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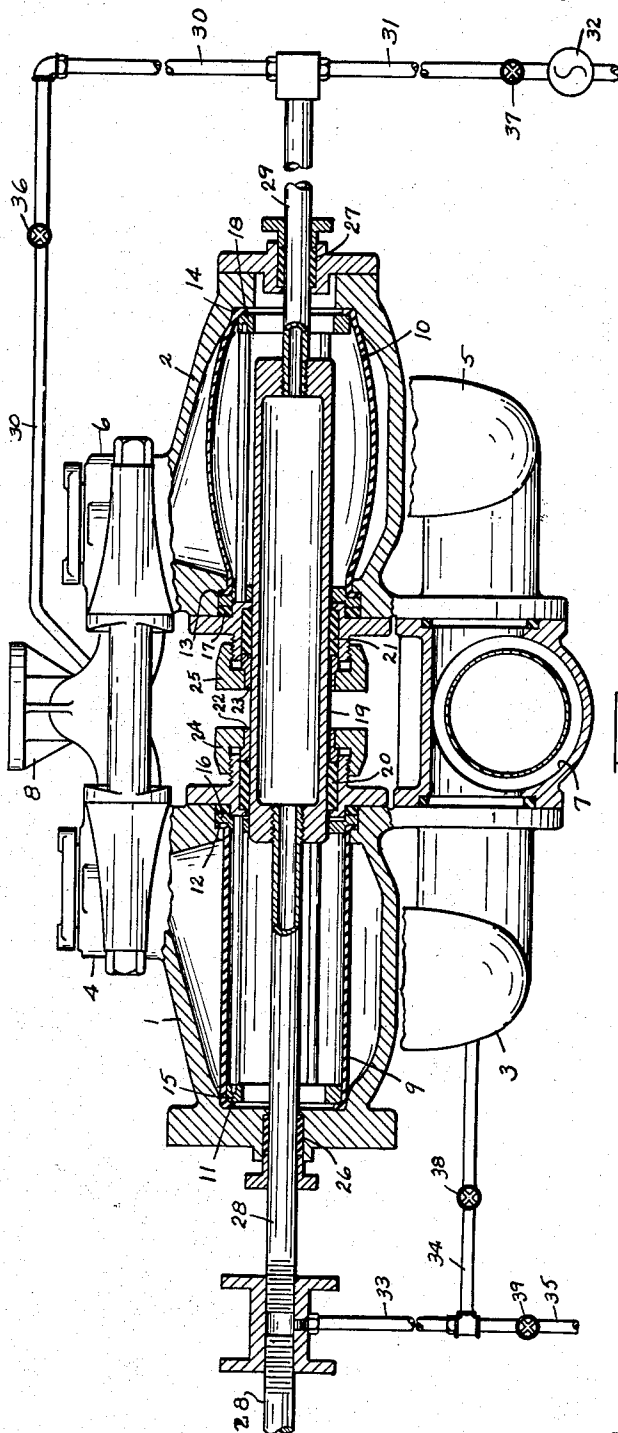


FIG. 1.

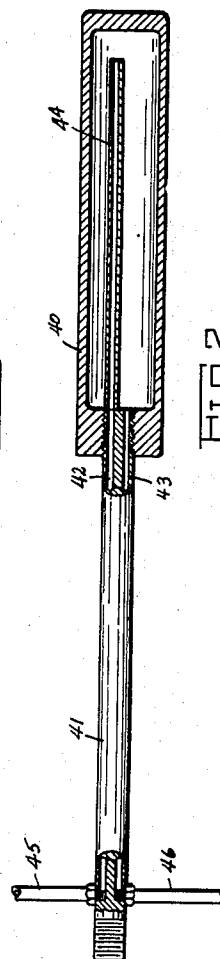


FIG. 2.

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PUMP

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8 Claims. (Cl. 103—44)

This invention relates generally to pumps.

It will be found particularly useful in pumps designed for pumping abrasive and corrosive fluid of the general type disclosed by Letters Patent of the United States to Stephens No. 1,848,441 of March 8, 1932. A conventional pump of this type adapted for use as a mud or slush pump in deep well drilling includes a barrel; inlet and outlet valves therefor; a hollow expansible member within the barrel; and a reciprocable piston to actuate pumping fluid confined within the expansible member to cause expansion and contraction thereof whereby pumped fluid is drawn into and forced out of said barrel.

In pumps of other types the pumped fluid is in contact with the piston and rod and carries away the heat generated by the reciprocation of the piston and rod through conventional packings. In the type of pump to which this invention relates, however, the piston and rod are sealed off from the fluid being pumped and the heat so generated is therefore transferred to the pumping fluid within the expansible member. These expansible members are usually made of rubber, which is a very good heat insulator, and the pumping fluid within the expansible member is in contact with very little metal. Under certain conditions, such as when the packings are inadvertently made too tight, the heat is not dissipated as rapidly as it is generated. And so, under such conditions, the pumping fluid in the expansible member will reach a very high temperature whereby the expansible member will be injured; and when the pressure on the pumping fluid is reduced on the suction stroke of the piston, the pumping fluid will boil so that the pumping member will remain expanded, which renders the pump inoperative. This invention has for its general object the provision of new and improved means to prevent heating of the pumping fluid to an objectionably high temperature by cooling the piston and rod to remove the heat where it is generated and before it enters the pumping fluid in the expansible member.

A specific object of the invention is to provide means to so cool the piston and rod with the pumped fluid as a coolant.

Another specific object is to so cool the piston and rod by circulating therethru a coolant from an external source independently of the pump.

The invention also has for another of its objects the provision of new and improved means whereby the pumping fluid may be kept above its freezing point, or at any desired predeter-

mined temperature, when pumps of this character are operated in very low temperatures.

Other objects will hereinafter appear.

The preferred embodiments of the invention are illustrated by the accompanying drawing wherein Fig. 1 is a partly sectional elevation of the pump; and Fig. 2 a detail view of a modified form of the piston and rod.

As the operation of this pump is clearly set forth in said patent to Stephens No. 1,848,441, it will be but briefly referred to here as follows:

The two barrels of the pump are indicated at 1 and 2. The inlet and outlet means for the former are indicated at 3 and 4, respectively; and for the latter at 5 and 6, respectively. The inlet means 3 and 4 communicate with a common inlet passageway 7, and outlet means 4 and 6 with a common outlet passageway 8. Within the barrels 1 and 2 are hollow expansible pumping members 9 and 10, the former being sealed at its opposite ends to the end walls of the barrel at 11 and 12, and the latter being sealed at its opposite ends to the end walls of the barrel 2 at 13 and 14. The numerals 15, 16, 17 and 18 indicate rings whereby the expansible members 9 and 10 are connected to the end walls of the barrels and will form the subject matter of another application.

The piston is indicated at 19 extending through the packings 20 and 21 into the expansible members 9 and 10, said packings 20 and 21 being held in place by means of the glands 22 and 23 secured by the ring nuts 24 and 25. Extending from opposite ends of the piston 19 through the packings 26 and 27 are the hollow rods 28 and 29.

The piston 19 may be reciprocated by the rod 28 and it will serve to displace the pumping fluid confined within the expansible members 9 and 10 to alternately expand and contract said members. When the piston 19 is in the position shown the pumping member 9 is in its normal cylindrical shape, and the pumping member 10 is in its expanded shape. When the piston moves to the left the pumping member 9 will be expanded, and the pumping member 10 will resume its normal cylindrical shape. The valves (not shown) of the inlet means 3 and outlet means 6 will then be closed, and the valves (not shown) of the inlet means 5 and outlet means 4 will be open, so that the pumped fluid confined in the barrel 1 will be expelled through the outlet means and passageway 8, and a fresh charge of pumped fluid will be drawn into the barrel 2 through the inlet passageway 7 and inlet means 5. When the piston 19 moves in the opposite direction into

the position shown by solid lines, the valves (not shown) of the inlet means 3 and outlet means 6 will open, and valves (not shown) of inlet means 5 and outlet means 4 will close, so that the pumped fluid within the barrel 2 will be expelled through the outlet means 6 and passageway 8, and a fresh charge of fluid will be drawn into the barrel 1 through the inlet passageway 7 and inlet means 3. It will be obvious that as the piston 19 reciprocates, this operation will be repeated.

Referring now to the new and improved means provided by this invention to prevent heating of the pumping fluid confined within the pumping members 9 and 10 to an objectionably high temperature:

The piston 19 and rods 28 and 29 reciprocate through the packings 20, 21, 26 and 27, and it will be noted that the piston 19 and rods 28 and 29 are hollow. The rod 29 is connected by a pipe 30 to the outlet passageway 8 and by a pipe 31 to a coolant pump 32. The rod 28 is connected by the pipe 34 to the inlet passageway 7, and may be connected by the pipes 33 and 35 to the pipe 31. The pipes 30, 31, 34 and 35 are provided with valves 36, 37, 38 and 39, respectively. Now if the valves 37 and 39 are closed, and the valves 36 and 38 opened, a portion of the pumped fluid discharged through the outlet passageway 8 will pass through the pipe 30 into the rod 29, piston 19 and rod 28 (to prevent the excessive generation of heat) and thence through the pipes 33 and 34 into the inlet passageway 7.

If the valves 36 and 38 are closed and valves 37 and 39 are opened, and the coolant pump 32 operated, a coolant may be forced from an external source of supply through the pipe 31 into the rod 29, piston 19 and rod 28 (to prevent the excessive generation of heat) and thence into the pipes 33 and 35 back to the source of coolant supply.

It will be apparent in view of the foregoing that the heat is removed before it enters the pumping fluid in the expansible members 9 and 10; that is, it is removed from the piston and rods and their packings by which it is generated.

It will be understood that to permit the reciprocation of the piston 28, the pipes 30, 31 and 33 will not be rigid, but will contain a flexible section.

Referring now to Fig. 2, a modified form of the piston is indicated at 40 and rod at 41. The piston 40 is hollow and the rod has two longitudinal ducts 42 and 43, the former of which extends into a relatively small pipe 44 terminating near the end of the piston. The duct 42 communicates with the pipe 45 and the duct 43 with the pipe 46. The pipe 45 may be connected to the inlet passageway 7 and the pipe 46 to the outlet passageway 8 (Fig. 1), or the pipe 45 may be connected to the pipe 31 and the pipe 46 to the pipe 35 (Fig. 1) whereby either the pumped fluid or a coolant from an external independent source of supply may be made to flow through the rod 41 and piston 40 to keep these elements cool.

It will be understood that if the pump is used in a very low temperature so that there is danger of freezing of the pumping fluid or lowering of the temperature thereof to an objectionably low point, the pumping fluid may be kept at a desired predetermined temperature by circulating a heating fluid rather than a coolant from an external independent source of supply, precisely in the manner that the coolant is so circulated as hereinabove described.

The invention is not limited to the preferred embodiment here disclosed. Various changes will occur to those skilled in the art, and may be made within the scope of the following claims.

I claim:

1. A pump having a pair of barrels; inlet and outlet means for said barrels; a hollow expansible pumping member in each of said barrels; pumping fluid in said members; piston packings in said barrels; a piston extending through and reciprocable in said packings to actuate said pumping fluid to effect the expansion and contraction of said members to draw pumped fluid into said barrels through said inlet means, and to expel it from said barrels through said outlet means; rod packings in said barrels; and a rod connected to each end of said piston and extending through one of said rod packings to the exterior of said pump; said piston and rods being hollow and communicating with said inlet means and outlet means so that a portion of the pumped fluid discharged through said outlet means will pass through said piston and rods and into said inlet means.

2. A pump having a pair of barrels; inlet and outlet means for said barrels; a hollow expansible pumping member in each of said barrels; pumping fluid in said members; piston packings in said barrels; a piston extending through and reciprocable in said packings to actuate said pumping fluid to effect the expansion and contraction of said members to draw pumped fluid into said barrels through said inlet means, and to expel it from said barrels through said outlet means; rod packings in said barrels; and a rod connected to each end of said piston and extending through one of said rod packings to the exterior of said pump; said piston and rods being hollow and communicating with said outlet means so that a portion of the pumped fluid discharged through said outlet means will pass through said piston and rods.

3. A pump having a pair of barrels; inlet and outlet means for said barrels; a hollow expansible pumping member in each of said barrels; pumping fluid in said members; piston packings in said barrels; a piston extending through and reciprocable in said packings to actuate said pumping fluid to effect the expansion and contraction of said members to draw pumped fluid into said barrels through said inlet means, and to expel it from said barrels through said outlet means; rod packings in said barrel; a rod connected to each end of said piston and extending through one of said rod packings to the exterior of said pump; said piston and rods being hollow; and means to circulate a coolant thru said piston and rods, independently of said pump.

4. A pump having a barrel; inlet and outlet means for said barrel; a hollow expansible pumping member in said barrel; pumping fluid in said member; a piston packing; a piston extending through and reciprocable in said piston packing to actuate said pumping fluid to effect the expansion and contraction of said member to draw pumped fluid into said barrel through said inlet means, and to expel it from said barrel through said outlet means; a rod packing; a rod connected to said piston and extending through said rod packing to the exterior of said barrel; said piston and rod being hollow and communicating with said inlet means and outlet means so that a portion of the pumped fluid discharged through said outlet means will pass through said piston and rod into said inlet means.

5 5. A pump having a barrel; inlet and outlet means for said barrel; a hollow expansible pump-
 10 ing member in said barrel; pumping fluid in said member; a piston packing; a piston extending
 15 through and reciprocable in said piston packing to actuate said pumping fluid to effect the expansion and contraction of said member to draw
 20 pumped fluid into said barrel through said inlet means, and to expel it from said barrel through
 25 said outlet means; a rod packing; a rod connected to said piston and extending through said rod packing to the exterior of said barrel; said piston and rod being hollow and communicating with said outlet means so that a portion of the pumped fluid discharged through said outlet means will pass through said piston and rod.

6. A pump having a barrel; inlet and outlet means for said barrel; a hollow expansible pumping member in said barrel; pumping fluid in said member; a piston packing; a piston extending
 20 through and reciprocable in said piston packing to actuate said pumping fluid to effect the expansion and contraction of said member to draw
 25 pumped fluid into said barrel through said inlet means, and to expel it from said barrel through said outlet means; a rod packing; a rod connected to said piston and extending through said rod packing to the exterior of said barrel; said piston

and rod being hollow; means to circulate a coolant thru said piston and rod, independently of said pump.

7. A pump having a barrel; inlet and outlet means for said barrel; a hollow expansible pump- 5
 ing member in said barrel; pumping fluid in said member; a piston packing; a piston extending
 10 through and reciprocable in said piston packing to actuate said pumping fluid to effect the expansion and contraction of said member to draw
 15 pumped fluid into said barrel through said inlet means, and to expel it from said barrel through said outlet means; said piston being hollow and communicating with said outlet means so that a portion of the pumped fluid discharged through 15
 said outlet means will pass through said piston.

8. A pump having a barrel, an expansible pumping member in said barrel, pumping fluid in said member, a piston to actuate said pumping fluid to cause said member to pump fluid through 20
 said barrel, said piston being hollow and being closed against the entrance of pumping fluid
 25 thereinto, and means for passing through said piston a fluid medium of different temperature from said pumping fluid to regulate the temperature of said piston and said pumping fluid.

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