

March 12, 1935.

C. P. McNEIL

1,993,973

HANDLING SULPHUR
Filed July 20, 1931

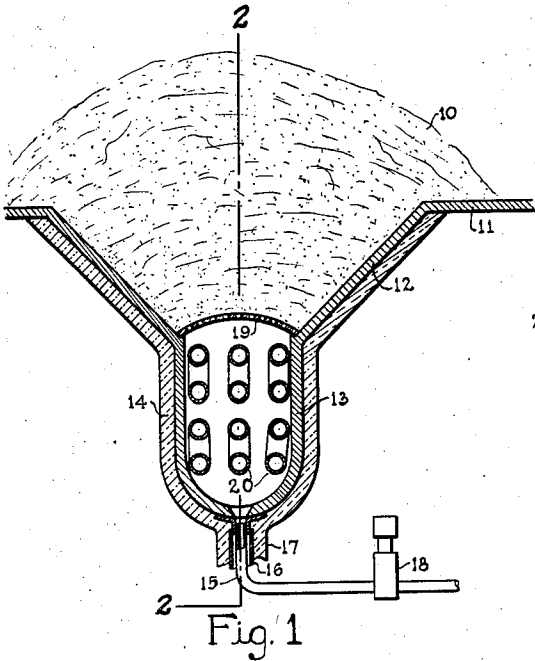


Fig. 1

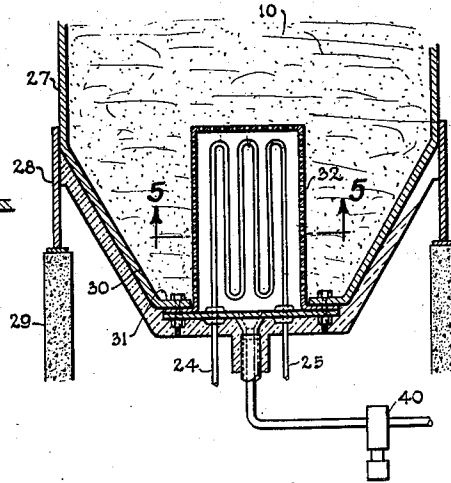


Fig. 3

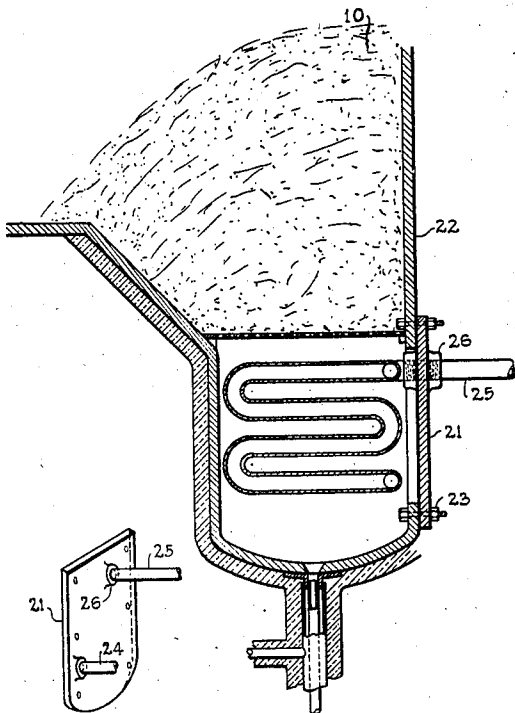


Fig. 2

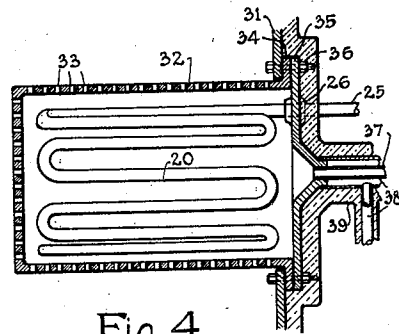


Fig. 4

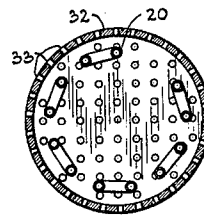


Fig. 5

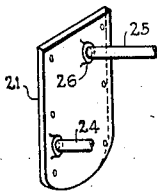


Fig. 6

Inventor:
Claude P McNeil
By Bruce K. Brown Atty.

UNITED STATES PATENT OFFICE

1,993,973

HANDLING SULPHUR

Claude P. McNeil, Whiting, Ind., assignor to
Standard Oil Company, Chicago, Ill., a corpo-
ration of Indiana

Application July 20, 1931, Serial No. 551,974

2 Claims. (Cl. 126—343.5)

This invention relates to the handling of sulphur or similar fusible solids and it pertains more particularly to an improved apparatus therefor.

My invention will be described as applied to the handling of powdered, pulverized or crushed sulphur but it is to be understood that this is by way of example and that my apparatus may be used for handling other fusible solids which are normally handled by shovels or mechanical conveyors.

When sulphur is mined by the Frasch process, it is melted by hot water or steam under pressure, elevated in liquid form and discharged into receptacles wherein it is allowed to solidify. The equipment used for mining sulphur cannot, of course, be used for handling loose sulphur in storage piles and heretofore the loose or powdered sulphur has been handled by mechanical means. The object of my invention is to provide an economical means for handling pulverized sulphur in storage piles which will avoid the dissemination of sulphur powder and which will minimize the amount of time and labor required. A further object is to provide an improved apparatus which may be employed in any system where pulverized sulphur must be transported from a storage pile or bin to a point of application. A further object is to provide apparatus of this type which is readily accessible for repair and replacement.

In practicing my invention I employ an improved heater at the base of a hopper or tank so that the sulphur in the lowermost point of the hopper is converted into liquid and is handled as such. When liquid sulphur is withdrawn from the base of the hopper pulverized solids slide down the sides thereof so that a continuous stream of molten sulphur may be withdrawn from a continuously formed pool in the base of the hopper.

I cover my heater with a perforated retaining member, such as a perforated shell, a screen, or a series of bars or grates. The molten sulphur readily runs through the perforations or openings during normal use of the apparatus; when the heat is turned off the sulphur solidifies in the openings of the sheath so that the heater may be readily removed without disturbing the pulverized sulphur. The invention will be more clearly understood from the following description of preferred embodiments thereof.

In the accompanying drawing wherein similar parts are designated by like reference characters in the several views,

Figure 1 is a vertical section showing my im-

proved apparatus used in conjunction with an ordinary storage pile.

Figure 2 is a section taken along the lines 2—2 of Figure 1.

Figure 3 is a vertical section of another embodiment of my invention.

Figure 4 is a vertical section of the heater unit shown in Figure 3.

Figure 5 is a horizontal section taken along the lines 5—5 of Figure 3.

Figure 6 is an isometric detail showing the removable end plate carrying the inlet and outlet heater pipes.

In ordinary commerce sulphur is transported in crushed or pulverized form and it is stored by industrial concerns in huge storage piles, bins or tanks. In accordance with my invention I pile the pulverized sulphur 10 on a concrete floor 11 over a hopper 12 which terminates at its base in a trough 13. If the trough is buried in the ground there will probably be no need for heat insulation. However, I may provide a heat insulator 14 around the trough. In the lowermost part of the trough I provide a discharge opening which leads to delivery pipe 15, which is surrounded by steam jacket 16 and insulating material 17. The delivery pipe is connected to a pump 18, both the pipe and the exposed parts of the pump being constructed of a resistant alloy so that corrosion by molten sulphur will be minimized. Above the trough I provide a perforated retaining member 19 which acts as a grate to hold the pulverized sulphur from the heater coils 20 in the trough. Retaining member 19 may consist of a heavy screen, spaced bars, or any equivalent means for holding back solids and permitting liquids to run through.

The heater coils are mounted on a removable plate 21 which is secured at the base of front retaining wall 22 by means of bolts 23. Inlet heater pipe 24 and outlet heater pipe 25 are secured to plate 21 by means of annular threaded members 26.

The operation of the above apparatus is as follows: When it is desired to convey sulphur from storage to a point of application, a heating fluid, such as steam under pressure, is passed through coils 20 and steam jacket 16 so that the trough and delivery pipe is raised to a temperature above the melting point of sulphur, preferably to about 125° C. (If steam is used it should be under a pressure of at least fifty pounds). The sulphur in the trough is melted to form a pool which acts as a supply reservoir for the delivery pipe. As sulphur is withdrawn through said pipe by means of pump 18 additional sulphur is melted

in the vicinity of the retaining member 19 and when it is melted it runs through the perforations into the pool and thence out to the delivery pipe. Pulverized sulphur in storage pile slides down the sides of the hopper 12 to replenish the sulphur which is melted and which flows through the apertures in the retaining member.

An important feature of the invention is the removable heater coil. If it is desired to remove said coil the flow of heating fluid therein may be stopped and pump 18 may be operated to remove substantially all of the molten pool in the trough. The molten sulphur in the vicinity of the retaining member will solidify to seal the apertures so that the sulphur powder is effectively prevented from entering the trough. Bolts 23 may then be loosened and the plate 21 may be removed together with the heating coils.

In Figures 3 to 5 I have illustrated another form of my invention wherein pulverized sulphur is stored in a large tank 27 supported by angle iron skirt 28 on foundation 29. The tank is provided with a conical hopper bottom 30 which terminates in an annular flange 31 around a central opening through which I insert a casing 32. This casing may be a cylindrical metal receptacle provided with a large number of apertures 33 or it may be a suitable screen casing, etc. The casing is provided at its base with a flange 34 and it is adapted to be closed by a cover 35. The cover, the flange on the casing, and the flange at the base of the conical hopper are held together by bolts 36 so that the removable casing 32 projects upwardly in the tank adjacent the downwardly converging hopper walls 30. The cover plate 35 carries heater coils 20 as above described, and to it is attached delivery pipe 37. This delivery pipe is surrounded by a steam jacket 38 and by insulation 39 and it leads to a pump 40 (see Figures 3 and 4).

The operation of this embodiment is substantially the same as the operation of the first embodiment; a pool of sulphur is formed in and adjacent to casing 32 and this pool acts as a reservoir for supplying liquid sulphur to delivery pipe 37 and pump 40. The bulk of sulphur in the tank remains in pulverized form so that it slides down the tank and is directed by sloping hopper

walls 30 against the casing 32. When the heater coils are allowed to cool, sulphur may be withdrawn from the casing and the solidified sulphur in the casing apertures will serve to hold back any powdered sulphur which might otherwise be disseminated when the cover 35 is removed to repair, clean or replace heating coils 20.

While I have described preferred embodiments of my invention, it is to be understood that I do not limit myself to any of the details set forth except as defined by the following claims which should be construed as broadly as the prior art will permit.

I claim:

1. An apparatus for handling powdered, pulverized or crushed sulphur and other low heat conducting materials comprising, a heating chamber, a storage compartment for holding said sulphur when in its normal solid state, heating coils located in said chamber, a superimposed grill separating said chamber from said compartment for preventing the passage of the solid material into the chamber and for passing the material when liquefied therethrough into the heating chamber, said grill being disposed within the melting heat range of said heating coils, means for withdrawing the liquid material from said heating chamber and for conducting the liquid to a place of use including a liquid conducting pipe, and means for heating said pipe to maintain said material in liquid state during its travel from the heating chamber to said place of use.

2. The method of handling powdered, pulverized or crushed sulphur such as is usually handled by shovels or mechanical conveyors, which comprises, directing the solid sulphur into an indirectly heated zone, in applying heat to that portion of the sulphur within the zone to cause the sulphur to liquefy, in immediately withdrawing melted sulphur from contact with solid sulphur in the heating zone and conducting it to a place of use, in replenishing the solid sulphur within said zone as rapidly as it is liquefied and in applying heat to the liquid sulphur during the time that it is being conducted to its place of use so as to maintain the sulphur in its liquid condition during its course of travel.

CLAUDE P. McNEIL.