macadam in which Tarvia "X" was used as a binder. The method employed in the construction of this street was as follows: First, the road bed was carefully prepared, and, after being brought to grade, thoroughly rolled. Four inches of crushed stone of the 11/2-inch size was then placed upon the road and likewise rolled until there was no perceptible movement beneath the roller. Over this was placed two inches more of the same size stone, and these again rolled. Tarvia "X" to the amount of one and one-half gallon to the square yard, heated to a temperature of 250 degrees Fahr., was then poured by hand from suitable sprinkling cans upon this prepared surface, after which clean screenings were drifted over the surface of the road in sufficient quantity to fill the voids without leaving any excess material. The road was then again thoroughly rolled and the second coat of Tarvia "X," from one-half to threequarters of a gallon per square yard, poured over the surface. Over this finally was placed another coating of screenings and the road thoroughly rolled to a finish.

The entire cost of laying this pavement, including all the gradings, was 78 cents per square yard. Early Street was paved two years ago and is at present in good condition.

In passing it may be of interest to note that the cost of removing Tarvia from the package and heating it to the required temperature is about one and three-fourth cents per gallon less than the cost of the same operation with asphalt binders.



Fig. 4.—Tarvia "X" Being Distributed from a Tank Wagon Fitted with a Fire Box and Hose Attachment.

Tarvia "X" can be quite readily transferred from the barrel when one head is removed, and if reasonable care is exercised it is not necessary to destroy the barrel.

The distribution of Tarvia "X" from a tank wagon fitted with a fire box by means of a hose attachment is shown in Fig. 4. In this operation the Tarvia is heated in the tank car, drawn off into the tank wagon, which has a capacity of six hundred gallons, attached to the steam roller and drawn to the point of operation. Steam connection is made between the roller and the tank wagon and the Tarvia forced from the tank through the hose under a pressure of about 15 pounds. This method is recommended as being more efficient and economical than the use of hand distributors.

The mixing method of application is favored by many engineers as giving better and more uniform results than the penetration method. The materials are either mixed together by hand or by machine. In the case of handmixing, Tarvia "X" heated to 250 degrees Fahr., using from 18 to 20 gallons to the cubic yard of stone, is thoroughly mixed by hand upon a mixing board and placed upon the prepared road bed in the desired thickness. The mixture is then leveled off with hand rakes, the voids filled with screenings, and the whole thoroughly rolled. Over this again is poured, as in the previous operation, the required amount of Tarvia. The second coat of screenings is then applied and the road rolled to a finish.

The method employed in machine-mixing was used recently in the construction of Park Avenue, Newark, N.J., which was built by the Essex County Park Commission. Crushed stone is loaded into the hopper, which is then lifted to an elevated position and its contents delivered into the drum of the mixer, where it is heated. After the stone is thoroughly dried and heated to the desired temperature, Tarvia "X," which has been previously heated in an ordinary heating tank, is also mechanically lifted and deposited upon the stone in the mixer. The stone is then thoroughly coated with the Tarvia, after which it is dumped into wheel-barrows and carried to its destination. The evidences are that this is destined to become a very popular method for the construction of bituminous macadam roads, and the experiences of those who are familiar with this machine would lead us to believe that it is well adapted to this work.

The asphalt bound macadam is built by using these same methods of construction (with the exception that heavy asphalt is used instead of tar as a binder). Many types of new roads have been experimented with during the last few years-with the view of solving the problem of an automobile-proof road without going to the heavy expense of a permanent pavement. One of the latest additions to the list is known as "Dolarway Pavement." This consists of a carefully laid concrete base, usually six inches thick, of not less than 1:3:5 mix, with expansion joints approximately every 25 feet. Upon this prepared concrete base there is placed a thin coat of Dolarway bitumen which is broomed out with a horse sweeper. This method of construction has been thoroughly tried for several years, and the evidences are that in the near future it will become very popular. This pavement is low in the first cost, dustless, resilient, economical to maintain, and, in fact, has all of the virtues of the best types of permanent pavements in use to-day without any of their disadvantages.

TESTS OF CROSS-ARMS.

The Department of Agriculture, Forest Service, has recently been conducting some strength tests of cross-arms and results are embodied in Circular 204, just issued by the department. The material tested includes practically twelve cross-arms of each of the following seven groups: Douglas fir, shortleaf pine, longleaf pine, graded by the manufacturers as 50 per cent. heart; longleaf pine, 75 per cent. heart; longleaf pine, 100 per cent. heart; Southern white cedar, and shortleaf pine, creosoted. Each of these cross-arms was tested in a 200,000-lb. Riehle universal testing machine. The comparative strength was as follows:

	riverage	
	Maxin	num Load
Longleaf pine, "75 per cent. heart" .		10,180
Longleaf pine, "100 per cent. heart"		9,780
Shortleaf pine		9,260
Longleaf pine, "50 per cent. heart" .		8,980
Shortleaf pine, creosoted		7,650
Douglas fir		7,590
White cedar		5,200

A summary in the report concludes with the statement that, all things considered, cross-arms of the species and dimensions tested are strong enough for ordinary use; with longer arms the strength is relatively of much more importance. With the standard 6-ft. cross-arm, however, the question of strength need not enter into calculations of line construction, except in the rare case of abrupt change in grade. The ability of the timber to resist decay and methods of preventing decay are considerations of greater importance.