore breed of bullocks are the kind required for the Wanchope and Slusser machines, but the common breed of the country will work the scraper well enough.

From R. M. BRERETON, Esq., M.I.C.E., to CLEMENT COLVIN, Esq., India Office, dated 35, Manchester Street, W., 16th April 1878.

Your letter of the 10th instant is received. I have the pleasure to forward with this all the remaining copies I have of the Wanchope and revolving scraper. I am sorry I have none left of the Slusser machine. Should the Government of India decide upon having these machines sent to India I would recommend that Mr. W. W. Evans, C.E., of 63, Pine Street, New York, be appointed the Agent for the Government in purchasing and shipping them to India. Mr. Evans is a thoroughly reliable and competent engineer. He is also a member of the Institute of Civil Engineers, London, and Agent for the Colonies of New South Wales, Victoria, and New Zealand in purchasing and shipping American railway plant, &c. Payments could be made through the agency of the Oriental Bank Corporation, who have their Agency in New York, on receipt of the bills of lading. I believe Mr. Evans' fees are 5 per cent. on amount of invoice for ordering, inspecting, receiving, shipping, drawing bills, &c.

GENERAL ACCOUNT.

Govt. of (1878) States.

PUBLIC WORKS.

To

Dated June 18th

Rec'd

Read

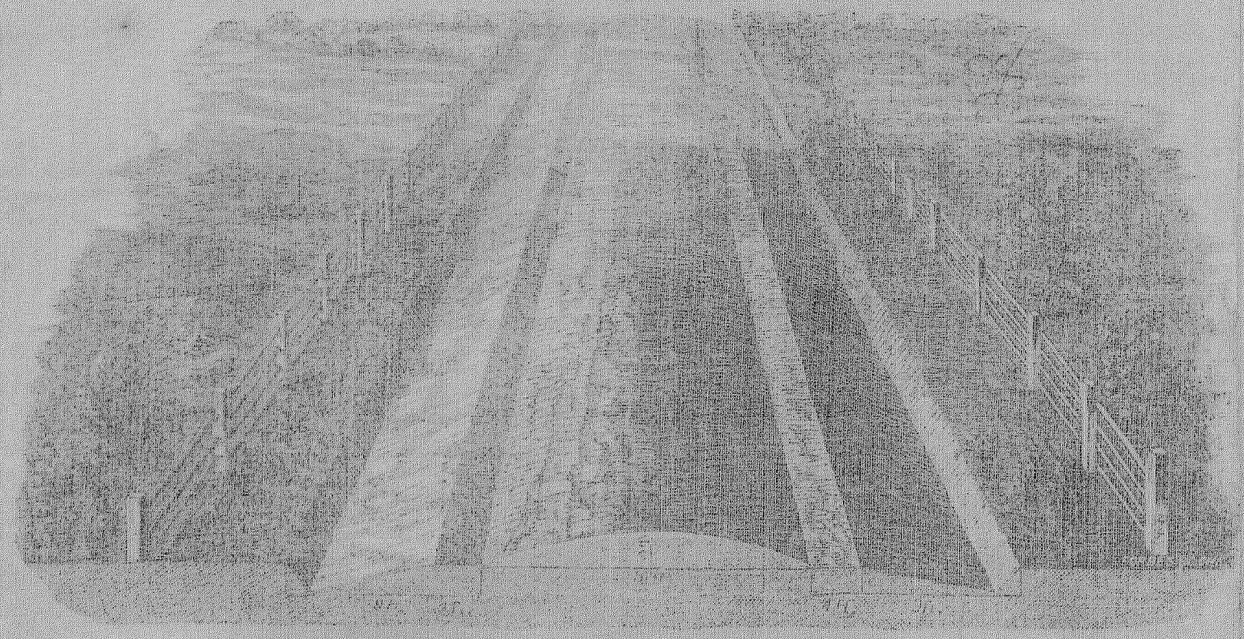
O. C. 1660 dated 18th June 1878. Fol. 2,660 W.

JUNE.

Nos. 56-57.

Wauchope and Ditcher Machines—Ordered that the Secretary of State be requested to ask the — are unsuited for this Presidency.

Show this to your Commissioners of Highways.



A ROAD AS USUALLY MADE BY THE WAUCHOPE GRADER AND DITCHER.

This road is 43 feet from outside to outside of ditches, leaving 25 feet—the width of the road bed—upon which the excavated earth is graded, undisturbed: That is in its natural condition. The ditches are each 9 feet wide, commencing at nothing and sloping back to any required depth, and deepest next the fences; thereby entirely and perfectly draining the road bed, and making in reality a road *forty feet wide*, readily allowing two loads of hay to meet and pass with safety. The machine is warranted capable of GRADING ONE QUARTER OF A MILE of ordinary prairie soil into a road; or of making ONE HALF MILE of open ditch, per day, in the most perfect manner; or of moving 500 cubic yards of earth. *Think of this—One Mile of Good Road every Four Days!*

HOW THE WAUCHOPE GRADES ROADS.

As the Grader moves forward, it plows its own earth, which is immediately carried, by an endless concave belt and deposited where it is wanted, taking one furrow at a time, laying it perfectly straight on the road bed, and so continuing until the required grade is made, and of any size desired; leaving the earth entirely uniform, and not—as is usually done with the plow and scraper—in humps and hollows.

How would you like to have your Township graded on every Section line, into roads like the above, thus forming perfect and continuous drainage to the land, and at a merely nominal cost. You can have it done for the road tax you would naturally raise in four years, by buying a

WAUCHOPE GRADER AND DITCHER.

See our large illustrated descriptive pamphlet! See the guarantee given with the machines! See there how to have good roads and good drainage—and this means rich farms—at a mere nominal cost.

This machine has received the highest commendation wherever it has been worked or exhibited. Has received many premiums and medals at various State and County fairs. Last season after the most severe and exhaustive trial the *Wauchope Grader and Ditcher* was unanimously awarded the Grand Gold Medal of the Illinois State Board of Agriculture.

THE WAUCHOPE IN CALIFORNIA.

Besides the extensive and successful use of the *Wauchope Grader and Ditcher* in grading wagon roads, railroad beds, etc., in various localities, the San Joaquin and King's River Irrigating and Canal Company of California, have adopted, and are now using these machines to their entire satisfaction, on their extensive system of canals, irrigating ditches and levees in California.

For further information, address,

J. EDWARDS,

As Manufactory and Salesrooms,

627, 629 & 631 S. HALSTED ST., CHICAGO, ILL.

THE WAUCHOPE MACHINE

simple in its construction, easily kept in repair, and can be run by any one possessing the least knowledge of machinery.

Is warranted capable of making eighty rods of good grade road, or one mile of open ditch in one day, or moving three hundred cubic yards of earth.

IN GRADING ROADS,

Grader moves along the ditch, the plow takes up the earth, which is carried away by apron of an endless concave belt at right angles with the line of Machine, and deposited wherever it may be desired, from 10 to 15 feet from where it was taken up and graded in the ditch. The apron is self-adjusting, and can be raised or lowered to any required height, and is capable of handling any kind of material that can be moved by plow or scraper. Any wagon seats have been converted for the accommodation of the driver. Any two-horse team can draw it, and one man can operate it. Any road that has been constructed with a scraper can be made in one-fifth the time with this Machine, and in much cheaper and better manner. It will pay for itself in 10 days.

IN MAKING OPEN DITCHES

In one hour, in the most favorable conditions, a good team and driver can move about 100 cubic yards of earth, but in ordinary weather, this will not double the quantity. Experience has shown that in this latitude, with ordinary teams and drivers, it will do as much more work and to better advantage than any other machine in use. It will do its work as well in both loose and tenacious soil, and in ploughing up and grading roads. It will make a ditch 9 feet wide, and 2 feet deep, at one operation, and will throw the earth 12½ feet high and eighteen feet from the edge of ditch. It can be used in connection with any Plough, Scraper or Grader now in use, and does not require any additional power to operate it. One man and a team of horses or mules can operate it. It requires no more skill to operate it than to drive a team. It is simple in its construction, and not liable to get out of order. It is warranted capable of making eighty rods of good grade road, or one mile of open ditch in one day, or moving three hundred cubic yards of earth.

IN GRADING ROADS.

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The following Documents and Testimonials will speak for themselves.

San Francisco, California, August 6th, 1870.

MOSES A. MOSS, Esq., Press, Sacramento:—The Wauchope Machine has graded [illegible] earth lying by the side of, and to the required [illegible] with the road-bed, and [illegible] machine doing work on the hard [illegible] ground, that we have ever seen. For actual working results with the other [illegible] to one hand, at a cost of [illegible] per cubic yard. It [illegible] a cut per cubic yard.

[illegible] and with the improved form of [illegible] I am satisfied the machine will [illegible] cubic yards a day.

[illegible] roads, main canals, and for levees, the larger machines are necessary.

[illegible] that Mr. Edwards has proved his case, and that the principle of the machine is well adapted for ploughing and moving earth in ranch, ditches, roads, and levees, and will be of great value to this State.

Yours truly, R. M. RICHARDSON,
Chief Engineer San Joaquin & King's River Canal & Irrigation Co.

Office of S. L. & R. R. C. & I. Co., Engineer's, California, August 4th, 1870.

Having witnessed the work and working of the WAUCHOPE GRADER and DITCHER, constructed by J. Edwards, of Chicago, am fully satisfied that they are the most adequate machine for moving earth in the construction of canals, ditches, levees and grading of railroads.

R. G. CHANDOS, E. & C. Supt.

Gentlemen were this country of the great superiority of this machine over any other, excavating and removing earth, that they bought the right to manufacture the machines in California.

Chicago, Ill., September 9th, 1870.

Have set up, with the WAUCHOPE GRADER, on G. & C. & S. F. R. R. Riverside farm [illegible] with 2½ days.

J. B. WALDEN, Contractor.

Pekin, Ill., September, 1870.

[illegible] certify and I have used the WAUCHOPE GRADING MACHINE on grade L. B. R. R. with complete success, [illegible] hundred cubic yards of earth per day; and for said purposes it is superior to any other in use.

J. A. BAILEY, Contractor.

STATE OF ILLINOIS, }
Cook County, } ss. William Morehouse, being duly sworn, according to law, deposes and says that he used the WAUCHOPE GRADER and DITCHER, last spring, in the Chicago, Danville & Ohio River R. R., and that with it he dug [illegible] cubic yards of earth per day; and that the average cost of said work was [illegible] cents per cubic yard.

WILLIAM MORREHOUSE.

Subscribed and sworn to before me, this 16th day of September, 1870.

J. B. [illegible], Notary Public.

Hundreds of these Machines have been sold and are in operation in various States, and wherever they have been used they have given entire satisfaction, and we unhesitatingly refer to any parties who have used our machines, for a full corroboration of the statements here made. In addition we would refer you to our large, illustrated pamphlet, containing much valuable information.

CAUTION.—All persons are hereby warned by me from purchasing any machine purporting to be a Road Grading and Ditching Machine, having wide and side carrier with apron or endless belt, EXCEPT THOSE BUILT UNDER THE WAUCHOPE PATENT, as all others are infringements of my patent, and will unhesitatingly be prosecuted to the fullest extent of the law. A word to the wise is sufficient.

J. EDWARDS,
Manufactory and Salesrooms,
Nos. 627, 629 & 631 S. HALSTED ST., CHICAGO, ILL.

Show this to your Commissioners of Highways.

A ROAD AS USUALLY MADE BY THE WAUCHOPE GRADER AND DITCHER.

This road is 45 feet from outside to outside of ditches, leaving 25 feet—the width of the road bed—upon which the excavated earth is graded, undisturbed. That is in its natural condition. The ditches are each 9 feet wide, commencing at nothing and sloping back to any required depth, and deepest next the fences; thereby entirely and perfectly draining the road bed, and making a really a road *forty feet wide*, readily allowing two loads of hay to meet and pass with safety. The machine is warranted capable of GRADING ONE QUARTER OF A MILE of ordinary prairie soil into a road, or of making ONE HALF MILE of open ditch, per day, in the most perfect manner; or of moving 300 cubic yards of earth. *Think of this—One Mile of Good Road every Four Days!*

HOW THE WAUCHOPE GRADES ROADS.

As the Grader moves forward, it plows its own earth, which is immediately carried, by an endless concave belt and deposited where it is wanted, taking one furrow at a time, laying it perfectly straight on the road bed, and so continuing until the required grade is made, and of any size desired; leaving the earth entirely uniform, and not—as is usually done with the plow and scraper—in humps and hollows.

How would you like to have your Township graded on every Section line, into roads like the above, thus forming perfect and continuous drainage to the land, and at a merely nominal cost. You can have it done for the road tax you would naturally raise in four years, by having a

WAUCHOPE GRADER AND DITCHER.

See our large illustrated descriptive pamphlet! See the guarantee given with the machines! ! See there how to have good roads and good drainage—and that means rich farms—at a mere nominal cost.

This machine has received the highest commendation wherever it has been worked or exhibited. Has received many premiums and medals at various State and County fairs. Last season after the most severe and exhaustive trial the *Wauchope Grader and Ditcher* was unanimously awarded the Grand Gold Medal of the Illinois State Board of Agriculture.

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Besides the extensive and successful use of the *Wauchope Grader and Ditcher* in grading wagon roads, railroad beds, etc., in various localities, the San Joaquin and King's River Irrigating and Canal Company of California, have adopted, and are now using these machines to their entire satisfaction, on their extensive system of canals, irrigating ditches and levees in California.

For further information, address,

J. EDWARDS,
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THE WAUCHOPE MACHINE

Is simple in its construction, easily kept in repair, and can be run by any one possessing the least knowledge of machinery.
It is warranted capable of making eighty rods of good grade road, or 100 rods of open ditch in ten hours of actual working time, the distance to cut and
cubic yards of earth.

IN GRADING ROADS.

e Grader moves along the ditch, the plow takes up the earth, which is carried away by means of an elevator consisting of eight scrapers with the cutting
e Machine, and deposited wherever it may be desired, from 14 to 17 feet from where it was taken and deposited on the grade of good road-bed ready to be
ration; and it can be operated in any soil that an ordinary plow will work in. Earth can be removed with it at a cost of less than 6 cts per cubic yard, and
nary wagon roads have been constructed for 5 to 20 cents per rod. No matching can afford to use the plow and scraper to make matching, when
line will do the same work so much cheaper and better. It will pay for itself in 30 days.

IN MAKING OPEN DITCHES

ds and leaves, in the best possible condition. A good open ditch—sloping so that teams can be driven through it, and that it will not fill with snow and leaves in
weather, etc., will not choke up, carrying the earth far enough from the ditch so that it does not cave in. Ditch is taken up the approximate
1. It will drain low as well as high land, and in draining around a piece of land, it leaves the dirt, if desired, scattered, or in good shape to grow
2. Ditches with these Machines can be made of any desirable width, and to a depth of 20 feet, three to four feet wide at bottom. Large and Shallow
especially for railroad work, have been in successful operation on the eastern section of railroads in various States.
Each and every town should have one of these Machines.
This Machine is far ahead of any other now in use for handling earth. It is durable, simple in construction and operation by ten workmen. Farmers
tractors would find it much to their advantage to examine the merits of this Machine. It will save them one-half the expense of the usual method. See what Railroad and Canal superintendents, Road Commissioners, Civil Engineers and
r experts, and Farmers and Business men say:—Any of whom may be addressed for full and fair statement of what they say, or will visit any
township using a Machine or to any person ever seeing one worked.

The following Documents and Testimonials will speak for themselves.

FRENCH CAMP, California, August 9th, 1871.
MORA MOSS, Esq., Pres., Dear Sir:—The WAUCHOPE Machines I have examined
work done by the 20 foot, and by the 25 foot machines, and am satisfied with the results
e had both machines at work on the hardest kind of ground that we have to deal with,
the actual working results were 250 cubic yards in 8 hours, at a cost of $2.1 for men and
s, or about 2 cents per cubic yard.
a sandy loam, and with the improved form of plough, I am satisfied the machine will
up 100 cubic yards a day.
all roads, main canals, and for levees, the larger machines are necessary.
nsider that Mr. Edwards has proved his case, and that the principle of the machine is
ell adapted for ploughing and moving earth for canals, ditches, roads, and levees, and
ely to be of great value to this State.
Yours faithfully,
R. M. BRERETON,
Chief Engineer San Joaquin & King's River Canal & Irrigation Co.

OFFICE OF S. J. & K. R. C. & I. Co., FRESNO, California, August 9th, 1871.
ving examined the work and working of the WAUCHOPE GRADER and DITCHER
manufactured by J. Edwards, of Chicago, am fully satisfied that they are the best
cheapest machine for moving earth in the construction of canals, ditches, levees, and
ng of railroads.
B. G. CHAMBOS, E. & C. Supt.

convinced were this company of the great superiority of this machine over any other,
excavating and removing earth, that they bought the right to manufacture the machines
California.

GILMAN, Ill., September 9th, 1871.
ave put up, with the WAUCHOPE GRADER, on C. C. & S. H. R., 950 cubic yards
rth in 25½ days.
I. B. CALDER, *Contractor.*

PAXTON, Ill., September, 1870.
ereby certify that I have used the WAUCHOPE GRADING MACHINE on the I. C.
R. R. with complete success, often handling 800 cubic yards of earth per day; and for
said purposes it is superior to any other in use.
J. A. BALCH, *Contractor.*

TE OF ILLINOIS, }
County, } ss. William Mercereau, being duly sworn, according to law, de
and says that he used the WAUCHOPE GRADER and DITCHER last spring, in
ing the Chicago, Danville & Pillo River R. R., and that with it he has excavated and
in the grade 70,000 cubic yards of earth in one day, as the measurement. He further
s that the daily average of yards moved with said Machine was from 500 to 700
s yards.
WILLIAM MERCEREAU.
bscribed and sworn to before me, this 9th day of September, 1871.
I. B. CALDER, *Notary Public.*

We, the undersigned, do hereby certify that we have used the WAUCHOPE GRADING AND DITCHING MACHINE, and that we consider it the best machine we have ever used for the purpose of grading roads and ditching, and for all purposes for which it is intended. It is of great capacities, as it does a large amount of work at a cheaper rate than any machine we have ever used. We have had many years' experience in road making, and have had a great deal of complaint about the cost of keeping roads in repair, but since we have used the WAUCHOPE GRADER we have had no complaints, as it does the work so much better than any other machine we have ever used. We therefore recommend it to all those who are desirous of having their roads graded in a workmanlike manner, according to specifications. We have had 12½ inches of rain in 24 hours, which washed the roads very much, but by using the WAUCHOPE GRADER we soon had them in good repair. We have used it on the hilly, mountainous roads in the vicinity of Auburn, Placer County, and on the level roads in the vicinity of Sacramento, and have no hesitation in saying it is the best machine we have ever used for the purpose. We have also used it in making ditches, and find it to be the best machine we have ever used for that purpose. We would say to all persons desirous of having their roads graded in a workmanlike manner, according to specifications, we have no hesitation in saying it is the best machine we have ever used for the purpose. We have also used it in making ditches, and find it to be the best machine we have ever used for that purpose. We would say to all persons desirous of having their roads graded in a workmanlike manner, according to specifications, we have no hesitation in saying it is the best machine we have ever used for the purpose.
WM. HOLL,
JAMES H. SCOTT,
Road Commissioners.

We, the undersigned, Highway Commissioners of Sussex Grove township, Dekalb County, Ill., having purchased the right to manufacture and sell the WAUCHOPE GRADERS, hereby certify that we deem it a duty we owe to the public to say that during all the years the proprietor claims he has been engaged in manufacturing, improving and introducing his machine for grading roads and ditching in the several townships in this State, fully believing that the interests of every citizen in the township will be promoted by the purchase of one for public use.
PETER ESH,
R. M. MALCOM,
CORNELIUS SAYLOR,
Highway Commissioners, Sycamore Grove Township, Dekalb County, Ill.
Sept. 1, 1871.

We, the undersigned, do certify that we have used the WAUCHOPE GRADING AND DITCHING MACHINE, and that the same is in all respects what we claim for it, and we consider it the best machine we have ever used for the purpose of grading roads and ditching, and for all purposes for which it is intended. It is of great capacities, as it does a large amount of work at a cheaper rate than any machine we have ever used. We have had many years' experience in road making, and have had a great deal of complaint about the cost of keeping roads in repair, but since we have used the WAUCHOPE GRADER we have had no complaints, as it does the work so much better than any other machine we have ever used. We therefore recommend it to all those who are desirous of having their roads graded in a workmanlike manner, according to specifications. We have had 12½ inches of rain in 24 hours, which washed the roads very much, but by using the WAUCHOPE GRADER we soon had them in good repair. We have used it on the hilly, mountainous roads in the vicinity of Auburn, Placer County, and on the level roads in the vicinity of Sacramento, and have no hesitation in saying it is the best machine we have ever used for the purpose. We have also used it in making ditches, and find it to be the best machine we have ever used for that purpose. We would say to all persons desirous of having their roads graded in a workmanlike manner, according to specifications, we have no hesitation in saying it is the best machine we have ever used for the purpose.
A. S. CRAIG,
A. EARL,
Commissioners of Highways, Sacramento County, Cal., and manufacturer and proprietor.

HUNDREDS OF THESE MACHINES have been sold and are in operation in various States, and wherever they have been used they have given entire satisfaction, and we unhesitatingly refer to any parties who have used our machines, for a full corroboration of the statements here made. In conclusion we would refer you to our large, illustrated pamphlet, containing much valuable information.

CAUTION.—All persons are hereby warned by me from purchasing any machine purporting to be a Road Grading and Ditching Machine, having fore and side carriers with spurs or gaining belt, EXCEPT THOSE BUILT UNDER THE WAUCHOPE PATENT, as all others are infringements of my patent, and will be rigidly prosecuted to the fullest extent of the law. A word to the wise is sufficient.

J. EDWARDS,
Manufactory and Salesrooms,
Nos. 627, 629 & 631 S. HALSTED ST., CHICAGO, ILL.

Public Works
No 7

India Office, London.
18th April 1878.

My Lord Duke,

I enclosed herewith are copies of letters and some printed papers received from Mr. E. M. Brereton, M. I. C. E. They relate to two American inventions - the Wauchope and Fleuss machines by which Mr. Brereton while engaged on Engineering operations in California was enabled to save greatly in labour and expense, and which

His Excellency,
The Most Noble,
The Governor in Council
Fort St. George.

his

his personal acquaintance with India where, as Your Grace is aware, he was formerly employed on the Great Indian Peninsula Railway, induces him to believe would be very serviceable in that country also.

2. Mr Bareton's professional experience and reputation may not improbably induce Your Government to regard his recommendation favorably, and if it is in consequence determined to give the Waucharpe and Thurser Machines

a

(4)

a trial, arrangements might be made for obtaining one or more specimens of each direct from America.

I have the honor to be,
My Lord Duke,
Your Grace's most obedient
humble Servant

Fairbairn Lawes

No 17

Public Works
1875 after 1878

The
Secretary to Secretary of State
for India

No 7

Rec'd 11 May 1878

Bar 5.5.78. Rly 10.5.78.
Cur 17.5.78. Mfs. 6.6.78
D.R. Encl 45 days

35 Manchester Street
Manchester Square
1st March 1878

The Under Secretary of State for India
India Office, London. S.W.

Sir,

Your letter dated 13 December 1877 asking for information concerning the Manchope and the Messer machines for excavating and moving earthwork would have been attended to by me sooner, ~~had I been attended to by me sooner~~, had I been in possession of my papers and references on the subject, but these I had left behind in California.

I beg to forward for the information of H.E. Marquis of Salisbury such descriptions of these machines as I have been able to obtain by post and I will obtain later on still further information and forward

the same to you. I have used these machines extensively on Large Irrigation works, Roads and Railroads, and have found them most economical and useful. They are only adapted for alluvial or loamy soils, and should not be thought of for excavating and moving Earth in hard ground.

The Wheelscrape machine with cost about £100 in America, by can be worked with horses, mules or large bullocks of the Ingore Kind, I generally worked them Machines with 8 mules and 2 men, and have excavated and moved over 1000 cubic yards of earth in 10 hours. I used the Sluser machines for making Dams and Large Embankments for which the the machine machine is not applicable. The Sluser Machine requires 2 strong Mules, or bullocks, and one man, and will excavate and move on the average 100 cubic yards per diem. I did a very large amount of earthwork in California with the ordinary and revolving American Scraper, which is a most useful Machine. It requires 2 mules or bullocks, and 1 man to work it. The ground is first ploughed up with a large sized plough worked by 6 to 8 horses, mules or bullocks, and then these scrapers are put to work to scrape and carry the earth into the Embankment, or out of a cutting. These scrapers will move from 35 to 50 cubic yards per diem. The cost in

Chicago

Chicago varies from £3 to £4 per scraper according to size. I forgot to state that the cost of the Lauson Machine is about £50 in America.—

The rates of labour and cost of feed in California are far higher than in India.— I paid from 10/- to 14/- per diem for labour, and 2/- to 4/- per diem for each pair of mules. and yet a large percentage of the earthwork done by the Irrigation Machine cost less than a penny a cubic yard.—

In alluvial soils, like the majority of the large Valleys of India, I am confident the Lauson machines could be worked with wonderful results as many of each of labour and time.—

I am inclined to think that if the Govt. of India should decide upon trying Stone & Machines in India, they would be consulting their interests by having the plans of these Machines overhauled by a competent Engineer in America, so that they may be built of suitable material to stand the dry weather of the hot season.—

Yours &c

J. R. M. Brereton

Revd: J. L. S.

16, Manchester Street Pr.
10th March 1878

Colonel Hyde R.E. Ladies & Gent

Dear Sir,

I was thinking over what you said about Labour being so cheap in India, that there was not so much object in introducing Labour saving Machinery. Labour in India is certainly cheap in comparison with European countries, but I did not consider it cheap for India, when the habits and means of the great mass of the people were considered. For 20 years ago I did a good deal of earthwork in the Deccan at one anna per cubic yard, when the women and children carried the earth in baskets on their heads at a contract a basket.

Yours

when the necessities for irrigation in the way of Irrigation Roads and Railways are considered in connection with means at the disposal of the Government, namely, if the cost of a large per centage of the earthwork that must be done can be reduced 50% by the use of machinery, then should be the use without the use of the machinery, the earthwork cost me in California from 12 to 16 cents per cubic yard for Manual labour.

In yard & certain soils a becoming as hard as a brick through the heat of the sun, I had the same difficulty in California as I had in India in California in only having during 3 months in the year - January, February and March - the black soil around Ther-

after clayey soils. I used to keep the ground broken up with the plough, and as fast as the loose portion was removed, the plough broke up the new surface, and this method succeeded even in the driest and hottest weather, when I have registered 118° in the shade for days together. In sandy or loamy ground it was not found necessary to break up the surface ahead. I could only recommend the use of the American Machines in such ground as can be ploughed in the ordinary manner, and in such places as Mule, horse or bullock power could be got - The Bypass and Return tread

fo

of Ballarat are the kind
required for the manufacture
and Lacer Machines, but
the common breed of the
country, with most the Scraper
belt empty -

Yours truly
Jos Robertson

35 Mansfield Street
16 April 1878

Clement Blair Esq
India Office

Dear Sir,

Your letter of the 10th inst is received
I have the pleasure to forward with
this, all the remaining specs. I have
of the Machine and Contract forms
I am sorry I have none left of the
Lacer Machine - I told the Govt
of India decide upon having these
machines sent to India, I would
recommend that Mr H. P. Dunn, 82
of 15 Pine Street, New York, be appointed
the Agent for the Govt in purchasing
and shipping them to India - Mr Dunn
is a thoroughly reliable and competent
Engineer - He is also a Member of
the Institute of Civil Engineers,
London, and Agent for the Colonies

of New South Wales, Victoria and
New Zealand, on purchasing and
shipping American Railway Plant, etc.
Payments could be made through
the agency of the Oriental Bank
Corporation, who have their Agency
in New York, on receipt of the Bills
of Lading — Duplicate Invoices
are to be made out
after viewing, inspecting, weighing
shipping, drawing bills, &c.

Yours &c
for Peto Brassey

PUBLIC WORKS DEPARTMENT.

Despatch from the Secretary of State for India,
No 7 dated 10th April 1878.

FOR ORDERS.

The Chief Engineer does not consider the "Wanchope Grader and Ditcher" a machine likely to be suitable for roads in the Madras Presidency.

Edwd Talbot
Chief Engr & Secy to Govt
Pub Wks

The Govt work of Road making & Grading in America differs in any respect from the conditions of this country

22/5/78

17th May/78

FOR ORDERS.

Ex. 2433 Public Works Department

PROCEEDINGS OF THE MADRAS GOVERNMENT

Under date the 10 January 1871

Read the following :—

Extracted from the Secretary of State for India's (No. 16) dated 18 April 1870

Ordered that the follow

copy be sent

for

Ref

The Right Honorable the Secretary
of State for Indian
affairs

My Lord,

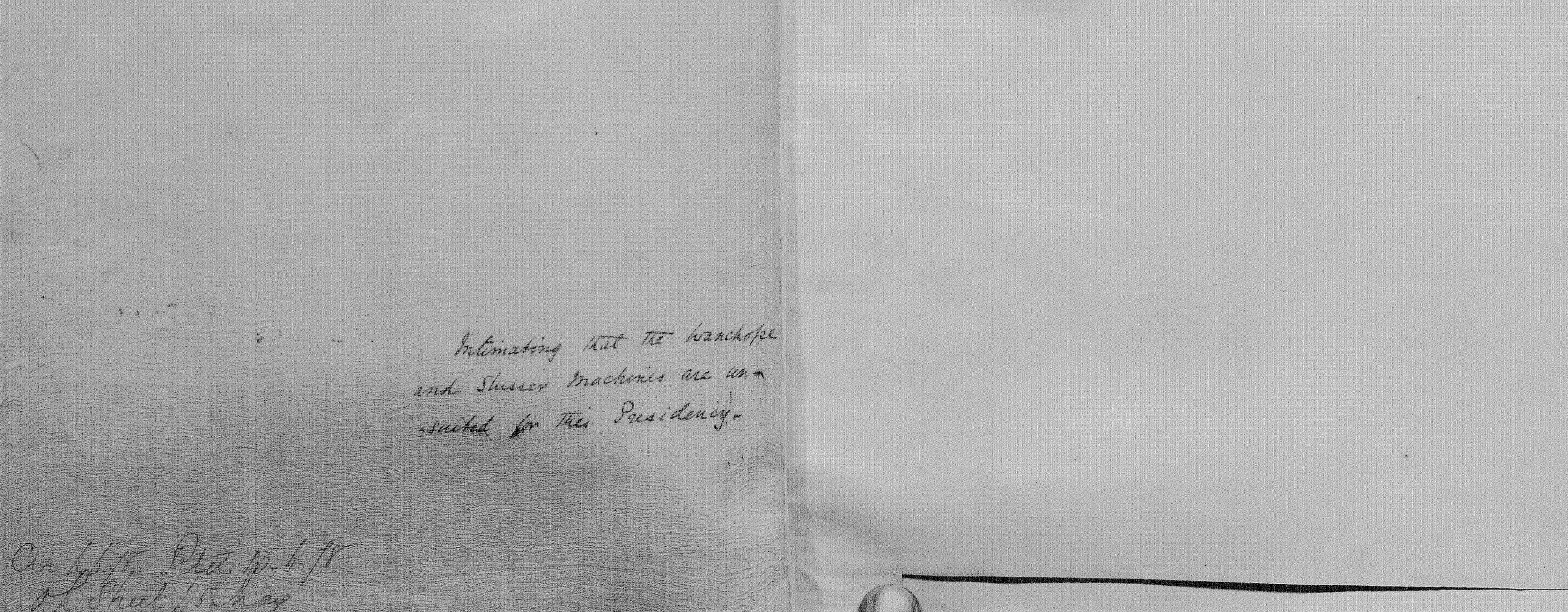
We have the honor to
acknowledge the receipt of
your Lordships Letter of
the 17th April 1778 & to
Lament with much regret
forwarded copies of letters
and printed papers relative
to two American inventions
the Pantescope and Thresher
Machines for excavating
and moving earth. The
papers have been referred
to our Chief Engineer

who is of opinion that the
machines are not likely
to be suitable for trade or
the ordinary purposes of
life these opinions are known.

It remains that the
evidence of land mate
and practice in Lancaster
where the machines are
stated to have been used
with the most advantage differs
materially from that evidence
and testimony in this
County.

Est 5/6

Intimating that the Ranchofee
and Shaver Machines are wanted for this Presidency.



Gobl. of (1878) Madras

PUBLIC WORKS

No. 1178 of 1878

Dated 10th June 1878, No. 2933

Kistnapore and Sluice Tracks

Ordered that the Secretary be informed that the Governor in Council has received for the Presidency -

Secretary Secy.