

UNITED STATES PATENT OFFICE.

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METHOD OF PRODUCING SOLIDS FROM BITUMINOUS EMULSIONS.

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Our invention relates to methods and processes for the repairing or building of pavements, roads, walls, or other structures, and for waterproofing surfaces in general and for protecting them from the action of the elements, and it has special reference to a method whereby such repair, building, waterproofing or protection is accomplished with greater efficiency and greater economy than has heretofore been possible in the art.

The principal object of our invention is to provide a container and to supply it with a quantity of particles of mineral substances, such as sand, or cement mixed with sand, which may be mixed further with particles of organic substances, such as sawdust or cork, and to subject the particles to a pressure greater than that of the atmosphere so as to eject the particles with great velocity from a nozzle exit, and to force into the stream of such particles a stream of a bituminous or asphaltic emulsion from another container, so that the globules in the emulsion are broken down and the water forced out of the emulsion by the impact of velocity of the stream of said particles and the bituminous substance in the emulsion and thereby a filling and binding solid is formed.

Some of the specific uses for which our invention is adapted will be further elucidated in the following detailed description, in which reference is made to the accompanying drawing:

The figure is a diagrammatic elevation of a truck carrying thereon an air compressor, two containers, one for the mineral and organic substances, and the other for the bituminous emulsion, and also an air motor feeding mechanism connected to the former container and adapted to feed the substances from the container at a uniform rate of flow.

In the preferred embodiment of our invention we mount an air compressor 5 and two containers 6 and 7 in any suitable manner upon a truck 8 or other movable conveyance. The compressor 5 may be of any approved make adapted for our purpose, and, preferably, the containers 6 and 7 are both connected at their tops with the compressor by conduits 9 and 10. While the conduit 9 is adapted to lead air from the compressor into the container 6 so that a pressure approximating 80 pounds per square inch is maintained therein, the conduit 10 is adapted to lead air into the container 7 so that the

pressure therein is approximately 100 pounds per square inch in order to bring about the best result, as will be further explained hereinafter.

At their tops the containers 6 and 7 preferably have flanged respective openings adapted to receive respective covers 11 and 12, either screwed onto the containers or otherwise secured thereto and sealed so as to make connections that will withstand the pressure to which the containers are subjected. The container 6 is provided with a valve 13 at its outlet 14, and has connected with the valve one end of a flexible conduit 15, which is at its other end connected with one branch 16 of a suitable bifurcated nozzle 17, and the container 7 is similarly provided with a valve 18 at its outlet 19, and with the valve 18 is connected one end of another flexible conduit 20, which preferably is at its other end connected with another valve 21 at another branch 22 of the nozzle 17, the two branches 16 and 22 having a common exit 23.

Through its top opening the container 6 is filled with particles of mineral substances 4, such as cement or sand, or cement mixed with sand, and these substances may be further mixed with particles of some organic substance, such as cork or sawdust, or both. In order to feed the mineral particles from the container 6 at a uniform rate of flow and in order to prevent lumping of the particles at the exit 14, the container has mounted therein and arranged on a slanting axis an endless screw 24, which in this instance is shown as driven by a suitably mounted air motor 25, connected by a conduit 26 with the compressor 5.

The container 7 is filled through its top opening with a bituminous emulsion, such as emulsified asphalt, which may be obtained in the market, but it is understood that any other bituminous emulsion, equally suitable for the purpose of carrying out the principle of our invention, may be used.

In practice, when the containers 6 and 7 have been filled, as stated, air is supplied to the containers and to the air motor 25 from the compressor 5, and the valves 13 and 3 are opened, so that the particles of the substances in the container 6 are rapidly carried through the conduit 15 to the branch 16 of the nozzle 17 and are ejected therefrom at the exit 23. The valves 18 and 21

are then opened so that the bituminous emulsion is forced through the conduit 20 and to the branch 22 of the nozzle and joins the stream of mineral particles with great velocity in the branch 16 and is incorporated therewith, as the emulsion and the particles leave the exit 23 together. As an illustration of some of the work that can be done by our method, a fragment of a wall 27, having a crack forming separated surfaces 28 and 29 therein, is shown. The mixture from the nozzle 17 is directed towards this crack and immediately covers the surfaces 28 and 29 with a coating, from which the water is forced out by the impact of velocity of the stream of the particles and of the bituminous substance in the emulsion, so that the coating quickly solidifies. In a short time, the crack is entirely filled and sealed, but the operation may continue, if it is desired to cover the front surfaces 30 and 31 in the same manner and to form thereon a solid coating which may be built up to any required thickness and will be an integral part of the wall, as shown by a lump 32 formed on the front surfaces 30 and 31. It is thus seen that the velocity of impact of the stream of substances-issuing from the nozzle exit 23 accomplishes a result far superior to that of tamping, which is insufficient to break down the globules of the emulsion and to force out the water therefrom completely.

In some instances we may use only sand in the container 6, or sand mixed with particles of a suitable organic substance, as cork particles or sawdust or with both, or we may use only cement, or cement mixed with sand in the usual proportion, say, two or three parts of sand to one part of cement, and the sand and cement may also be mixed with cork particles or sawdust or both, or with particles of some other organic substances which we may deem suitable for the purpose of combining with the bituminous substance of the emulsion for building a solid, as already has been described.

We have also found it advantageous in some instances to connect the nozzle branch 16 with a water conduit 33 leading from a suitable water-supply source and controlled, for example, by a valve 34 adjacent to the nozzle branch 16. When the valve 34 is opened, water will flow into the cement and sand mixture before the emulsion reaches it from the branch 22 and will thus combine with the cement and assist in the hardening thereof.

It has already been mentioned that the pressure in the container 7 is preferably greater than that in the container 6. This difference in pressure is for the purpose of thoroughly incorporating the emulsion into the mixture from the container 6 so that, when the mixture from both containers solidifies it retains as a whole the property

of the asphaltum to resist the action of water and other elements.

From this it may be understood that our invention, in addition to what already has been stated, may be used in many different arts and for different purposes. For instance, in repairing leaky oil tanks our invention is invaluable, since by our method the leak will not only be repaired quickly and permanently, but wherever a coating, whether thick or thin is applied by our method, it forms also an insulation which will protect such tanks from being struck by lightning. The method is therefore also invaluable in the electric arts. It is of great value in tree surgery, as the wound in a tree or a plant by means thereof can be dressed quickly, and such tree or plant will have a healthier existence than before because of the protection the asphaltic substance affords against parasitic growth and the attacks of insects, and so forth. Only a few of the numerous uses for which our invention is adapted are here pointed out, as obviously the description thereof would require a volume or even several volumes in order to cover every detail.

Having thus illustrated and described the preferred embodiment of our invention, we claim as new and desire patent protection thereon, the following:—

1. A method of producing a solid from a bituminous emulsion combined with particles of mineral substances, said method consisting in forcing a stream of said particles under a pressure greater than that of the atmosphere to a surface or surfaces of a solid or a plurality of solids, and in forcing the bituminous emulsion into said stream, so that the globules of the emulsion are broken down and the water forced out of the emulsion by the impact of velocity of the stream of said particles and the bituminous substance in said emulsion.

2. A method of producing a solid from an asphaltic emulsion combined with sand, said method consisting in forcing a stream of said sand under a pressure greater than that of the atmosphere to a surface or surfaces of a solid or a plurality of solids, and in forcing the asphaltic emulsion into said stream, so that the globules of the emulsion are broken down and the water forced out of the emulsion by the impact of velocity of the stream of said sand and the asphalt in said emulsion.

3. A method of producing a solid from a bituminous emulsion combined with particles of mineral substances, said method consisting in forcing a stream of said particles under a pressure greater than that of the atmosphere to a surface or surfaces of a solid or a plurality of solids, and in forcing the bituminous emulsion into said stream at a pressure greater than that on said parti-

cles, so that the globules of the emulsion are broken down and the water forced out of the emulsion by the impact of velocity of the stream of said particles and the bituminous substance in said emulsion.

4. A method of producing a solid from a bituminous emulsion combined with particles of mineral substances and particles of organic substances, said method consisting in forcing a stream of said particles under a pressure greater than that of the atmosphere to a surface or surfaces of a solid or a plurality of solids, and in forcing the bituminous emulsion into said stream, so that the globules of the emulsion are broken down and the water forced out of the emulsion by the impact of velocity of the stream of said particles and the bituminous substance in said emulsion.

5. A method of producing a solid from an asphaltic emulsion combined with cement and sand, said method consisting in forcing a stream of said cement and sand under a pressure greater than that of the atmosphere to a surface or surfaces of a solid or a plurality of solids, and in forcing the asphaltic emulsion into said stream, so that the globules of the emulsion are broken down and the water forced out of the emulsion by the impact of velocity of the stream of said cement and sand and the asphalt in said emulsion, so that some of the water combines with said cement while the cement is mixed with said sand and said asphalt and therewith forms a new solid substance.

6. A method of producing a solid from an asphaltic emulsion combined with cement,

sand and sawdust, said method consisting in forcing a stream of said cement, sand and sawdust under a pressure greater than that of the atmosphere to a surface or surfaces of a solid or a plurality of solids, and in forcing the asphaltic emulsion into said stream, so that the globules of the emulsion are broken down and the water forced out of the emulsion by the impact of velocity of the stream of said cement, sand and sawdust and the asphalt in said emulsion, so that some of the water combines with said cement while the cement is mixed with said sand, sawdust and said asphalt and therewith forms a new solid substance.

7. A method of producing a solid from an asphaltic emulsion combined with cement, sand, sawdust and particles of cork, said method consisting in forcing a stream of said cement, sand, sawdust and cork particles under a pressure greater than that of the atmosphere to a surface or surfaces of a solid or a plurality of solids, and in forcing the asphaltic emulsion into said stream, so that the globules of the emulsion are broken down and the water forced out of the emulsion by the impact of velocity of the stream of said cement, sand, sawdust, cork particles and the asphalt in said emulsion, so that some of the water combines with said cement while the cement is mixed with said sand, sawdust, cork particles and said asphalt and therewith forms a new solid substance.

In testimony whereof we affix our signatures.

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