Mar. 3, 1925. 1,528,412

R. H. FLETCHER

PUMPING APPARATUS

Filed Feb. 18, 1924 2 Sheets-Sheet 1

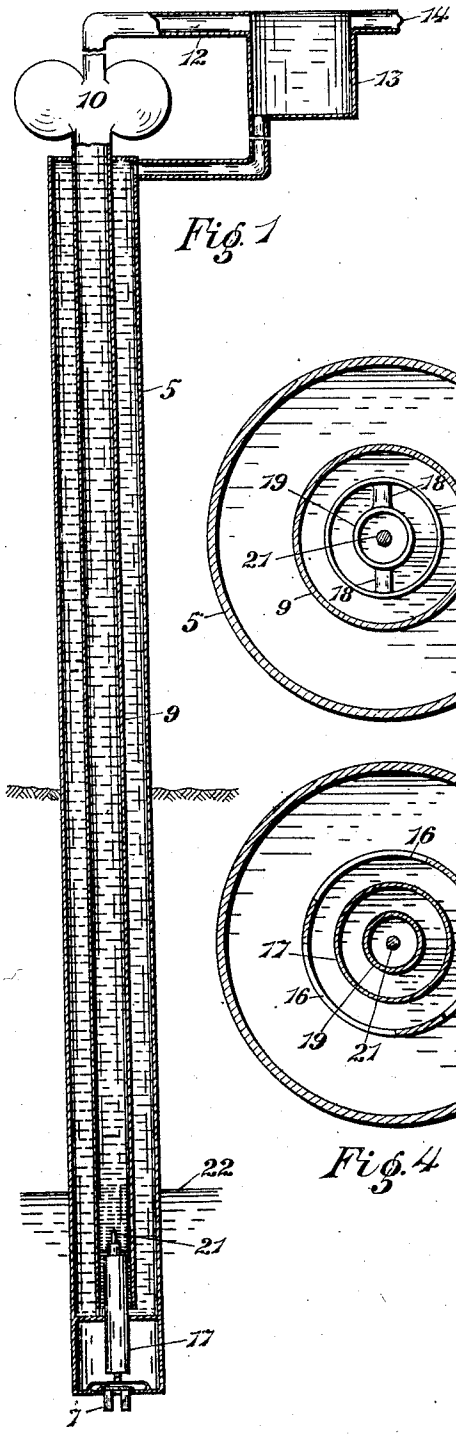


Fig. 1

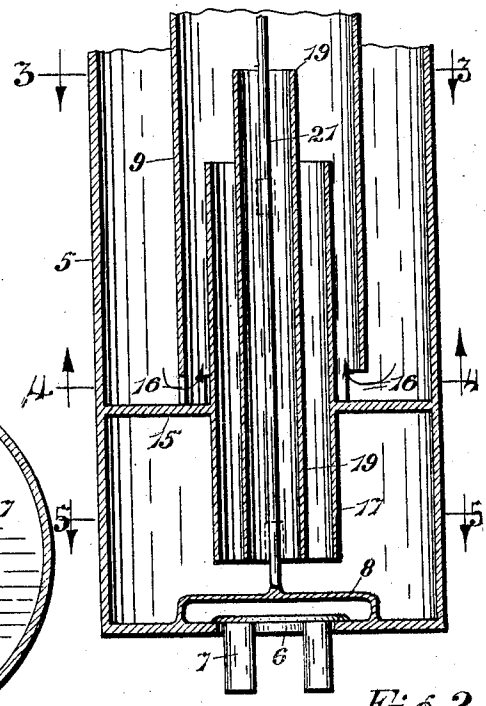


Fig. 2

Fig. 3

Fig. 4

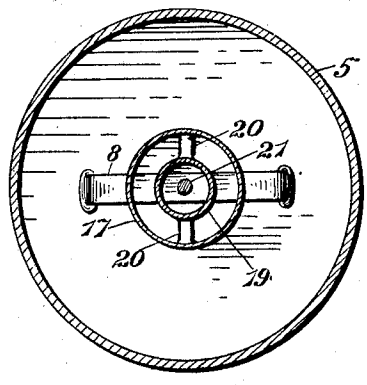


Fig. 5

INVENTOR.
R. H. Fletcher

BY

ATTORNEY.

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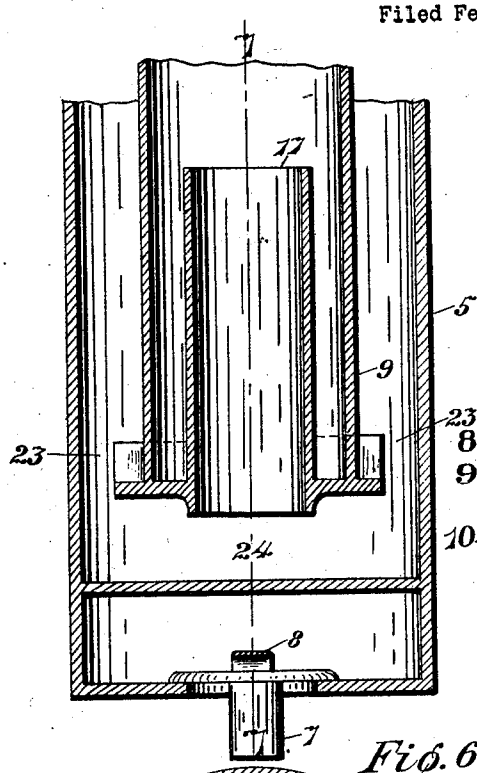


Fig. 6

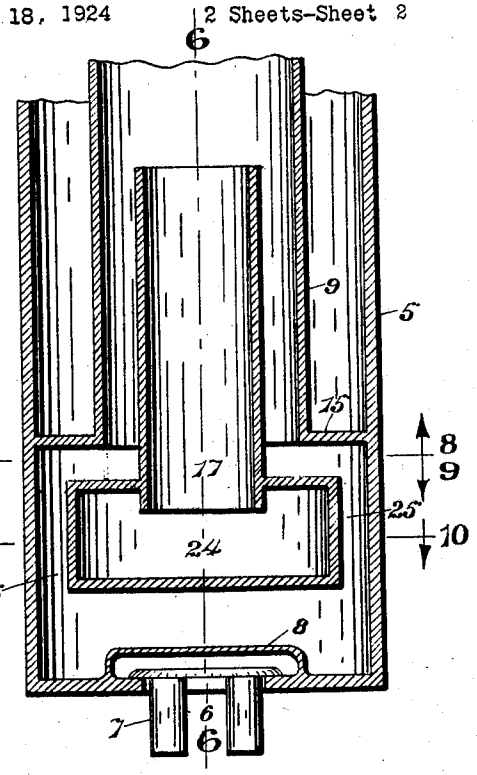


Fig. 7

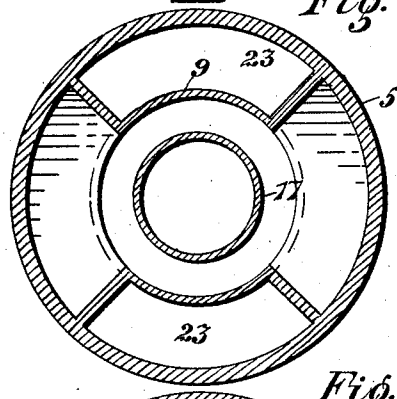


Fig. 8

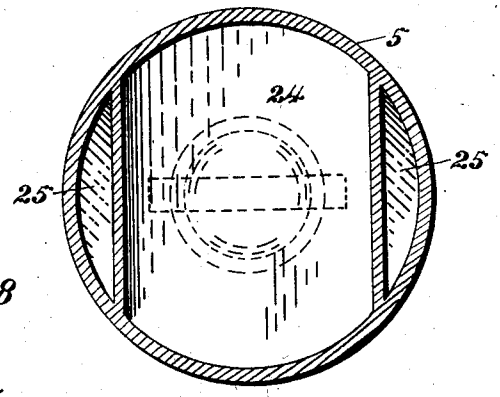


Fig. 10

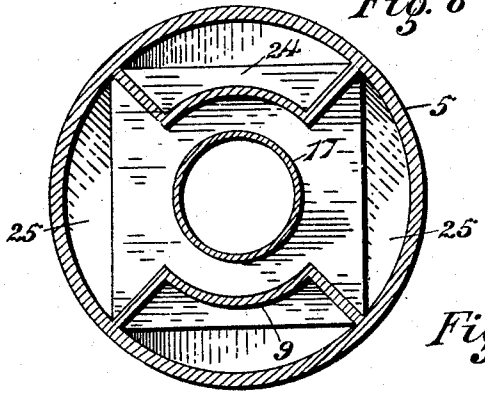


Fig. 9

INVENTOR.
R. H. Fletcher

BY

ATTORNEY.

Patented Mar. 3, 1925. 1,528,412

UNITED STATES PATENT OFFICE.

RICHARD H. FLETCHER, OF DENVER, COLORADO.

PUMPING APPARATUS.

Application filed February 18, 1924. Serial No. 693,656.

To all whom it may concern:

Be it known that I, RICHARD H. FLETCHER, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Pumping Apparatus, of which the following is a specification.

My invention relates to pumps and its primary object is to provide a simple apparatus for raising water and other liquids from a deep source of supply, in which the action of a mechanically operated suction pump is augmented by a hydraulically produced partial vacuum.

It is a distinctive feature of my invention that the hydraulic suction increases in ratio to the elevation above the source of supply to which the water is raised and it is for this reason particularly adapted for drawing water or oil out of mines, wells and other deep bores or excavations.

An embodiment of my invention has been illustrated in the accompanying drawings in the several views of which like parts are similarly designated and in which—

Figure 1 represents a sectional elevation of a pumping apparatus made in accordance with my invention;

Figure 2, a longitudinal section of the lower portion of the apparatus, drawn to an enlarged scale;

Figure 3, a transverse section on the line 3—3, Figure 2;

Figure 4, a similar section taken along the line 4—4, Figure 1;

Figure 5, a section in the plane designated by the line 5—5, Figure 1;

Figure 6, a section similar to that shown in Figure 2, of a modified construction of the lower portion of the apparatus;

Figure 7, a section on the line 7—7, Figure 6;

Figure 8, a transverse section on the line 8—8, Figure 7, looking upwardly;

Figure 9, a section taken on the same line looking in the opposite direction; and

Figure 10, a section on the line 10—10, Figure 7.

Referring first to Figures 1 to 5 of the drawings, my invention comprises a stand pipe 5 which extends at its lower end below the level of the body of water or other liquid to be raised and which may be supported and held in an upright position by any suitable means.

The pipe has in its bottom an opening 6 normally closed by a gravity suction-valve 7 the upward movement of which is restricted by a transverse strap 8.

Mounted in axial coincidence with the stand pipe is a suction pipe 9 of smaller diameter which at its upper end connects with the ingress opening of a suction pump 10.

The pump which is installed in superposed relation to the stand pipe may be of any suitable character or construction and its mechanism and mode of operation have not been illustrated in the drawings.

The egress opening of the pump is through the medium of a conduit 12 connected with an inlet at the upper end of the stand pipe and included in this conduit is a small reservoir 13 which has an overflow pipe 14 for the discharge of the water raised from the source of supply in the operation of the apparatus as will hereinafter be more fully explained.

The suction pipe 9 is at its lower end supported upon a transverse partition 15 spaced from the bottom of the stand pipe, and it has adjacent said partition a plurality of ports 16 for its connection with the interior of the stand pipe.

An open ended nozzle 17 having its axis coincident with that of the suction pipe, passes through a central opening of the partition and has its lower end a short distance above the bottom of the stand pipe.

The nozzle is braced at its upper end by cleats 18 fastened to the suction pipe, and interiorly of the nozzle is a suitable contrivance for the prevention of counteracting currents, which in the drawings has been represented by a concentric tube 19 of smaller diameter fastened inside the nozzle by braces 20, and a rod 21 extending in the axis of the nozzle and supported on the transverse strap which limits the upward movement of the suction valve.

The tube 19 extends a short distance above the upper end of the nozzle 17 and the rod 21 extends above the upper extremity of the tube.

In the operation of my invention, the stand pipe is installed in an upright position with its lower end immersed in the body of water at the bottom of a well or other excavation, which in the drawings has been designated by the reference numeral 22, and the entire apparatus including the reservoir is filled with water or other liquid.

The weight of the liquid in the stand pipe, the conduit 12 and the reservoir 13, exerts an upward pressure on the liquid in the suction pipe 9 which is constantly withdrawn by the action of the pump and the current passing through the ports at the lower end of the suction pipe produces a partial vacuum around and at the upper end of the nozzle which in co-operation with the suction of the pump and the natural pressure of submergence causes an inflow of water from the source of supply past the suction valve 7.

The water, including the amount drawn from the source, passes through the pump into the conduit 12 and the reservoir 13 from where the surplus is discharged through the overflow 14.

It will thus be evident that with the system of pipes filled with a liquid as stated hereinbefore, and with the pump in continuous operation, a circulatory movement of the liquid body is effected with a constant discharge of a surplus equal to the amount of liquid drawn from the source, and that the capacity of the apparatus is governed by the height of the stand pipe and the elevation of the reservoir above the liquid level in the source, augmentary to the power of the pump and the pressure of submergence.

The pipe and the rod inside the nozzle serve to prevent the liquid moving upwardly in the nozzle by hydraulic force, from caving over the upper edge of the nozzle, thereby preventing the formation of a downwardly directed countercurrent and aiding in producing an uninterrupted and unimpeded upward flow of the liquid.

It will be apparent that the reservoir has not the function of a storage tank but is provided merely to receive and discharge the surplus of liquid represented by the amount drawn from the source and it will be understood that the arrangement of the essential parts of the apparatus may be varied without departing from the spirit of the invention.

In the construction illustrated in Figures 6 to 10, for example, the parts are arranged so that the partial vacuum which in the first described form of the invention was created exteriorly of the nozzle through which the water drawn from the source of supply, passes into the suction pipe, is now formed interiorly of the nozzle while the water raised past the valve 7, enters the suction pipe at the lower end thereof and flows through the space exteriorly of the nozzle.

To accomplish this purpose, it is of course necessary that the water in the stand pipe which causes the hydraulic force by which the partial vacuum is produced, be compelled to enter the nozzle instead of the space around the same and that the lower end of the suction pipe be in direct connection with the space in the bottom of the stand pipe above the suction opening 6.

This result is obtained by providing the partition 15 at the lower end of the suction pipe 9 with ports 23 which connect the interior of the stand pipe with a transverse duct 24 formed at the lower end of the nozzle 17, as clearly shown in Figure 6, and the lower end of the suction pipe is placed in direct communication with the bottom portion of the stand pipe above the suction opening 6, by passages 25 at opposite sides of the duct as illustrated in Figure 7.

With the apparatus filled with liquid as before, the hydraulic force causes the liquid in the stand pipe to enter the nozzle 17 through the ports 23 and the duct 24 and by replacement of the liquid exhausted from the suction pipe in the operation of the pump 10, produces a partial vacuum around the upper end of the nozzle which augments the pump action in drawing liquid from the source of supply past the suction valve 7, and into the suction pipe 9 through the passages 25 at opposite sides of the duct.

The tube 19 and the rod 21 which in the form shown in Figure 2, constitute the contrivance opposing the formation of countercurrents in the suction pipe have not been shown in the construction illustrated in Figures 6 to 10, but it is obvious that they may be applied to perform their function in the manner hereinbefore described, without any change in the arrangement or form of the parts except the provision of an aperture in the bottom of the duct 24 for the passage of the rod.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. Pumping apparatus comprising a stand pipe having a valve-controlled intake opening at its lower end, a pump having an ingress and an egress, a suction pipe connected to the ingress of the pump, a conduit connecting the egress of the pump with the stand pipe at the upper end thereof, a reservoir included in the conduit and having an outlet for the discharge of surplus liquid, a nozzle in the suction pipe at the lower end thereof, above the intake opening of the stand pipe, a liquid body in the pipes and the conduit, the stand pipe and the suction pipe intercommunicating to admit to the suction pipe a current caused by downward movement of the liquid in the stand pipe, and means to check convergence of liquid moving through the suction pipe past the nozzle.

2. Pumping apparatus comprising a stand pipe having a valve-controlled intake-opening at its lower end, a pump having an ingress and an egress, an upright suction pipe in the stand pipe, connected at its upper

end to the ingress of the pump, a conduit connecting the egress of the pump with the stand pipe at the upper end thereof, an upright open-ended nozzle in the suction pipe at the lower end thereof, above the intake-opening of the stand pipe, a liquid body in the pipes and the conduit and means for the discharge of surplus liquid, the stand pipe and the suction pipe intercommunicating to admit to the suction pipe a current caused by downward movement of the liquid in the stand pipe, and a member extending above the nozzle to check convergence of liquid moving through the suction pipe.

3. Pumping apparatus comprising a stand pipe having a valve-controlled intake opening at its lower end, a pump having an ingress and an egress, an upright suction pipe in the stand pipe, connected at its upper end to the ingress of the pump, a conduit connecting the egress of the pump with the stand pipe at the upper end thereof, an upright open-ended nozzle in the suction pipe at the lower end thereof, above the intake-opening of the stand pipe, a liquid body in the pipes and the conduit and means for the discharge of surplus liquid, the stand pipe and the suction pipe intercommunicating to admit to the suction pipe a current caused by downward movement of the liquid in the stand pipe, and a plurality of members of different diameters extending at different distances above the nozzle to check convergence of liquid moving through the suction pipe.

4. Pumping apparatus comprising a stand pipe having a valve-controlled intake opening at its lower end, a pump having an ingress and an egress, an upright suction pipe in the stand pipe, connected at its upper end to the ingress of the pump, a conduit connecting the egress of the pump with the stand pipe at the upper end thereof, an upright open-ended nozzle in the suction pipe at the lower end thereof, above the intake-opening of the stand pipe, a partition around the nozzle, dividing the stand pipe beneath the suction pipe, a liquid body in the pipes and the conduit, and means for the discharge of surplus liquid, the stand pipe communicating with the suction pipe above the partition to admit to the suction pipe a current caused by downward movement of the liquid in the stand pipe.

In testimony whereof I have affixed my signature.

RICHARD H. FLETCHER.