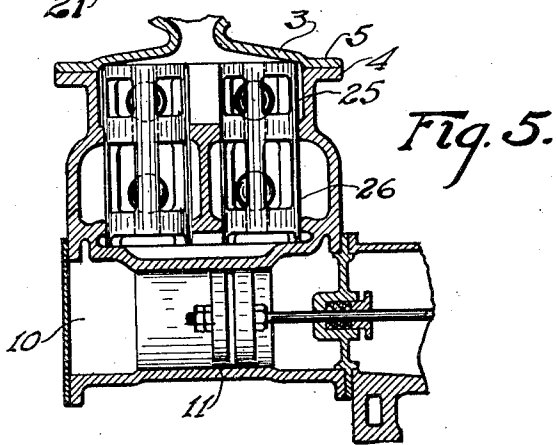
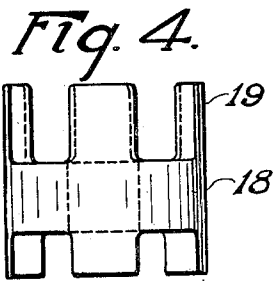
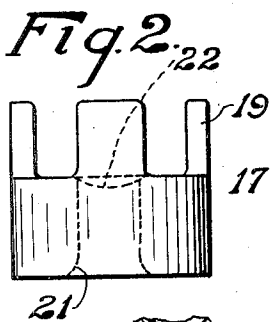
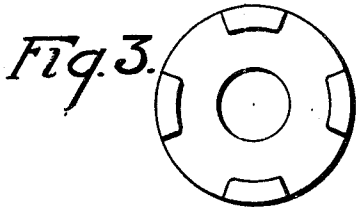
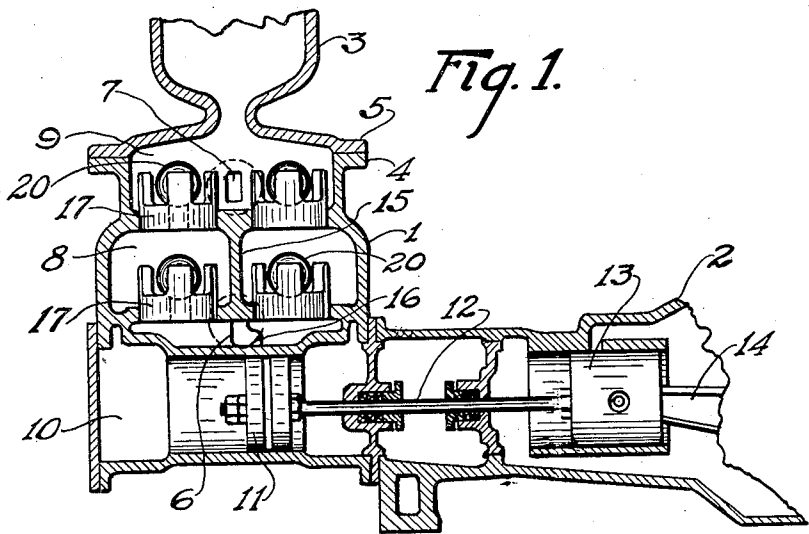


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VALVE FOR MINE PUMPS
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VALVE FOR MINE PUMPS

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1 Claim. (Cl. 251—121)

This invention relates to improvements in pumps more particularly to improved valves for mine pumps, and it is among the objects thereof to provide a valve structure which shall be adapted to resist the destructive action of coal dust lodging in the valve seat and the corrosive action of the fluids carrying grit in suspension which speedily destroy the metallic valve elements of the conventional form of mine pump.

In the operation of mine pumps, the water pumped from the mine is delivered by successive stages to a discharge port of the pump, and passes through a series of chambers, each of which are valved, the valves varying in number depending upon the stages through which the fluid is pumped and also depending upon whether or not the pump is single or double-acting. As the double acting pump is commonly employed, there are usually four or more valve elements in such a pump, and the use of the conventional form of bronze valve elements necessitates frequent renewal because of the conditions enumerated above.

In accordance with the present invention, I employ a series of wooden valve blocks and a non-ferrous metallic valve ball instead of the flat metallic valve elements of the conventional type of mine pump.

I have found that by employing a valve construction of this general character, it is unnecessary to replace the wood blocks, and the non-ferrous ball elements are practically indestructible. In carrying out the invention, I employ a cylindrical valve block of wood preferably a gum wood which has practically no grain and which is cut out to form a cage for the valve ball. This form of valve structure is readily adapted to the conventional type of mine pump of the double-acting and multiple stage type by merely replacing the conventional bronze disc valves with the wooden elements.

The proposed wooden seat and metallic ball valve is very economical of construction as it eliminates expensive machining operations and the employment of springs, the equivalent force of which resides in the weight of the ball which is lifted by the force of the pump and seats by gravity, and aside from the economy and the cost of initial installation of the improved form of valve, it insures reliable operation without the frequent take-downs for replacements thus eliminating the necessity of duplicating the pumping equipment or losing the operating capacity of the mine while repairs are being made.

The invention will become more apparent in consideration of the accompanying drawing constituting a part hereof in which like reference characters designate like parts and in which:

Figure 1 is a fragmentary view in vertical cross-section of a mine pump embodying the principles of this invention;

Figure 2 is a side elevational view of a wooden valve member such as is employed in the pump in Figure 1;

Figure 3 is a top plan view of the valve seat;

Figure 4 a side elevational view of a modified form of valve; and,

Figure 5 a cross-sectional view of part of a pump showing a modified form of ball valve structure.

With reference to the structure shown in Figure 1, the reference numeral 1 generally designates a housing which is the water end of the pump, and the reference numeral 2 a portion of the power end of the pump housing.

The housing 1 is provided with an expansion or air chamber 3 which is seated on a flange 4 of the housing and clamped by means of bolts extending through the flanges 4 and 5.

The housing 1 is provided with a suction port designated by the reference numeral 6 and a discharge port 7, these ports being divided or separated by a plurality of chambers 8 and 9.

Directly beneath the chambers 8 is a cylinder chamber 10 in which is disposed a double-acting piston 11 operated by a piston rod 12 secured to a cross head 13 which in turn is actuated by a connecting rod 14 of the crank shaft (not shown).

The chambers 8 and 9 of the water end are provided with partitions 15 and 16, and the wooden valve blocks 17 are disposed in cylindrical openings which are arranged in superposed and horizontally spaced relation as shown. The wooden blocks 17 are either of a type shown in Figure 2 or of the type designated by the reference numeral 18 in Figure 4 of the drawing. The blocks are preferably cut from gum wood, and are provided with extensions 19 which act as a retaining cage for the valve ball 20. The blocks 17 are provided with a central perforation 21 which constitutes the flow passage from the suction chamber of the pump to the discharge port, and which passages are controlled by the valve balls 20 which close these passages by their own weight and are displaced by the force of the fluid pumped into the chamber to establish communication with the discharge port 7 of the water end. As previously explained, the blocks 17 are con-

structed of a very dense wood, most gum woods being suitable for this purpose as they are substantially free of grain, and when the blocks are fitted in the water end of the pump as shown in Figure 1 of the drawing, the ball assumes a central position with respect to flow passages 21 by virtue of a counter-sunk or concave seat 22 which may be provided in the valve element as shown in Figure 2.

10 In operation, the pump is connected with the suction 6 connected to the source of the fluid which it is desired to pump out of a mine, and the discharge port 7 is connected to a drain. When the engine or other prime mover is energized, the piston element 11 is actuated by the connecting rod 14 and cross head 13, and in response to the movement of the piston 11, fluid is drawn into the end chambers of the cylinder casing 10 on each stroke of the piston and discharged through the ball valve elements 17 on the pressure stroke of the piston. For example, on one stroke of the piston, the lower chamber on the side of the suction port 6 will be filled with fluid and on the subsequent pressure stroke, the fluid will be discharged through the lower valve element 17 into chamber 8. At the same time, the bottom chamber of the opposite valve element is filled which, upon a subsequent stroke of the piston, is discharged into the partitioned chamber 8 and so on, with subsequent pressure strokes of the piston elements causing the fluid to evacuate from the chambers 8 and flow to the chambers 9 through the ball valve seats 20 and thence through the discharge 7 to the drain.

35 In Figure 5 is shown a valve structure of wood which eliminates the central horizontal partition wall by seating an upper valve 25 on a lower valve 26, both valves being made of wood. Balls 20 are disposed in the wooden valve cages and by means of this construction, the upper valve block 40 25 cannot be driven downward by the pounding of the ball as it is firmly seated on the lower valve 26.

45 One of the important factors in mine pumps is the ability of the valve mechanism to withstand the corrosive actions of the fluids which contain a great deal of acid and speedily consume even bronze elements when employed in the pumps. However, where bronze is used or other

non-ferrous flat valve structures are employed, the steady pounding of the valve on its seat will speedily destroy the valve seat causing leakage and resulting in the pumping of air which lowers the capacity of the pump which eventually necessitates the shutting down of the mine until repairs are made to the valves. 5

Also, the flat seat type of pump requires frequent shut-downs, to remove dirt from the seat and springs as often as many times a day and sometimes for hours. 10

By employing the hard wood valve seats with a ball valve as herein disclosed, these difficulties are overcome as the ball will rise with the pressure of the fluid and will seat by gravity without imparting any particular blow to the wooden valve seat. However, any pounding of the ball will not destroy the valve seat since there is no contact of metal on metal as in the conventional form of valve. Also, the ball valve functions as a 15 line check valve and through its ability to hold water the pump is self-priming which is an important feature in mine pumps. 20

It has been found by actual use that a valve of the type herein disclosed will stand up indefinitely 25 in a mine pump, whereas the bronze type of flat valve of the conventional form of pump has to be renewed at frequent intervals, the frequency of which is dependent upon operating conditions, that is, the nature of the fluid and the amount of coal dust and grit which is suspended in the fluid being pumped. 30

Although one embodiment of the invention has been herein illustrated and described, it will be obvious to those skilled in the art that various 35 modifications may be made in the details of construction without departing from the principles herein set forth.

I claim:

A valve structure for mine pumps comprising 40 a cylindrical wooden block constituting a valve seat having a ball cage integrally formed therewith, said wooden block being made of fine grained wood and having a fluid flow passage therein, and a spherical member of a non-ferrous material 45 disposed in and retained by said cage element to constitute the movable flow controlling element of said flow passage.

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