E. F. Caldwell: The clay tile takes in the moisture from the joints, and also because of its porosity. It goes through a different process than the cement tile. One is set up by seasoning process, and the other by burning, and there is quite a difference in the two. You take a brick and put it into a pail of water and you find the absorption is different from that of a cement brick. We have never used in my state a cement tile. We have seen them laid as concrete and have had to take them up and lay other pipe that would be salt glazed to carry our conduits because they broke at the joints and disintegrated and went to pieces. And we gradually eliminated it, and I have not seen any cement tile laid for land drainage or anything of that kind, but thousands of feet of clay pipe for drainage.

Cement vs. Clay Tile

Mr. MacDonald: That just shows how much we are gaining every day, because in some parts of the country it is coming to be understood, and farmers are claiming that the cement tile is the best, that it will stand more hard usage, and if they ever do fill up they can be cleaned out and put back again without any chance of breaking, while in the other case there is a great percentage of breakage. I have no brief for either one. I am only speaking of my experience, but we are using the other pipe. If you gentlemen here are finding out new uses for the cement pipe we will be glad to use your experience and profit by it.

Col. W. H. Sohier: When we have laid a drain pipe for a culvert, instead of building a concrete culvert we have always dug our trench deeper than the pipe and put something underneath it—quite a little material so as to keep its alignment, broken gravel or some material that would drain itself.

Mr. Caldwell: I would like to find out whether the seepage of a tile made of cement is detrimental to that tile if it is stronger than the ordinary field tile.

Depends Upon Materials and Workmanship

Mr. MacDonald: I tried to introduce into my state, and went so far as to secure a patent for a metal-protected collar and sleeve of a cement pipe by reason of the expense that towns had to enter into to secure access to these larger clay double thick salt glazed pipe, so that we could get a perfect union. The great fault with the other pipe was the irregular burning of the pipe and the lack of being able to dip them, and I felt if I could get a collapsible core and jacket and put on a metalprotected bell and mould this through and dip them in asphalt, such a pipe would supply a long-felt want, for they could be made right on the job and save expense. So I am very friendly with cement pipe, but I don't believe that it would be advantageous or economical to use a cement pipe in place of what we have now on a question of economy.

Mr. Caldwell: I had occasion to put in ten thousand feet of tile, and put in cement tile because we could not get clay tile, and I don't like the looks of them. A great many of the men who were using clay tile claim that they are porous, and that the water runs through the tile. That is not so. The water going into a field tile goes in through the joint, and nowhere else. The claim that has been made for the draining of a field by cement tile is that it is porous enough, and you can lay the joints closer together, getting away from all chance of sand getting in the joint, and enough water will go through the tile itself to supply that drainage. It is easy to try yourself. Take a field tile, block up the ends solid and put into a pail of water. It would remain dry. A cement tile will . not. How long it will last I don't know. Agricultural clay pipe is not porous. You have to be careful not to lay it too close together or you will not allow the water to get in.

Mr. MacDonald: Take a flower pot and stop it up and fill it with water, and put timothy on the outside. It will grow, and when you take the water out it drops off, which shows that a clay pipe is porous and does absorb and take in water.

Mr. Drinkwater: Both clay and cement pipe differ in the manufacture and material used. Clay pipe in some districts will let water through like a sponge, that is, pipe made from loam clay. The clay pipe made from shale clay, which is burned and vitrified, is almost non-porous. In cement it depends on the size of sand and the quantity of cement you use. You can build a cement tile that will be as tight as any vitrified type ever made, provided you use enough cement, and it will be just as indestructible as the other.

MAINTAINING OLD ASPHALT PAVEMENTS

(Continued from page 325)

measure, the price including delivery on the work; and that the asphaltic cement for painting joints is paid for by the gallon delivered.

The cost of the street work includes labor, the chopping out of patches, laying material and cleaning up. This we pay for by the square yard.

Our contract also provides for relaying concrete base, unless the city performs the work with its own force.

Also for paving in trenches with binder $1\frac{1}{2}$ inches deep and top $1\frac{1}{2}$ inches deep and labor—a price being bid—

For trenches under 80 square yards.

- For trenches between 80 and 480 square yards.
- For trenches between 480 and 1,000 square yards.

For trenches over 1,000 square yards.

If two or more trenches of this kind are within onehalf mile one from another and are repaired as a continuous work, the sum of their areas is the area on which payment is made.

By this specification the city uses all cf either the binder or the top as its engineer requires and pays for the amount actually used. Our specifications quote that the average depth experience was for binder 1.12 inches, top 1.57 inches, or 75 and 78 per cent. of original depth, and this definition we make for the information of the bidder.

Less Binder Being Used

In the 1917 work we found that we used about 0.87 inch average depth of binder and 1.57 inch of top, or 58 and 78 per cent., respectively. The reduction in binder is partly due to the fact that our pavements are becoming thin. Those laid prior to 1892 were laid on one-half inch cushion instead of binder, and these require little, if any, binder in repairs. Our specifications provide that when the old pavement is less than two inches deep, binder shall not be used for repair.

Bids for repairs are received early in the calender year, giving the contractor time to order his material and to arrange his organization.

As soon as the weather permits, usually in March, an inspection of all pavements is made, conditions are