June 10, 1930. G. W. CHRISTIANS 1,763,219

METHOD AND APPARATUS FOR SEALING CREVICES IN ROCK FORMATIONS OR THE LIKE

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FIG. 1.

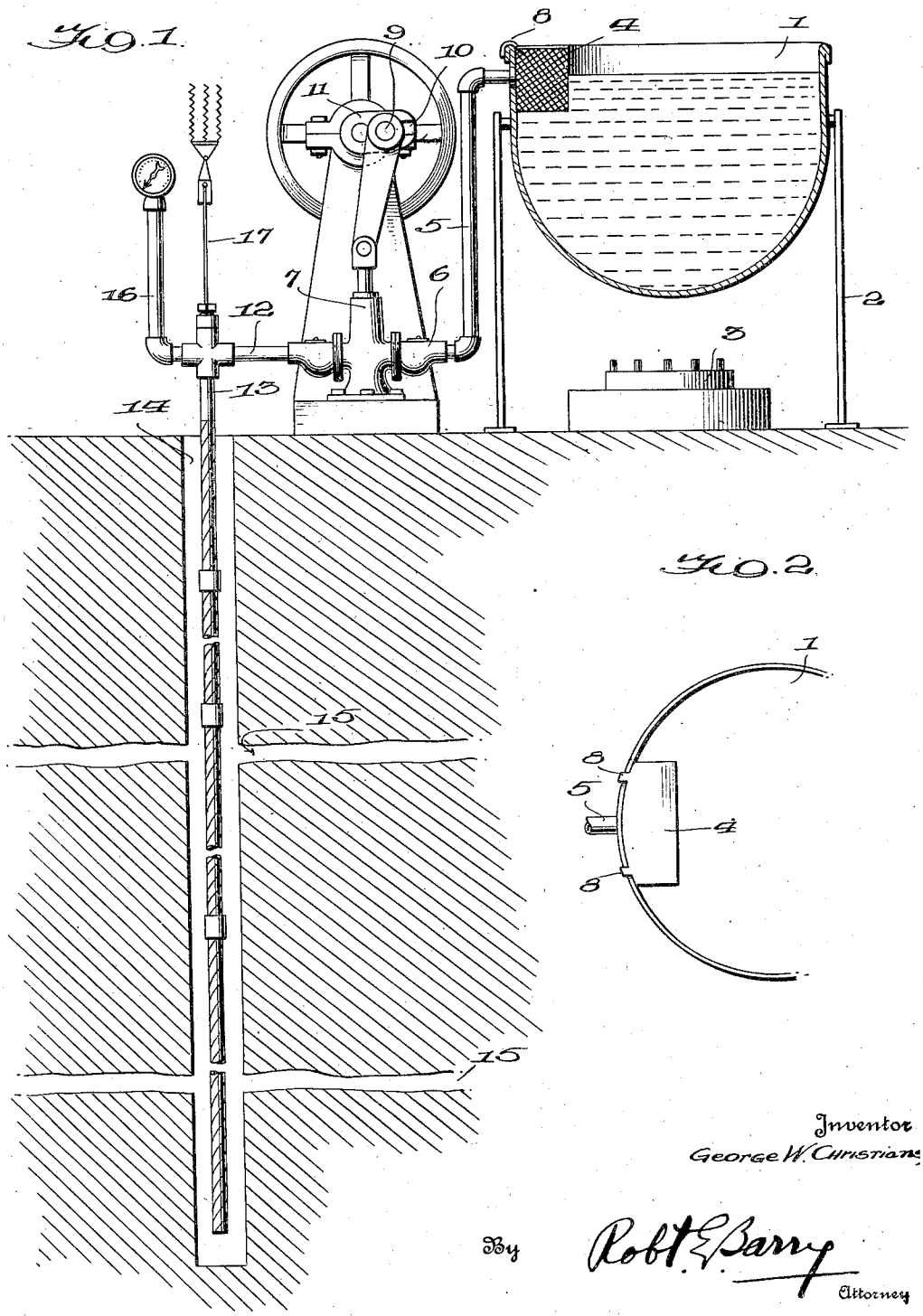

FIG. 2.

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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR SEALING CREVICES IN ROCK FORMATIONS OR THE LIKE

Application filed September 11, 1926. Serial No. 134,920.

This invention relates to a method and apparatus for sealing underground crevices and the like with thermo-plastic materials such as asphalt, pitch, sulphur or the like, and more specifically to a novel method and apparatus for forcibly feeding such materials to subterranean crevices or fissures, which are to be sealed.

In my Patents, 1,327,268 and 1,327,269, dated Jan. 6, 1920, I have disclosed a method and apparatus for sealing crevices in rock formations and the like, and in that method, a hole is extended to the point where the underground crevice occurs. Hot asphalt or the like is then pumped through this hole and into the crevice for sealing the latter, and this sealing agent is maintained in heated condition during its passage through the hole by heat radiating from within the hole.

In practicing said process, the thermo-plastic material was arranged in a heating kettle and siphoned off from said kettle to the pump, employed for feeding the sealing agent to the crevice. The siphon arrangement is an obvious and convenient method and was used for a long time. However, it has disadvantages. The gas liberated from the asphalt tends to break the action of the siphon. Under low pressure work, it did not often do this, but very frequently interfered and prevented the pump from getting a full cylinder of asphalt, with a resulting non-uniform flow which gave very confusing pressure indications. Considerable difficulty was experienced with such siphon arrangement when working on a high pressure job.

The main object of the present invention is to provide a feeding method and apparatus in which the defects of the siphon system are eliminated. The desired result is obtained by a straight gravity feed from the upper portion of the heating kettle to the pump, which permits the gas to escape from the feeding pipe and gives a full cylinder at every stroke of the pump, and which makes the operation much more satisfactory.

The top of the heating kettle, in the present invention, is open and the level of the asphalt or the like cannot be drawn down below the intake pipe, as asphalt is fed into the top of the kettle whenever necessary to prevent this. The kettle is only emptied occasionally for cleaning and at the end of a job.

Another object of the invention is to prevent unmelted portions of the asphalt or large pieces of other material from flowing from the heating kettle into the intake pipe of the pump, and this is accomplished by a removable screen arranged at the top of the kettle at a point where it is readily accessible for removal, cleaning or the like.

Other objects of the invention will appear as the description proceeds, and I will now describe the details of the invention while referring to the accompanying drawing.

In the drawing,

Fig. 1 is a side view partly in section of the improved apparatus.

Fig. 2 is a top plan view of a portion of the kettle.

1, in the drawing, indicates a kettle of any suitable form and material, mounted on supports 2 and heated by any suitable heating device 3. In operation, asphalt or other suitable thermo-plastic material is fed into the open top of the kettle and an effort is made to keep the kettle substantially full at all times. As the asphalt melts, it will flow upwardly and this heated asphalt will pass from the upper end of the kettle through a perforated screen 4, and into the upper end of a gravity feed pipe 5 which communicates with the suction pipe 6 of the feeding pump 7.

The screen 4 is preferably of box-shape, and is suspended on the upper edge of the kettle by hooks 8. This will permit the screen to be readily removed for the purpose of cleaning and the like.

In the present construction, the hot asphalt at the top of the tank readily flows by gravity into the pipe 5, and any gas within the pipe will rise and may discharge through the inlet end of the same. Consequently, such gas will not interfere with the working of the apparatus, as is does in the siphon system.

At the beginning of an operation, the pipe 5 is heated by a torch or the like, so that the asphalt may readily flow through the same, and after the operation is under way, the

pump 7 will draw hot asphalt through the pipe 5 with sufficient velocity to maintain the pipe 5 in heated condition.

The crank pin 9 of the pump is adjustable in a slot 10 in the crank 11, in a manner similar to that disclosed in my application Serial No. 127,896, filed Aug. 7, 1926, so as to allow the stroke of the pump to be varied whenever necessary.

The thermo-plastic sealing agent is maintained in heated condition while traveling through the pipe 13 by electric means, such means including the wire 17 which extends through the pipe 13 from its upper to its lower end. Such means of heating is clearly disclosed in my Patent No. 1,327,269.

The pump 7 forces the hot asphalt into a discharge pipe 12, connected to the upper end of a conduit 13 which extends into the hole 14 that has been drilled to permit the hot asphalt to be fed into the crevices 15 which are to be sealed.

16 indicates a pressure gage arrangement which is specifically described in my above mentioned application.

From the above description, it may be seen that in the operation of the apparatus, the asphalt is taken from the top of the kettle, and that the cold asphalt fed into the top of the kettle sinks to the bottom thereof. This hot asphalt flows off through the gravity feed pipe 5 through the screen 4, which, as before stated, keeps out trash and the like, and is accessible for easy changing. As long as the pump is in operation and asphalt is fed into the top of the kettle, the apparatus will operate without trouble, and this has been proved by actual practice.

I believe from the foregoing description, when read in connection with the accompanying drawing, that my improved method and apparatus may be readily understood by those skilled in the art, and I am aware that changes may be made in the details disclosed without departing from the spirit of the invention as expressed in the claims.

What I desire to secure by Letters Patent is:

1. A method for sealing crevices in rock formations and the like, including the steps of heating a mass of thermo-plastic material, feeding the heated thermo-plastic material from the upper portion of the mass by gravity, through a passage-way, heating said passage-way to permit the material to readily flow through the same, and pumping such heated material through a conduit and into the crevice to be sealed.

2. A method of sealing crevices in rock formations and the like, including the steps of heating a mass of thermo-plastic material, permitting such material in heated condition to flow by gravity from the upper portion of the mass through a passage-way, heating said passage-way before introducing the material into the same to facilitate the flow of the material through the passage-way, and forcing said heated material through a conduit and into the crevice to be sealed.

3. An apparatus of the class described, including a kettle having an open top, a gravity feed discharge pipe having its entrance end connected to the upper portion of said kettle in close proximity to its upper end, a pump having its intake connected to the lower end of said pipe, a conduit connected to the outlet of the pump, and means for heating said conduit.

4. An apparatus for use in sealing crevices in rock formations and the like, comprising an open top kettle adapted to contain thermo-plastic material, means for heating said kettle, a downwardly extending gravity feed pipe having its upper end connected to the upper portion of the kettle in close proximity to the upper end of the latter, said pipe being arranged to permit thermo-plastic material in heated condition to readily flow from the upper portion of the kettle downwardly by gravity, a pump having its intake connected to the lower end of said pipe, and means for feeding said material from the outlet of the pump to the crevice to be sealed.

5. In an apparatus of the character described, a heating kettle having an open top and a gravity feed discharge pipe connected to the upper portion of the kettle, a screen arranged in the kettle over the inlet end of said pipe, and suspended on the kettle to permit ready removal of the screen from the top of the kettle.

6. A method for use in feeding thermo-plastic materials, including heating a mass of such material, permitting the material as it is heated, to rise and flow by gravity from the upper portion of said mass through a passageway having its entrance at the upper portion of said mass, adding thermo-plastic material to said mass, and thus maintaining the volume of the mass substantially constant, and pumping the material while it is in heated condition from said passageway.

7. A method of sealing crevices in rock formations and the like, including heating a mass of thermo-plastic material, permitting the material as it is heated, to rise and then flow by gravity from the upper portion of said mass through a passageway having its entrance at the upper portion of said mass, pumping the heated material from the passageway through a conduit and into the crevice to be sealed, and maintaining the material in heated condition while flowing through said conduit.

8. A method of sealing crevices in rock formations and the like, comprising heating a mass of thermo-plastic material, permitting such material as it is heated, to rise and flow by gravity from the upper portion of said mass through a passageway, allowing any

gases in the passageway to readily discharge from the inlet end thereof, forcing heated material from the passageway through a conduit and into the crevice to be sealed, and heating the material while it flows through said conduit.

9. An apparatus for use in sealing crevices in rock formations and the like, including a kettle adapted to contain thermo-plastic material, means for heating said kettle, a downwardly extending gravity feed pipe having its upper end connected to the upper portion of the kettle in close proximity to the upper end of the latter, said pipe being arranged to permit thermo-plastic material in heated condition to readily flow from the upper portion of the kettle by gravity, means for feeding said material from the outlet of the pump to the crevice to be sealed, and screening means arranged at the entrance end of said pipe, and readily removable from the top of the kettle.

10. An apparatus for use in sealing crevices in rock formations and the like, comprising a kettle adapted to contain thermo-plastic material, means for heating said kettle from the exterior of the latter, a downwardly extending gravity feed pipe having its upper end connected to the kettle in close proximity to the upper end of the latter, said pipe being arranged to permit thermo-plastic material in heated condition to readily flow from the upper portion of the kettle by gravity, screening means arranged at the entrance end of said pipe and readily removable from the top of the kettle at all times, a pump having its intake connected to the lower end of said pipe, and means for feeding said material from the outlet of the pump to the crevice to be sealed.

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