Nov. 13, 1928. 1,691,744

W. B. VAN ARSDEL

PUMPING MECHANISM

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Fig. 3

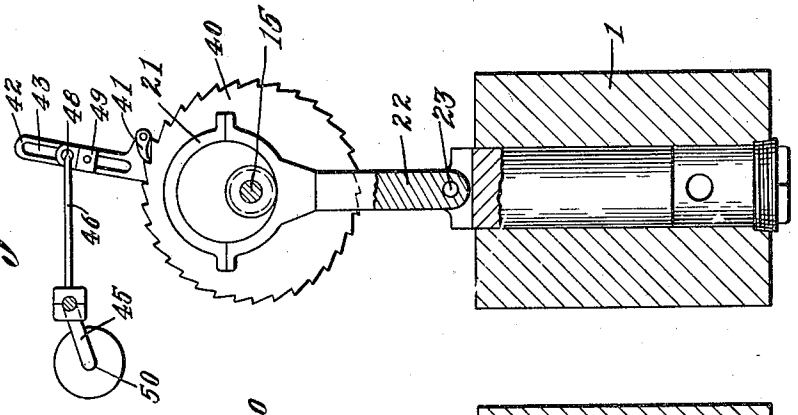



Fig. 2

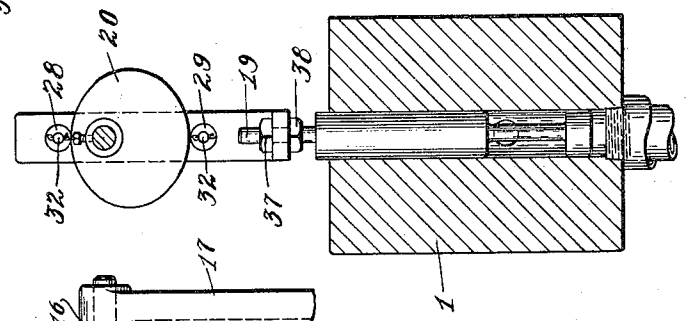
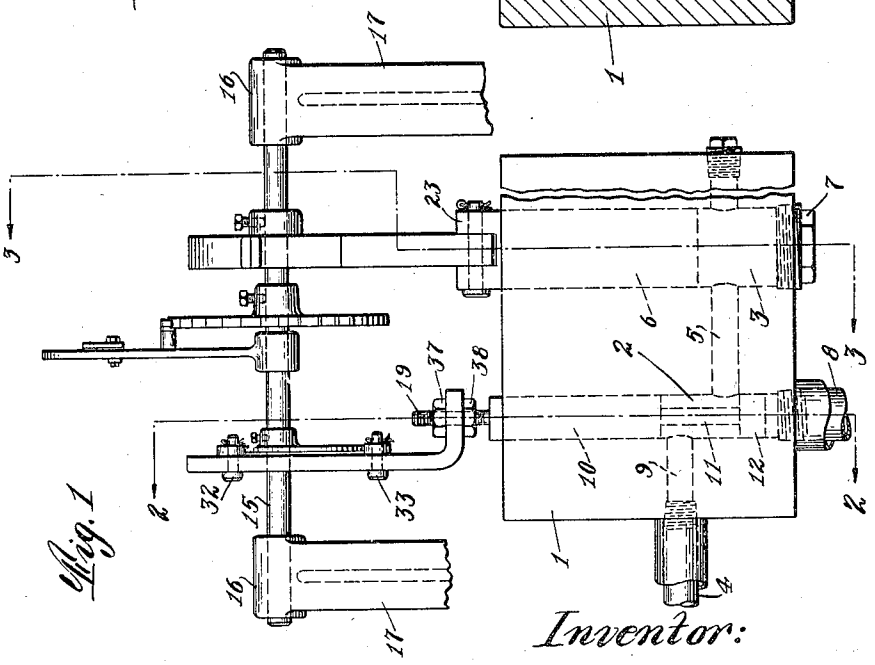



Fig. 1




Inventor:

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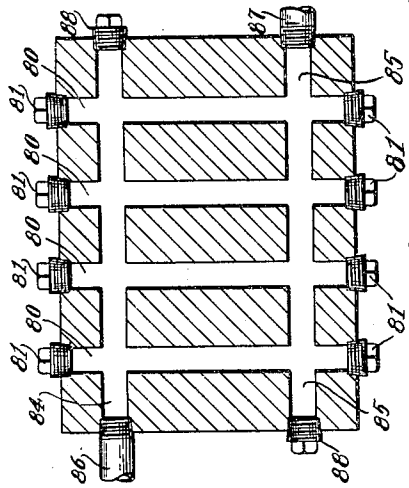
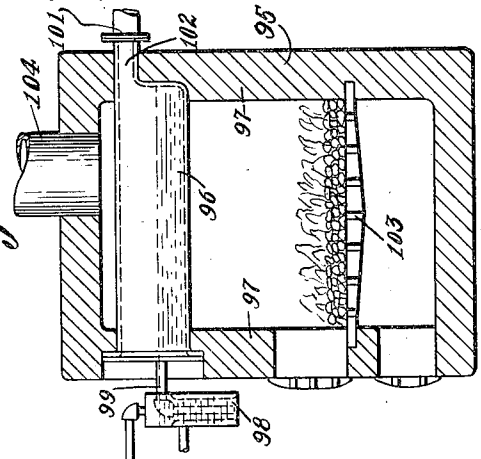


Fig. 6



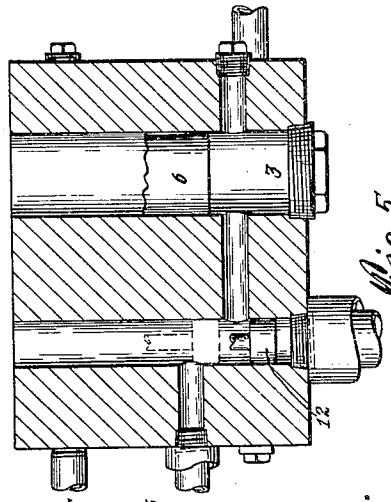


Fig. 5

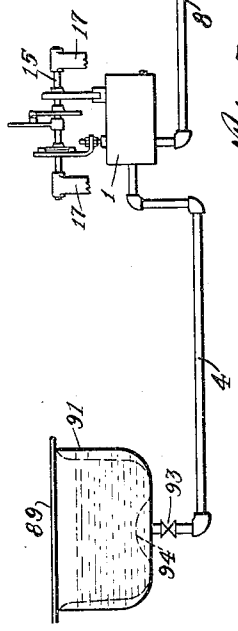


Fig. 7

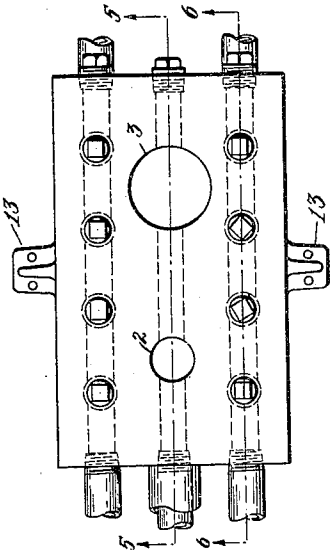


Fig. 4

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Patented Nov. 13, 1928. 1,691,744

# UNITED STATES PATENT OFFICE.

WALLACE B. VAN ARSDEL, OF BERLIN, NEW HAMPSHIRE, ASSIGNOR TO BROWN COMPANY, OF BERLIN, NEW HAMPSHIRE, A CORPORATION OF MAINE.

## PUMPING MECHANISM.

Application filed May 13, 1925 Serial No. 29,895.

This invention relates to feeding and vaporizing apparatus, and has for one of its objects to provide an apparatus by means of which molten sulphur or similar material may be pumped in uniform and measured quantity, variable at will, to a vaporizing furnace wherein the sulphur vapor may be continuously vaporized, and then used, as for example, in the production of carbon bisulphide, as fully described in a companion application, Serial Number 37,612, filed June 17, 1925, by Paul Brown.

In carrying out the afore-mentioned object, this invention provides a pump construction which obviates the use of sensitive and troublesome parts, such as springs, piston rings, check valves, stuffing boxes, and materials such as leather or rubber, which are reacted upon by the molten sulphur or especially corrosive impurities contained in the sulphur, such as the sulphur chlorides, thus reducing to a minimum pump troubles, and the possibility of the pump being disabled.

The invention further provides an easily accessible arrangement of the various pump parts, so that replacement thereof may be made easily and quickly when they have become worn out owing to corrosion or wear. Other features of invention and advantages incident thereto will appear as the description proceeds.

On the accompanying drawings, which are somewhat conventional and diagrammatic,

Figure 1 represents a front view, partly in section, of a pump unit constructed in accordance with this invention.

Figures 2 and 3 are sections taken respectively on the lines 2—2 and 3—3 of Figure 1, looking to the left of the figure.

Figure 4 represents a plan view of the unit.

Figures 5 and 6 are sections taken respectively on the lines 5—5 and 6—6 of Figure 4, looking in the direction of the arrows.

Figure 7 illustrates an arrangement of the entire apparatus.

Referring to the drawings, 1 represents the body portion of the pump, which consists of a single casting of iron or steel, in the form of a rectangular block which may be rigidly secured to a suitable support by suitable fastening means, as bolts, through the lug portions 13, 13 on its sides. Cylindrical holes 2 and 3, spaced from each other along the transverse center line 5—5, are bored vertically through the block,—the lower end of the hole 3 being closed by a plug 7, and the lower end of hole 2 connected to an outlet steam jacketed pipe 8. Both holes are accurately ground and finished,—the hole 3 constituting a piston chamber, and the hole 2 a valve chamber. A horizontal hole 9, constituting the sulphur inlet, is bored inwardly from the valve end of the lower portion of the block to the valve chamber 2, and is connected to the liquid sulphur supply source by a steam jacketed conduit 4. Another hole 5 is bored inwardly from the opposite end on a somewhat lower level, to the valve chamber 2, and constitutes a port between the two chambers.

Adapted to be reciprocated within the chamber 3 is the pump piston or plunger 6, which is accurately machined to make a good sliding fit therein, without the use of piston rings or a stuffing box. Similarly disposed within the chamber 2 is a plunger slide valve 10, near the lower end of which an annular portion has been cut away, forming what may be termed a stem portion 11, and leaving a short stub portion 12 of full cross section and of sufficient length to occupy the chamber space 2 between the two horizontal openings 9 and 5.

The suction stroke of the piston 6 takes place on its upward travel, with the valve 10 resting at its lowest position as indicated by its full line position (Figure 5)—sulphur flowing in around the valve stem and through the port 5 into the piston chamber 3. Near the completion of the suction stroke the valve is quickly lifted to a position shown by its dotted line position cutting off the flow of sulphur to the chamber 3, and is allowed to remain there while the downward or pressure stroke of the piston takes place,—the sulphur being forced from the piston chamber 3 through the port 5 and the lower portion of the valve chamber 2, into the outlet or discharge pipe 8. Near the completion of the downward stroke, the valve is quickly lowered to its lowest position, and the cycle of operations is repeated.

Both the valve 10 and the piston 6 are, of course, power-driven, and are actuated respectively by a cam 20 and a split sheave eccentric 21, fixed to a common driving shaft 15, directly above the pump block 1. The shaft 15 is journaled in the bearings 16, 16, which are supported by the uprights 17, 17. The eccentric 21 imparts a reciprocating motion to the piston 6, through the connecting rod 22, piv-

otally connected to the piston by a pin 23. Similarly, the cam 20 actuates the valve through cam rollers 28 and 29, mounted on the studs 32 and 33 carried by an L-shaped cam arm, adjustably connected to the valve 10. The adjustable connection is made through a stud 19, extending through the horizontal portion of the arm 30 and positioned between a pair of fixing nuts 37 and 38. By raising or lowering the valve with respect to the nuts 37 and 38 and the arm, the limits of travel of the valve may be changed. Before passing on to a description of the shaft-driving mechanism, it may be said that the construction thus far described ensures a predetermined flow of liquid sulphur.

In order to obtain a variable delivery of sulphur, the shaft 15 is driven by a suitable variable speed mechanism. The variable speed mechanism, as shown, comprises a ratchet wheel 40, fixed to the driving shaft 15, and actuated by a pawl 41 carried by a rock arm 42, mounted loosely on the shaft 15 and having an elongated slot portion 43. Motion is imparted to the shaft 15 from a crank drive shaft 50, which may be power-driven from a motor (not shown), through a crank 45 and a connecting rod 46 which engages the arm 42 by a wrist pin 48, carrying a positioning or fixing member 49 slidably mounted in the slotted portion 43. By sliding the member 49 up or down, the pawl may be made to pick up more or fewer teeth on the ratchet wheel,—the speed of the pump shaft, and hence the delivery of sulphur, thus being increased or decreased.

In order to maintain the sulphur in liquid condition and prevent the deposition of any solid sulphur in the pump, provision is made to maintain the sulphur in its molten condition by heating it while it is being pumped. To accomplish this result, the pump is steam jacketed as follows. A plurality of holes 80 are bored vertically through the block on both sides of the center line 5—5,—both ends of the holes being plugged by plugs 81,—and two holes are bored horizontally on each side through the block,—one hole 84 joining the upper portions of the vertical holes 80, and the other the lower portions. The alternate ends of the holes are plugged by the plugs 88,—the top hole 84 serving as a steam inlet manifold,—steam entering at one end through the steam pipe 86, and the bottom hole 85 as an outlet manifold,—the steam leaving at the opposite end through the steam pipe 87. The block may also be lagged with a heat insulating material such as magnesia asbestos, if desired.

In Figure 7 is illustrated apparatus for use with which the pump embodying the invention is particularly adapted. Such apparatus as illustrated consists of a sulphur melting pot 89 and a sulphur vaporizing furnace 95, both connected to the pump unit. The melting pot is equipped with a steam jacket 91, and has screened outlet 94 at its bottom portion, and communicates with the pump inlet by the steam jacketed conduit 4, valved as at 93. The sulphur passes from the pump outlet steam jacketed conduit 8 to the vaporizing furnace 95. The furnace comprises a shallow vaporizing muffle 96, supported at the upper portion of the furnace, directly over the fire bed, by the furnace walls 97. Exterior to the furnace structure on a slightly higher level than muffle 96, is a steam-jacketed open reservoir 98, into which the molten sulphur from the pump is delivered. An inverted L-shaped delivery pipe 99 communicating with the muffle 96 extends through a side portion of the reservoir 98 into the molten sulphur, the sulphur tending to rise beyond the level of the horizontal portion of the pipe 99 being delivered into the muffle. This type of delivery acts as a vapor seal, preventing any sulphur vapor from escaping into the atmosphere. The sulphur vapor formed in the muffle is conducted therefrom through its side portion 102 into a conduit 101. It will be obvious that, while I have described a single-acting pump unit having a somewhat intermittent sulphur delivery to the reservoir 98, the same features of invention could be applied equally as well to a plurality of such units relatively timed to give a more uniform fluid flow.

At the risk of repetition, it may again be stated that the drawings are diagrammatic, no attempt having been made to show the true size relation between the various instrumentalities or their spacial relation to one another. For the sake of clarity in the drawings, unnecessary details of construction such as pipe-lagging and pipe-steam jackets have been omitted, but it is understood that these will be supplied where necessary. It will of course also be understood that, while the description has been limited to what may be considered a preferred embodiment of this invention, this was by the way of illustration only, and this invention is susceptible of various changes and modifications which are within its spirit and scope as defined by the appended claims.

What I claim is:

1. Apparatus for pumping hot fluid, comprising a block having bores therein disposed in a plurality of substantially parallel planes, means associated with the bores in one of said planes actuable to pump fluid supplied thereto, and means for plugging all but two of the surface openings of the bores in each of the remaining planes, the unplugged openings being available as inlet and outlet ports for heating fluid.

2. Apparatus for pumping hot fluid, comprising a block having bores therein disposed in a plurality of substantially parallel planes, means associated with the bores in one of said

planes actuable to pump fluid supplied thereto, the bores in each of the other said planes comprising a plurality of closely spaced parallel bores extending through the block and a pair of widely spaced bores transversely intersecting said parallel bores, and means for plugging all but two of the surface openings of the bores in each of said other plane, the unplugged openings being at points in diagonally opposite portions of the block.

3. Apparatus for pumping hot fluid, comprising a block having bores therein disposed in a plurality of substantially parallel planes, the bores in one of said planes including a pair of parallel bores connected by a transverse bore, the bores in each of the other said planes being interconnected and having an inlet and an outlet port for the circulation of heating fluid, one of said parallel bores being closed at one end, a piston slidably fitted for reciprocation in said one bore, the other said parallel bore having an exhaust port communicating with one end thereof and an inlet port opening thereinto at a point spaced from the point of connection with said transverse bore, a valve member slidably fitted in said other parallel bore and movable therein from and to positions between the inlet port and the transverse bore and between the transverse bore and the outlet port, and means for reciprocating said piston and valve member.

In testimony whereof I have affixed my signature.

WALLACE B. VAN ARSDEL.