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TAMPED OILED ROADS

By Chas. Alma Byers.

Editor Advertiser: The accompanying article on "Tamped Oiled Roads," from the Industrial Magazine for May, 1908, (Cleveland, O.), may be of interest to our road makers in the Territory. We have been using petroleum as a surface coating on some of our roads, with good results except as to durability of the surface, but this method seems to have been superseded in California by the oil impregnated road with apparently greatly superior results.

As the total quantity of oil used is but 3 1/2 gallons per square yard the process would not seem to be much more expensive than the macadam process now generally employed. The most difficult thing to prevent in our roads is the erosion from heavy rainfall, which would seem to be largely obviated by the oil process.

Very truly yours,
WILL J. COOPER.

Since road construction is a matter that is receiving at present greater and more scientific attention throughout almost the entire world than has ever heretofore been given it, and since some method for the construction of better roads is being universally sought, it will probably be interesting, and possibly beneficial, to know something of the use of oil in the making of roads, a method of road building that, in California, while still more or less in an experimental stage, is meeting with much success—especially under the new method of tamping now in vogue.

It was almost thirty-five years ago that the first experiment with crude petroleum for road beds was made, an experiment instituted by the Noble Brothers firm, in Boku, Russia. The firm sprinkled all the streets of the town with oil from the near-by oil wells, the intention being to lay the dust, which it effectively did; but on account of the nature of the oil it did not become hard, hence giving no evidence of its being useful in road making. The credit for the discovery that oil—that is, the asphaltic kind—can be so used must, instead, be given to California. It was noticed, some years ago, that when oil was sprinkled on the surface of the roads in California it would combine or mix with the soil and produce a hard, smooth and impervious surface.

After this discovery, the next step taken in the using of oil for road beds was to spread the petroleum on the surface of the roadway, harrow it in, and then sprinkle a thin layer of sand and gravel on the oiled soil and roll it until smooth. It was then left to dry and become hard. This process, on some soils, produced an excellent road—but a road that lacked durability. The process, however, proved an important step in the right direction, paving the way to later accomplishments that amount to almost complete success—if not entirely complete.

From the later experiments it soon became evident that if the soil of the roadway could be thoroughly bituminized and every particle of the earth impregnated with asphaltic oil a material would be produced similar in character to the bituminous rock used to a great extent for street paving in California, and that in accomplishing this the road would be given a topping of sufficient thickness to make it durable. This realization led to many experiments. To compress the bituminized earth heavy smooth rollers were at first used, with more or less success, but the use of rollers caused the leathery-like surface of the road to buck and creep under the heavy load, leaving the surface often in waves.

The tamping machine, which is now used to overcome this serious fault, was invented about five years ago by a man named Fitzgerald. The idea was conceived from seeing the results made by a band of sheep that had been driven across a freshly oiled surface. The tread of the sheep had tamped the oil into the earth so thoroughly and packed it so hard and smooth that all that was necessary was to build a machine that would produce the same results. Fitzgerald secured a large, heavy log of wood, drove it full of railroad spikes, put a frame around it, hitched horses to the machine and demonstrated that even the tread of sheep could be beaten. This was the beginning of the present tamping machine that is proving so satisfactory in the construction of California's oil tamped roads—or petroliothic pavements.

The theory on which the machine works is: The feet-like projections of the rolling cylinder penetrate the pulverized soil, and the first time over the ground packs a portion of the soil at the bottom of the loosened surface. By repeatedly passing over the ground with the machine, layer after layer is tamped until perfectly solid, the machine gradually being lifted to the surface. The top will eventually become hard and smooth, and the roadway will afterwards need no other rolling or leveling.

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Roads of this kind can be constructed from any kind of soil. Each kind of soil, however, requires more or less individual attention. Some soils, for instance, will mix with oil better when a little water is applied before the oil, some will stand absolutely no water first, and some will work better when nearly puddled with it. In all cases, however, some water is necessary at some stage of the work. It helps to disseminate the oil, and it also helps the packing of the road. Then, too, some soils can be worked to advantage with harrows, some with cultivators, and some with disk harrows or plows.

While the ingredient is not absolutely necessary, and many of California's oiled roads are made without it, roadways of this kind can often be greatly improved by the addition of screened rock, crushed rock, or even good gravel. The presence of such material in the road bed gives it stability, durability and prevents ruts and chucks. It helps to withstand the wear, resisting abrasion more than earthy material. The rock should vary in size from pea size to pieces as large as a walnut, should have angular edges, the flat surfaces to aid in keying, and the quantity should vary with the soil. For instance, adobe-like soil should have more rock than a more gritty soil, such as disintegrated granite.

In regard to the oil, undoubtedly the best kind is one without sediment, sulphur, or any chemical which would tend to make brittle the asphaltum contained in the oil. In other words, the oil should contain a large percentage of asphaltum and a small percentage of lubricating oils. The ideal road oil, in fact, is one which is made artificially. The crude oil that comes from a few wells is satisfactory, containing the ingredients in proper quantities, but the manufactured oil can always be relied upon, therefore being generally considered the best.

The process of making a tamped oiled road or petroliothic pavement of the very best quality, as now adopted by California's leading street and road builders, may be briefly described as follows: After the road is brought to sub-grade it is broken up with plows to a depth of six or seven inches, the clods are crushed and the surface is put in a thoroughly pulverized condition. Oil is then applied in three or four coats, two gallons to the square yard. This is thoroughly mixed by cultivation with the pulverized soil, after which it is liberally sprinkled with water. Tamping, with the tamping machine, now begins, and is continued until only about two inches of loose material remains on the surface. Two or three inches of screened rock is then spread evenly over the road, followed by another coat of oil, amounting this time to about one and one-half gallons per square yard. This is thoroughly mixed with the two inches of loose material, and then the tamping is resumed, continuing until the road is perfectly solid. The surface meanwhile is kept regular by road machines and floats.

Many of the tamped oiled roads of California are made without the use of screened rock, and they have proved very satisfactory. Screened rock, however, makes the roads much firmer and more durable than are the ones made without, and therefore the extra cost is considered well invested.

In regard to the building of such roads in the eastern and northern states, Mr. Sutherland Hutton of Los Angeles, Cal., one of the most successful petroliothic road builders in the West, says there is no reason why they should not be built anywhere in the United States; that neither heat nor cold, no matter how severe, will affect such roads to the slightest extent, and that, because of the oil, the roads are proof against water, as well as dustless. The road, however, must be made at some season when the soil is comparatively dry. The rules of the process also must, of course, be intelligently observed, and the oil used must contain the ingredients in proper proportions. When these points are kept in mind and followed the tamped oiled road can be adopted by road builders in any part of the world. Roads of this kind have already been built in California, Washington, Michigan, Louisiana, Florida, Cuba and Brazil. The system, however, has not been introduced to any great extent in any of the localities except California.

The specifications in regard to the quality of the oil usually made by the road builders of California require that the oil shall not contain more than eight per cent. of matter volatile, not more than two per cent. of water and sediment and not less than seventy per cent. of asphaltum. The test to determine the percentage of these ingredients is made by subjecting the oil to different degrees of heat.

The cost of constructing petroliothic roads varies. In some localities it is more than in others, owing to the prices of oil, rock, labor, etc. In Southern California it is usually figured at six cents a square foot, or fifty-four cents a square yard. Asphaltic oil here costs about \$1.10 per barrel, and the crushed rock can be had, delivered in Los Angeles, at \$2.00 per yard. For men and teams about twenty-five per cent. of the total cost of the work is expended.

The petroliothic rolling tampo, the tamping machine usually used in the construction of these roads, is shown in an accompanying illustration. It is built almost entirely of steel and iron, and weighs 5,000 pounds. It is designed to begin the tamping at the bottom of the pulverized soil, instead of at the top as does an ordinary roller. The patent is owned by the Petroliothic Pavement Company of Los Angeles, Cal.

Practically all of the roads now being built in California are constructed by the petroliothic process, and many miles of such roads and streets are already in use—a few of which have been for more than five years. The roads are particularly satisfactory for automobile, and many of them are successfully withstanding without damage the heaviest kind of draying.

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