ins. in width, the allowed maximum pressure per square inch of tire being dependent upon the following relationship between the aforesaid pressure and diameter of the wheel:. For a 2-ft. diameter wheel, 250 lbs. shall be the maximum pressure per linear inch of width of tire per wheel, an additional pressure of 20 lbs. per inch being allowed for each additional 3 ins. in diameter."

Operating the Distributor

In operating a mechanical distributor it is important that applications should not overlap either at the ends or sides, and that at the completion the nozzles should not drip on the road. Care should be taken that the nozzles are kept clean so that no strips are left to be later closed in by the hand-pouring pot. By calculation and experience, the proper amount of bitumen may be delivered on the road with reasonable precision. Adjustments as to speed of travel and in feed to the nozzle may be readily arrived at by an experienced operator.

Immediately after this first application of bitumen, a uniform layer of small size broken stone should be spread over the surface in such quantity as to fill the surface voids. The road should then be rolled with the addition of more stone if necessary. The size of this stone is about ¾ in., and should also be clean and free from dust and dry, so that the bond with the road will not be interfered with and will present a proper surface for the reception of the final or seal coat.

Applying the Seal Coat

The bitumen surface should also be kept free from dust, dirt or foreign substances while this ¾-in. stone is being spread. Good practice is to deliver the stone by a side swing of the shovel, which spreads the stone evenly and gives more opportunity for the stone to come to rest in the voids. Just sufficient of this course should be used, otherwise the roller will crush the excess and form a blanket or mat with little wearing ability, and also prevent the penetration of bitumen. The surface is then swept to remove excess of stone and fine material not held firmly in place.

The seal coat is then applied in exactly the same manner as the previous applications except that the quantity is less, there being much less penetration. The surface is uniformly coated, care being taken to avoid excess which would form a thick, undesirable mat.

Immediately after the bitumen is applied, it should be covered with a thin layer of small broken stone of good, clean, hard quality, or clean, sharp sand. The amount placed should be just enough to fill any remaining voids and act as a thin covering over the bitumen to prevent it sticking to the wheels of traffic. Rolling then finally compacts the road and forces the particles of sand or stone together, leaving a finished smooth surface.

Rolling of the pavement after it is completed is a matter which appears to be slighted frequently. The rolling of a penetration road is a vastly different proposition from the rolling of sheet asphalt or of bituminous concrete having a well graded mineral content. It should be rolled when sufficiently warm, so that the road is somewhat plastic. This rolling should be carried on for some time after the pavement is opened to traffic,—possibly for two weeks. Too much stress cannot be laid on the rolling or compacting of the road and the reduction of voids to a minimum.

Finish Contracts in Summer

It goes without saying that all this work should be done in the heat of summer, but in practice very often this is not the case, and frequently contracts run unto late fall, which, of course, gives rise to many difficulties. The stone is cold and chills the bitumen, causing improper penetration. The stone is more apt to be damp, preventing proper adhesion. After the first frosts, leaves from trees along the roadside, more particularly in city streets, fall on the loose stone and if not removed prevent penetration.

The final dressing of small stone or sand above referred to should be left on and if necessary kept on and swept about for the first year, which very materially assists in filling the surface voids, which is most essential and vital to the life of the pavement. Traffic will iron a dressing of sand, if properly spread, to a very smooth surface, and there we have one of the factors in paving—it is smooth. Being smooth, it readily lends itself to ease in cleaning, which in turn prevents dust.

One of the most desirable features of penetration pavements is the ease of construction. Practically all the machinery required besides dump wagons is the heater, distributor and a roller. If material is to be hauled any great distance, the use of motor tractors will be found most economical.

"The Roof of the Road"

Following the capital cost of any pavement, the most important consideration is the question of maintenance. Ordinarily a properly designed and constructed penetration road should require small repairs. A rejuvenation of the seal coat, or its renewal when worn away, should be the limit unless traffic is exceedingly heavy or the dirt hauled on the road has been ground into the surface before cleaning. However, no attention should be required for from three to five years, and then a light dressing of bitumen covered with stone chips or sharp sand will replace or renew the life of the seal coat. Care should be taken that too thick a mat is not formed, which will have quite a tendency to shove under traffic and form waves.

Just as the seal coat forms the roof of the road, it should never be allowed to wear out. It forms a waterproof blanket, preventing water from penetrating and spelling destruction. If proper adhesion to the road is secured and traffic is at all uniformly distributed, it will wear away very slowly and uniformly. When sufficiently worn, a coat or dressing should be applied in a manner exactly similar to the original seal coat.

If, on the other hand, breaks occur anywhere in the seal coat, they should be promptly repaired. Broom and clean out the weak spots to allow proper adhesion, then apply the bitumen and stone chips and tamp back level with the original road.

Life of Road Indefinite

By maintaining the seal coat, the life of the road is continued indefinitely. Frequently a break in the surface is due to lack of support from below. The cause of this may be weak foundation, poor subgrade or faulty drainage. Under such circumstances, it is obvious that the proper procedure is to remove the cause of failure before attempting a repair on the surface. Further causes of failure may be unsound stone and improper distribution, as well as the use of bitumen damaged or unsuitable for the purpose. Ruts appearing may be the result of improper rolling or the rutting of the stone while the bitumen is being applied, or the use of too much or too soft binder.

So it will appear that although a penetration road is possibly the simplest to build, it nevertheless requires eternal vigilence on the part of the superintendent if he wishes to turn out a finished road and avoid the many waiting pitfalls which will spell destruction to the best intentions.

Costs Have Nearly Doubled

Costs at the present time are the most problematical element entering into road construction of any kind, and it is scarcely safe to hazard an estimate due to the varying scale of wages paid and the uncertain cost of materials. Citing the city of Stratford as an example, the cost of laying a 3-in. bituminous penetration surface on a prepared base was 81.6 per square yard during 1919, as compared with 47 cents during 1915. We anticipate that the cost for 1920 will be considerably higher.

In conclusion, we would just like to add that though the penetration road may not represent the finest product in so-called permanent pavements, it is still worthy of due consideration as the go-between, and we feel it has a proper place to fill in the advancement of our highways, and that place will be no mean proportion of the very comprehensive scheme now being contemplated.