C. E. FULLER.

METHOD OF TREATING POROUS BLOCKS.

APPLICATION FILED OCT. 20, 1916.

1,229,439.

Patented June 12, 1917.

2 SHEETS—SHEET 1.

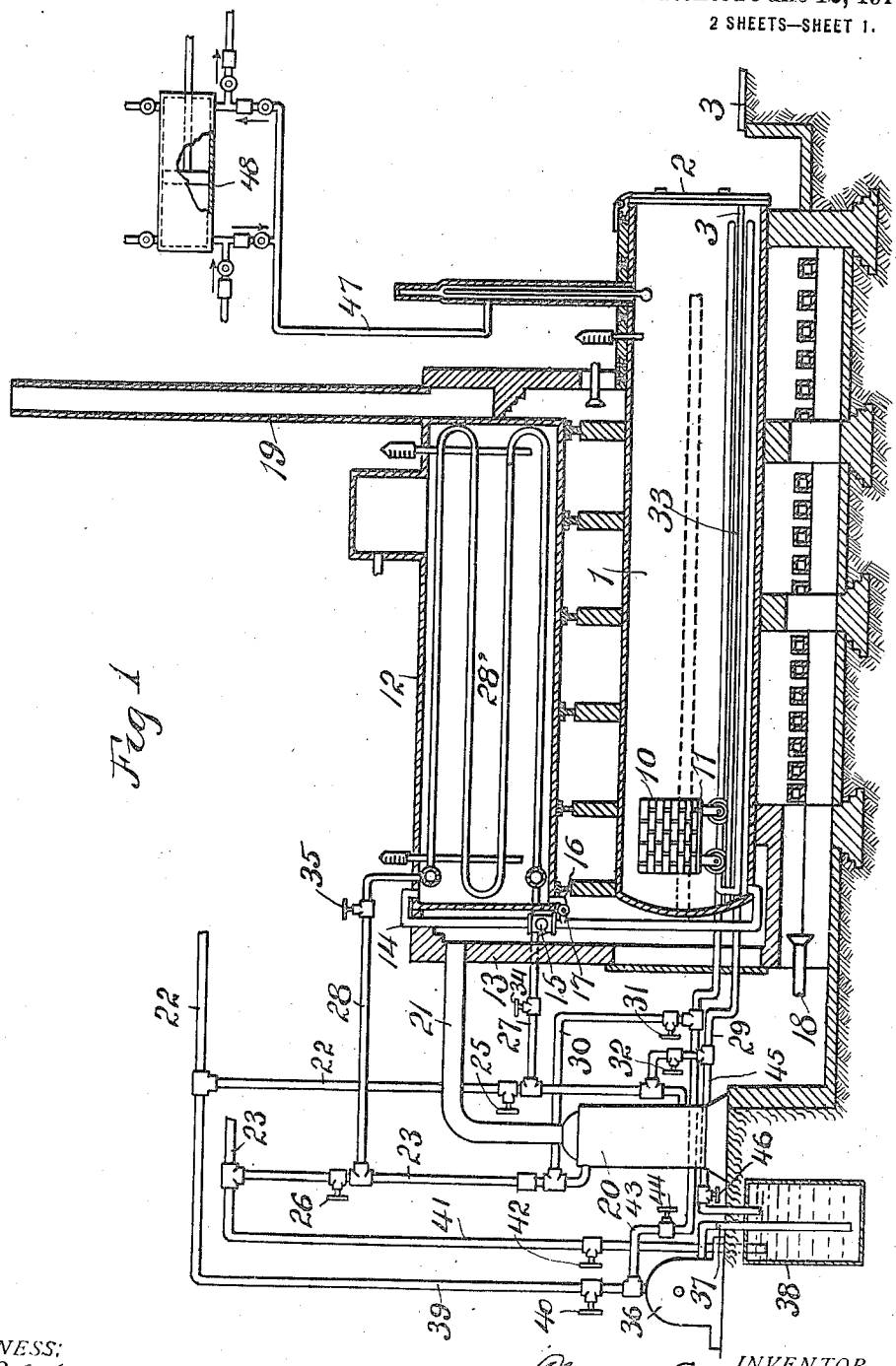

Fig 1

WITNESS:

R. S. Hamilton

INVENTOR.

Claud E. Fuller

BY

Warren D. House

His ATTORNEY

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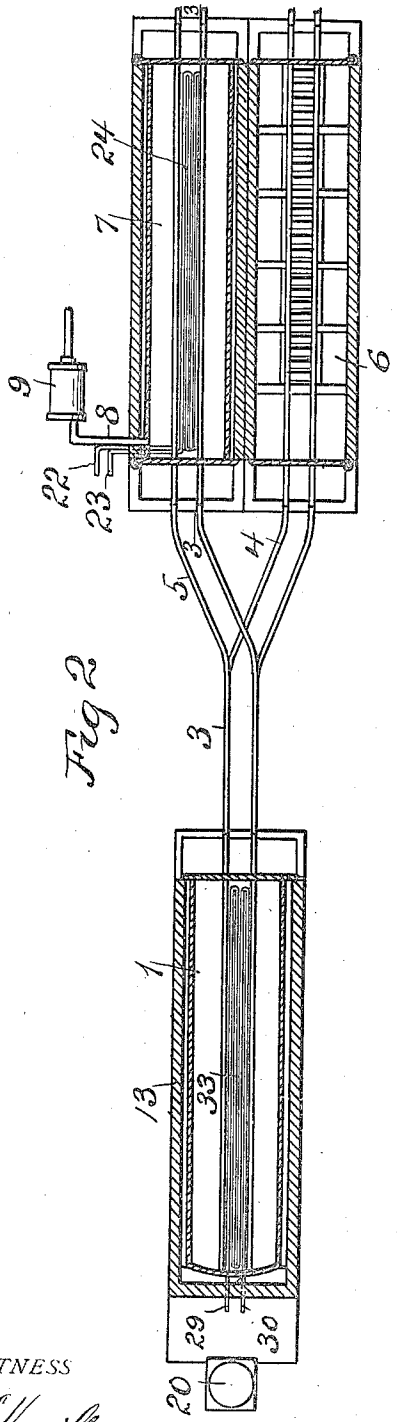

Fig 2

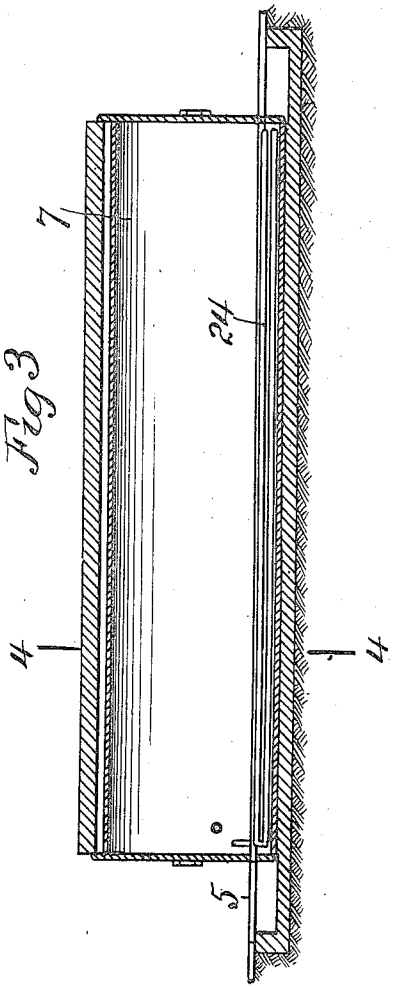

Fig 3

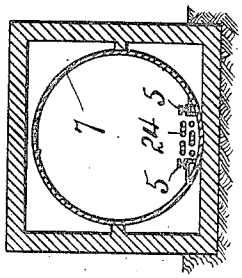

Fig 4

WITNESS

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UNITED STATES PATENT OFFICE.

CLAUD E. FULLER, OF KANSAS CITY, MISSOURI.

METHOD OF TREATING POROUS BLOCKS.

1,229,439. Specification of Letters Patent. Patented June 12, 1917.

Application filed October 20, 1916. Serial No. 126,805.

To all whom it may concern:

Be it known that I, CLAUD E. FULLER, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented a certain new and useful Improvement in Methods of Treating Porous Blocks, of which the following is a specification.

My invention relates to improvements in methods of treating porous blocks.

It relates to the treatment of blocks, such as bricks, designed for paving purposes.

It relates particularly to the treatment of blocks by impregnation of the same with a suitable material, such as asphalt, which solidifies at ordinary temperatures.

Blocks so treated in assembled condition are liable to stick together when the filling material solidifies.

The object of my present invention is to provide a method of treatment for the blocks which will eliminate the liability of the blocks sticking together when the impregnating material solidifies.

In carrying my invention into effect, the blocks are impregnated with the desired filling material, following which, while the impregnating material is still in liquid form, the blocks are subjected to a vacuum, that is to a pressure less than atmospheric, after which the blocks are cooled until solidification of the liquid occurs.

When the impregnation of the blocks takes place, there occurs a filtering action, particularly with dense or fine grained blocks. This filtering action leaves a coarse coating or scale of the material on the surface of the blocks which causes them to stick together when the liquid solidifies.

The action of the vacuum causes some of the impregnating material to pass out of the pores of the blocks, thereby loosening the coarse covering or scale, which will then drain from the blocks, if they are permitted to stand. To facilitate this draining operation, the blocks may then be subjected to washing while the filling material is still in liquid form, and preferably, but not necessarily, while the blocks are still subjected to the vacuum.

The washing operation may be, and preferably, is, effected by immersing the blocks in a like liquid. Other washing means may be employed, however, such as will carry away the coarse coating or scale. I have found, however, that the washing may, in some cases, be dispensed with, as with some filling materials the coarse coating will be loosened and will drain off, due to the vacuum action alone.

I have also found it to be a desirable auxiliary feature, to simultaneously cool the blocks, while they are subjected to the vacuum, preferably, to a temperature above that at which the impregnating material solidifies. This results, when the filling material has a greater coefficient of expansion than the blocks, as in the case of bricks impregnated with asphalt, in the impregnating material contracting, while cooling and still in liquid form, thereby drawing into the pores excess material which is on the surface of the blocks.

After the blocks have been subjected to the vacuum, they may then be cooled to the point of solidification of the filling material, either in the vacuum, in the open air at atmospheric pressure, or under pressure greater than atmospheric.

When cooled at a pressure greater than that to which they are subjected in the vacuum the outside pressure further forces the surface filling material into the pores.

The impregnation of the blocks may be partial or it may be carried to saturation, and it may be effected in any well known manner.

In carrying my invention into effect, I prefer to employ the following described steps.

The blocks are first subjected to a vacuum so as to withdraw therefrom the air contained in the pores. The blocks are then immersed in the liquid filling material, such as liquid asphalt, and subjected to pressure, whereby such air as still remains in the block is compressed and the blocks are thereby filled to saturation.

The immersing liquid is then removed and the blocks are subjected to a vacuum which

will cause the discharge from the pores of some of the filling material which will drain from the blocks.

If desired, the blocks may be then again immersed in the filling liquid for washing off the coarse coating while the blocks are in the vacuum. The blocks are then cooled, preferably while in the vacuum, to a temperature above the temperature at which the filling material solidifies. This step effects a contraction of the filling material in the pores of the blocks, thus withdrawing the filling material from the surface.

The blocks may then be cooled in the open air at atmospheric pressure and temperature.

When asphalt is used as a filling material, the blocks are preferably heated to approximately 350 degrees Fahrenheit. When cooled in the vacuum, the temperature is reduced to about 250 degrees Fahrenheit, which is above the point of solidification of the asphalt, but which is sufficiently low to effect a considerable amount of contraction in the liquid asphalt.

Upon the blocks being then subjected to a greater pressure than that to which they were subjected in the vacuum, as when they are placed in the open air to complete the cooling operation, the outside pressure will cause the filling material, which is still in liquid form, to be further forced into the pores, thereby further decreasing the liability of sufficient filling material remaining on the surface of the blocks to cause them to stick together.

In the accompanying drawings, I have illustrated an apparatus adapted to carry my improved method into effect.

Figure 1 is a view partly in vertical section and partly in side elevation of my improved apparatus, parts being omitted.

Fig. 2 is a horizontal sectional view of the apparatus.

Fig. 3 is a vertical section, enlarged, on the line 3—3 of Fig. 2.

Fig. 4 is a cross section on the line 4—4 of Fig. 3.

Similar reference characters designate similar parts in the different views.

1 designates the treating or immersing chamber having at one end a door 2, and provided with a track 3 having two branches 4 and 5 which respectively pass through a preheating chamber 6 and a chamber 7 adapted to be made air tight, and connected by a pipe 8 with a vacuum pump 9, Fig. 2.

10 designates porous blocks, such as bricks, which are to be treated and which are piled on a car 11 on the track 3.

12 is a tank above the chamber 1 and which contains the liquid filling material, such as melted asphalt, and which is, preferably contained with the chamber 1 in a casing 13.

A conductor 14 has its upper end connected to the upper side of the tank 12 and its lower end connected to the lower side of the chamber 1. Said conductor contains a shut off cock 15. It is also provided, below said cock, with a branch 16 connected to the under side of the tank 12 and containing a shut off cock 17.

Any suitable means may be employed for heating the chambers 1, 6 and 7 and the tank 12. Also any means may be employed to cool the chambers 1 and 7.

In the drawing, Fig. 1, I have shown a burner 18 arranged to discharge under the chamber 1, the heat passing from the burner around the chamber 1 and under the tank 12 into a chimney 19.

As a supplemental means of heating the tank 12 and chambers 1 and 7, I provide a boiler 20, the smoke pipe 21 of which discharges into the casing 13.

Connected with the boiler 20 are two conductors 22 and 23 which connect with a heating coil 24 in the chamber 7. In the conductors 22 and 23 are provided respectively shut off cocks 25 and 26. Below said cocks two conductors 27 and 28 are respectively connected to the conductors 22 and 23. A heating coil 28′ in the tank 12 has its ends respectively connected with the conductors 27 and 28.

Connected respectively to the conductors 22 and 23, below the cocks 25 and 26 are conductors 29 and 30, which respectively contain shut-off cocks 31 and 32, and which respectively connect with the end of a heating coil 33 in the chamber 1. When it is desired to heat the chambers 1 and 7 and the tank 12, the cocks 25, 26 and 31 and 32 are opened, thereby permitting steam to pass from the boiler 20 through the conductors 22 and 23 to the coil 24 and through the branches 29 and 30 to the coil 33. The steam passes into the coil 28′ through the conductors 27 and 28, which latter may be provided respectively with shut-off cocks 34 and 35.

In order that the coils 24 and 33 may be supplied with cold water, when it is desired to reduce the temperature in the chambers 1 and 7, the following described mechanism may be employed.

A force pump 36 has connected to it a conductor 37 which extends downwardly into water contained in a tank 38. A conductor 39 connects the pump 36 with the conductor 22 and contains a shut-off cock 40. A conductor 41 is connected to the conductor 23 above the cock 26 and discharges into the tank 38. It contains a shut-off cock 42.

Upon the cocks 25 and 26 being closed and the cocks 40 and 42 opened, cold water is circulated by the pump 46 through the coil 24. A conductor 43 containing a shut-off cock 44 connects with the conductor 39 and the conductor 30. A conductor 45 is con-

nected to the conductor 29 and contains a shut-off cock 46 and discharges into the tank 38.

Upon the pump 36 being operated, and the cocks 31 and 32 closed and the cocks 44 and 46 opened, cold water will be pumped from the tank 38 and through the coil 33 and discharged again into the tank 38.

A conductor 47 is connected to the upper side of the chamber 1 and to a double action air pump 48, of any suitable construction and which is adapted to suck air from the chamber 1 or to force air into said chamber.

Any suitable means may be employed to heat the preheating chamber 6. This chamber and the chamber 7 are provided each with end doors, so that cars, corresponding to the car 11 may be run clear through the chamber.

In operating the apparatus, the cocks 25, 26, 31, 32, 34 and 35 are opened so that steam from the boiler 20 may enter the coils 24 and 33 and the coil 28′, the cocks 40, 42, 44 and 46 being closed.

After the asphalt in the tank 12 has been melted and has been heated to a temperature of about 350 degrees Fahrenheit, and the preheating chamber 6 has been heated to about the same temperature, the cars 11 carrying the bricks 10 are run into the preheating chamber 6 and left there until sufficiently heated, after which they are run into the chamber 1, the door 2 of which is then closed and hermetically sealed. The chamber 1 is now heated to about 350 degrees Fahrenheit, following which the pump 48 is operated to produce a vacuum in the chamber 1, the air being thus withdrawn from the pores of the bricks 10.

The cock 17 is then opened, thus permitting the liquid asphalt in the tank 12 to pass through the conductors 16 and 14 into the chamber 1. When this chamber has been filled, the cock 17 is closed, the cock 15 having been closed prior to the air pumping operation.

The pump 48 is then operated to force air into the chamber 1, thereby forcing the liquid asphalt into the pores of the bricks 10. After the chamber 1 has been left under pressure a length of time sufficient to effect saturation of the bricks 10, the cock 15 is opened and the pump 48 operated to force air into the chamber 1, thereby forcing the asphalt from said chamber into the tank 12 through the conductor 14.

The cock 15 is then closed and the pump 48 is operated to produce a vacuum in the chamber 1. At this time, the cocks 31 and 32 are closed and the cocks 44 and 46 opened and the pump 36 operated so as to force cold water through the coil 33. When the temperature in the chamber 1 has been reduced to about 250 degrees Fahrenheit, the pump 36 is shut off from the coil 33.

When the bricks have been subjected to this lower temperature in the vacuum, the small amount of air which was in the bricks will have expanded and forced some of the asphalt from the bricks, thereby loosening the outer coating. During the period of low temperature, comparatively speaking, the asphalt remaining in the pores of the bricks will contract, thereby freeing the surface of the bricks of excess asphalt.

If desired, instead of lowering the temperature in the chamber 1, as above described, after the asphalt has been pumped back into the tank 12, the cars 11 may be run from the chamber 1 on the track 3 and branch track 5 into the chamber 7, after which the doors of the latter chamber are closed tightly and the vacuum pump 9 operated to produce a vacuum in the chamber 7. This chamber may be kept at a temperature of about 250 degrees Fahrenheit by properly controlling the cocks 40 and 42 and 25 and 26.

After the bricks have been subjected to the vacuum, and cooling operation in either chamber 1 or 7, they may be then run into the open air and be permitted to cool at atmospheric pressure until solidification of the liquid asphalt in the pores of the bricks has occurred.

If it is desired to wash the bricks off to assist in removing the outer coarse coating following the subjecting of the bricks to the vacuum action after their immersion in the chamber 1, this may be done by again immersing the bricks in the chamber 1, prior to the cooling operation, in the manner already described. The bricks may then be cooled to 250 degrees Fahrenheit in a vacuum, either in the chamber 1 or the chamber 7, and then permitted to be finally cooled in the open air.

Modifications of my invention within the scope of the appended claims, may be made without departing from its spirit.

What I claim is:—

1. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures, and then subjecting the block to a vacuum before the liquid solidifies.

2. The method consisting in impregnating a porous block, while subjected to pressure greater than atmospheric, with a liquid which solidifies at ordinary temperatures, and then subjecting the block to a vacuum before the liquid solidifies.

3. The method consisting in impregnating a porous block with liquid bitumen, and then subjecting the block to a vacuum before the liquid solidifies.

4. The method consisting in impregnating a porous block with liquid asphalt, and then subjecting the block to a vacuum before the liquid solidifies.

5. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures, then subjecting the block to a vacuum before the liquid solidifies, and then subjecting the block to pressure until solidification occurs.

6. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures, then subjecting the block to a vacuum before the liquid solidifies, and then subjecting the block to atmospheric pressure until solidification occurs.

7. The method consisting in impregnating a porous block with liquid bitumen, then subjecting the block to a vacuum before the liquid solidifies, and then subjecting the block to pressure until solidification occurs.

8. The method consisting in impregnating a porous block with liquid asphalt, then subjecting the block to a vacuum before the liquid solidifies, and then subjecting the block to pressure until solidification occurs.

9. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures, subjecting the block to a vacuum and simultaneously cooling the block to a temperature above the point of solidification of the liquid, and then further cooling the block under pressure.

10. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures, then simultaneously subjecting the block to a vacuum and to cooling to a point above the point of solidification of the liquid, and then further cooling the block at atmospheric pressure.

11. The method consisting in impregnating a porous block with liquid bitumen, then subjecting the block to a vacuum and simultaneously cooling it to a temperature above that at which the bitumen solidifies, and then further cooling the block at atmospheric pressure.

12. The method consisting in impregnating a porous block with liquid asphalt, then subjecting the block to a vacuum and simultaneously cooling it to a temperature above that at which the asphalt solidifies, and then further cooling the block at atmospheric pressure.

13. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures, then subjecting the block to a vacuum, and then washing the block before the liquid solidifies.

14. The method consisting in impregnating a porous block while subjected to pressure greater than atmospheric with a liquid which solidifies at ordinary temperatures, then subjecting the block to a vacuum, and then washing the block before the liquid solidifies.

15. The method consisting in impregnating a porous block with liquid bitumen, then subjecting the block to a vacuum, and then washing the block before the liquid solidifies.

16. The method consisting in impregnating a porous block with liquid asphalt, then subjecting the block to a vacuum, and then washing the block before the liquid solidifies.

17. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures, then subjecting the block to a vacuum, and then, before the liquid solidifies, washing the block with a like liquid.

18. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures and which has a greater coefficient of expansion than the block, then subjecting the block to a vacuum, and then, before the liquid solidifies, washing the block with a like liquid.

19. The method consisting in impregnating a porous block with liquid bitumen, then subjecting the block to a vacuum, and then, before the liquid solidifies, washing the block with liquid bitumen.

20. The method consisting in impregnating a porous block with liquid asphalt, then subjecting the block to a vacuum, and then, before the liquid solidifies, washing the block with liquid asphalt.

21. The method consisting in impregnating a porous block, while under pressure greater than atmospheric, with a liquid which solidifies at ordinary temperatures, then subjecting the block to a vacuum, and then washing the block with a like liquid before the liquid solidifies.

22. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures, then subjecting the block to a vacuum, then washing the block before the liquid solidifies, and then subjecting the block to cooling to a temperature above that at which the liquid solidifies while the block is in the vacuum.

23. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures, then subjecting the block to a vacuum, then washing the block before the liquid solidifies, then cooling the block to a temperature above that at which the liquid solidifies and while the block is in the vacuum, and then further cooling the block under pressure until solidification occurs.

24. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures, then subjecting the block to a vacuum and simultaneously cooling the block to a temperature above the point of solidification of the liquid, and then further cooling the block until solidification occurs.

25. The method consisting in subjecting a

porous block to a vacuum, then impregnating the block with a liquid which solidifies at ordinary temperatures, then subjecting the block to a vacuum before the liquid solidifies, and then cooling the block until solidification occurs.

26. The method consisting in impregnating a porous block with a liquid which solidifies at ordinary temperatures, then subjecting the block to a vacuum before the liquid solidifies, and then cooling the block at atmospheric pressure until solidification occurs.

In testimony whereof I have signed my name to this specification.

CLAUD E. FULLER.