and carriage traffic, as well as some of a heavier character, the traffic amounting to 120,000 tons per yard width per annum.

Pitchmac has been used to a limited extent in Massachusetts. The writer is indebted to Arthur W. Dean, chief engineer of the Massachusetts Highway Commission, for the following authoritative and instructive data covering the cost of construction and maintenance of Pitchmac pavements in Massachusetts having top courses of two inches, filled with tar and sand, and foundation courses of 4 inches of broken stone:—

Roads	Year Built	Cost	Maintenance Per Sq. Yd.	Traffic
Tyngsboro W. .	1913	$1.01	$0.0118	Medium
Natick E.	1914	1.12	0.0191	Heavy
Newton	1914	1.21	0.0118	Medium
Reading S.	1914	1.18	0.0266	Very heavy
Wayland	1914	1.46	0.0175	Very heavy
Gloucester W. .	1915	1.15	0.0141	Medium
Boston	1916	1.20	0.0000	Heavy

Notes:—The condition of all these roads is good. The character of traffic on the several sections is as follows:—

Tyngsboro W.—Heavy pleasure travel, truck and logging teams in spring and fall.

Natick E.—Pleasure cars, trucks between Framingham and Boston.

Newton—Pleasure cars 70%, trucks 15%, teaming 15%.

Reading S.—Pleasure cars, very heavy trucking.

Wayland—Pleasure cars, very heavy trucking.

Gloucester W.—Pleasure cars 80%, trucks 10%, teams 10%.

Boston—Mostly trucks and teaming, pleasure cars 30%.

The maintenance cost quoted is the average per square yard per year since the surface was laid, and with the exception of the Reading S. road, is entirely for sanding. There having been no repairs made nor necessary, nor probably will be for some years. At Reading the contractor had poor workmen and early corrections were necessary on that account. The sanding was necessary mostly on account of surplus tar on surface, and perhaps 25% for slipperiness during cold weather. Notice no repair expense at Boston, due to perfect workmanship. This was partly the result of experience, as it was the latest piece laid and can be equalled under favorable conditions.

Distributors—The appliances used in the distribution of tar cements may be classified as gravity distributors and pressure distributors. The market is supplied with so many different types, that a thorough investigation should be made preceding the purchase of a machine. The following factors should be given consideration when selecting a distributor:—

(1) Character and range of work upon which the distributor will be used.

(2) Present and probable requirements in specifications pertaining to type and details of distributors and the work to be done.

(3) Different types and grades of tar cements which the machine will distribute, and the range in the amount per square yard which can be applied.

(4) Gravity or pressure distribution, and, if the latter, the range in pressure per square inch.

(5) Method of controlling uniformity and amount of distribution.

(6) Accessories of distributors for heating material, recording temperature of tar cement, amount in tank and amount of pressure, and for shutting off tar cement at end of run.

(7) Width of distribution and means for modifying same.

(8) Motive power.

(9) Width of tires and loads per linear inch of tires when tank is full.

(10) Ease of operation and repair.

(11) Structural strength.

(12) Amount and character of labor required to efficiently operate the distributor.

(13) Economics, including overhead operation and maintenance charges.

Cost Data—The cost of tar pavements built by penetration methods varies with the amount and kind of tar cement and road metal used and the method of construction employed. An average cost, using 6 to 8 inches of compacted broken stone and a total of 2 to 2¾ gallons of tar cement per square yard, varies from 25 to 40 cents per square yard in excess of the cost of waterbound broken stone roads, or from 70 cents to $1.25 per square yard.

Tar Concrete Pavements

Definition—A tar concrete is one composed of broken stone, broken slag, gravel or shell, with or without sand, portland cement, fine inert material or combinations thereof, and a tar cement incorporated together by a mixing method.

Classification—Tar concrete pavements may generally be grouped into three classes. The essential characteristics of these classes are as follows:—

Class A—A tar concrete pavement having a mineral aggregate composed of one product of a crushing or screening plant.

Class B—A tar concrete pavement having a mineral aggregate composed of a certain number of parts by weight or volume of one product of a crushing or screening plant, and a certain number of parts by weight or volume of sand, broken stone screenings or similar material, with or without a filler.

Class C—A tar concrete pavement having a predetermined, mechanically graded aggregate composed of broken stone, broken slag, gravel or shell, with or without sand, portland cement, fine inert material or combinations thereof.

Patent Litigation—In connection with the design or selection of a suitable type of tar concrete pavement, it is necessary to consider the possibility of an infringement suit being brought by one of the patentees of proprietary pavements. Highway engineers and contractors are primarily interested in the types of tar concrete pavements which may be constructed without danger of litigation rather than in a voluminous discussion of the probabilities of successfully defending infringement suits.

Class A—There is ample evidence at hand that tar concrete pavements of this class may be constructed without danger of litigation proceedings.

Class B—The history of litigation cases indicates that the construction of unpatented tar concrete pavements of this class on a large scale will in all probability lead to an infringement suit.

Class C—With the exception of the class of tar concrete pavements having mineral aggregates similar to that covered by the Topeka decree, the extensive use of nonpatented tar concrete pavements of this class will usually lead to litigation proceedings.

Foundations—Many failures have occurred due to laying tar concrete pavements on weak foundations. Of the more common types of foundations, satisfactory results have been obtained under medium traffic with thoroughly filled and compacted broken stone and tar-concrete foundations. Cement-concrete foundations should generally be used.