

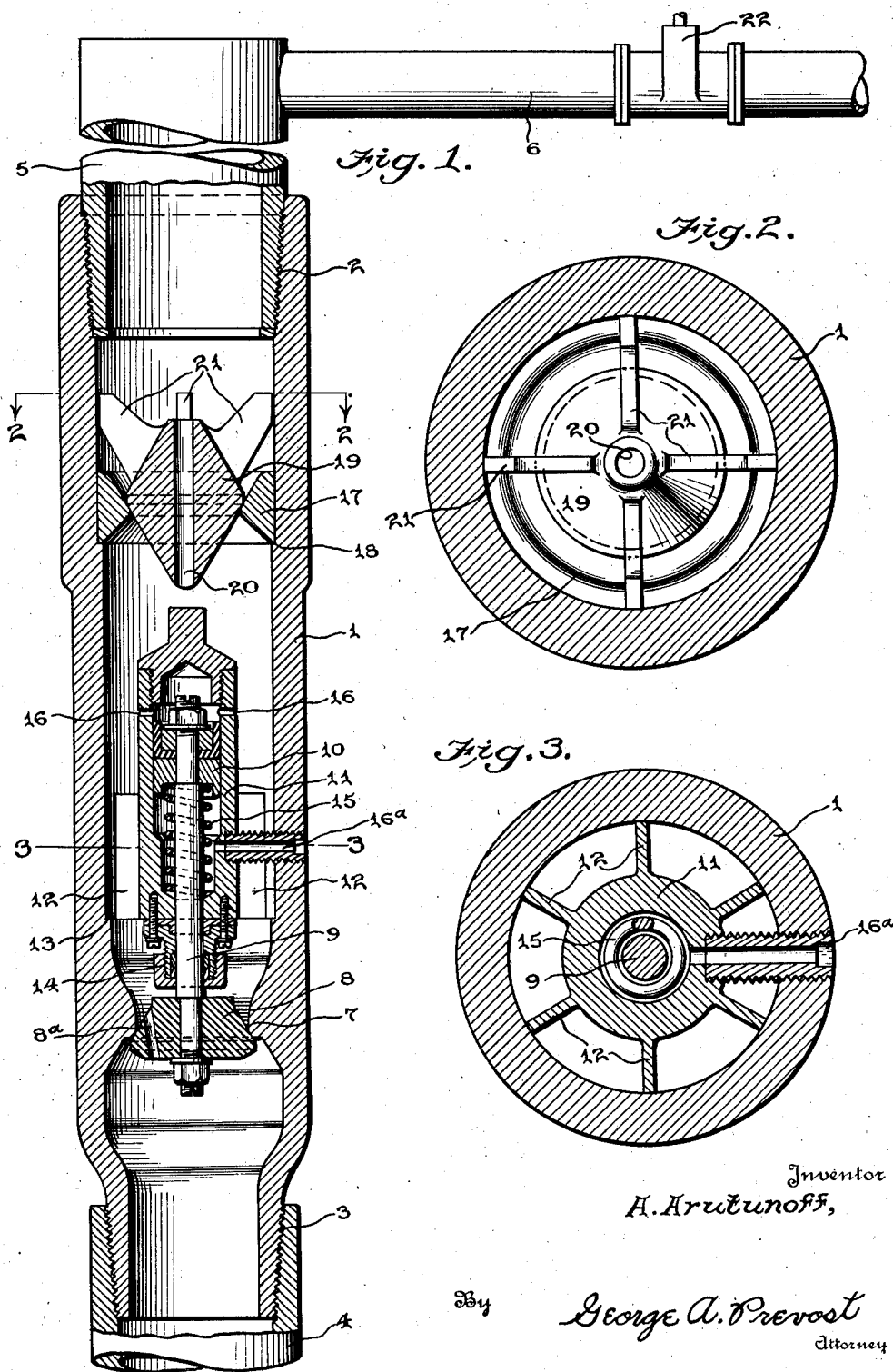
Sept. 9, 1930.

A. ARUTUNOFF

1,775,480

VALVE UNIT FOR CENTRIFUGAL PUMPS

Filed Sept. 8, 1928



UNITED STATES PATENT OFFICE

ARMAIS ARUTUNOFF, OF BARTLESVILLE, OKLAHOMA

VALVE UNIT FOR CENTRIFUGAL PUMPS

Application filed September 8, 1928. Serial No. 304,819.

My invention consists in new and useful improvements in a starting and stopping valve unit for centrifugal pumps, and has for its object to provide a device which will eliminate the possibility of overloading the motor while starting the pump unit, and one, which, when the pump has been stopped, will retard the downward flow of fluid returning by gravity to the pump below, thus preventing the rotation of the impellers in a reverse direction at an objectionable speed.

Heretofore, in starting centrifugal pumps, the driving motors have been frequently overloaded, delivering fluid in far greater than normal capacities. This is particularly true with regard to deep well pumps, where the discharge tubing is empty at the start. When the centrifugal pump is started, it pumps fluid at several times its normal capacity, due to the fact that there is no back pressure in the empty discharge tubing.

It is therefore obvious that the driving motor may be damaged on account of such overloading before the fluid rising in the tubing is enabled to build up a pressure sufficient to warrant normal operation of the pump. In fact, the motor, in some cases, may never come to speed, and will burn out before the necessary back pressure has been established.

It is therefore the object of my invention to overcome the disadvantages of structures heretofore known, and to this end I have provided a valve unit which may be easily attached to any centrifugal pump, and one which will automatically control the flow of the fluid being pumped at the start of the pumping operation.

With the above and other objects in view which will appear as the description proceeds, my invention consists in the novel features herein set forth, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

Referring to the drawings, in which numerals of like character designate similar parts throughout the several views,

Fig. 1 is a view showing my improved valve unit connected into a vertical centrif-

ugal pump and pipe line, said valve unit being shown in cross section.

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1, showing the stopping valve, and

Fig. 3 is a section taken on line 3—3 of Fig. 1, showing the manner in which the starting valve mechanism is secured in the shell.

In the drawings, 1 represents the shell of the unit which, in the illustration shown, is inwardly threaded at its upper extremity as at 2, and externally threaded and reduced at its lower extremity as at 3. The lower threaded end 3 is adapted to be screwed into the upper end of a pump unit 4, while the upper end 2 is adapted to receive one end of a tubing 5, into which is connected a suitable pipe line 6.

The shell 1 is cylindrical in shape and internally reduced as at 7 to form a seat for the valve 8, which valve is provided with a reduced opening 8^a, and is mounted on the lower end of a piston rod 9, at the upper end of which is secured a piston 10. The piston 10 is enclosed and adapted to reciprocate in a chambered cylinder 11, which is rigidly secured within the shell 1, immediately above the valve seat 7, by a spider arrangement 12, supported on an internal shoulder 13 in the shell.

14 represents a stuffing box mounted at the lower extremity of the cylinder 11, and through which the downwardly extending rod 9 is adapted to pass. Within the cylinder 11, and around the rod 9, I provide a coil spring 15, the lower end of which abuts the bottom of the chamber and the upper end being in contact with the lower surface of the piston 10, whereby the latter is normally forced upwardly to cause the valve 8 to engage its seat 7.

The upper portion of the chamber within the cylinder 11, above piston 10, is in communication with the interior of the shell 1 by means of ports 16, while the lower portion of said chamber, beneath the piston 10 is in communication with the exterior or atmosphere, by means of the threaded tube 16^a which extends through the shell 1.

In the upper portion of the unit 1, above

the starting valve arrangement just described, I provide a stopping valve which consists of a reducing ring 17, mounted on an internal shoulder 18, and forming a seat
 5 for a valve 19, which valve is of the floating type and is preferably conical in shape, having a reduced opening 20 extending vertically through the center thereof, and provided with a plurality of centering fins 21 for
 10 maintaining said valve in the proper position within the shell 1. This valve 19 is adapted to be raised by the pressure of the fluid on the under side, and lowered by the weight of the fluid on its upper side, as will
 15 be hereinafter set forth.

Having thus described in detail the construction of my improved stopping and starting valve unit, its operation is as follows.

The valve 8 is normally closed by means
 20 of the upward pressure of the spring 15, on the piston 10; thus when the pump 4 is started, the fluid pumped thereby is throttled by said valve, and caused to pass through the reduced opening 8^a in said valve. This reduced opening 8^a is of such a size that the
 25 amount of fluid passed therethrough is under a pressure equal to or below that of the pump at normal capacity, hence the pump does not acquire, at starting, any more power
 30 from the motor than is normally required.

When the upper portion of the shell 1 and the tubing 5 have been gradually filled to the surface, the valve 22 in the pipe line 6 is
 35 manually closed, thus stopping the flow and creating a back pressure in the shell 1, and in the upper portion of the chamber within the cylinder 11, the latter through the medium of ports 16. When sufficient pressure
 40 has been attained, the piston 10 is forced downwardly against the pressure of the spring 15, causing the valve 8 to open, in which position it is maintained as long as the pressure in the shell 1 is above that of the atmosphere. The valve 22 is then opened,
 45 permitting the discharge of the fluid pumped.

When the pump is stopped, the apparatus is protected from damage by the falling column of fluid, by means of valve 19, which,
 50 due to the weight of said fluid, is caused to seat and control the return flow, said fluid being caused to pass through the reduced opening 20 in said valve.

From the foregoing, it is believed that my invention may be clearly understood by those
 55 skilled in the art, without further description, it being borne in mind that numerous changes may be made in the details of construction, without departing from the spirit of the invention as set forth in the following
 60 claims.

What I claim and desire to secure by Letters Patent is:

1. In combination with a centrifugal pump, a starting valve, comprising a shell
 65 member, a valve body in said shell member

having a reduced opening therein, means for normally maintaining said valve in closed position, whereby the fluid pumped is throttled and caused to pass through said reduced opening when said valve is closed, and means
 70 operable by the pressure of said fluid for opening said valve.

2. In combination with a centrifugal pump, a starting valve, comprising a shell
 75 member, a valve body in said shell member having a reduced opening therein, spring means for normally maintaining said valve in closed position, whereby the fluid pumped is throttled and caused to pass through said reduced opening when said valve is closed,
 80 and means operable by the pressure of said fluid for opening said valve.

3. A starting valve for centrifugal pumps, comprising a shell, a throttle valve and seat
 85 within said shell, one of said last named members having a reduced opening therein, a cylinder in said shell, a piston in said cylinder connected to said valve, means for maintaining said valve in closed position, whereby the
 90 fluid pumped is caused to pass through said reduced opening when the valve is closed, and means whereby the pressure of the fluid thus pumped into said shell will act upon said piston to open said valve.

4. A starting valve for centrifugal pumps,
 95 comprising a shell, a throttle valve body having a reduced opening therein, a seat for said valve within said shell, a cylinder in said shell, a piston in said cylinder connected to said valve, spring means within said cylinder for maintaining said valve in closed position,
 100 whereby the fluid pumped is caused to pass through said reduced opening when the valve is closed, and means whereby the pressure of the fluid thus pumped into said shell will act upon said piston to open said
 105 valve.

5. A valve unit for centrifugal pumps, comprising a shell, a starting valve in said
 110 shell consisting of a cylinder, a piston adapted to reciprocate therein, a rod depending from said piston and extending through a stuffing box at the lower end of said cylinder, a valve body at the lower extremity of said
 115 rod having a reduced opening therein, a valve seat in said shell for engaging said valve body, means for normally retaining said valve in closed position, and means whereby an increase in pressure in said shell will automatically cause said piston to move down-
 120 wardly to open said valve.

In testimony whereof I affix my signature.
 ARMAIS ARUTUNOFF.