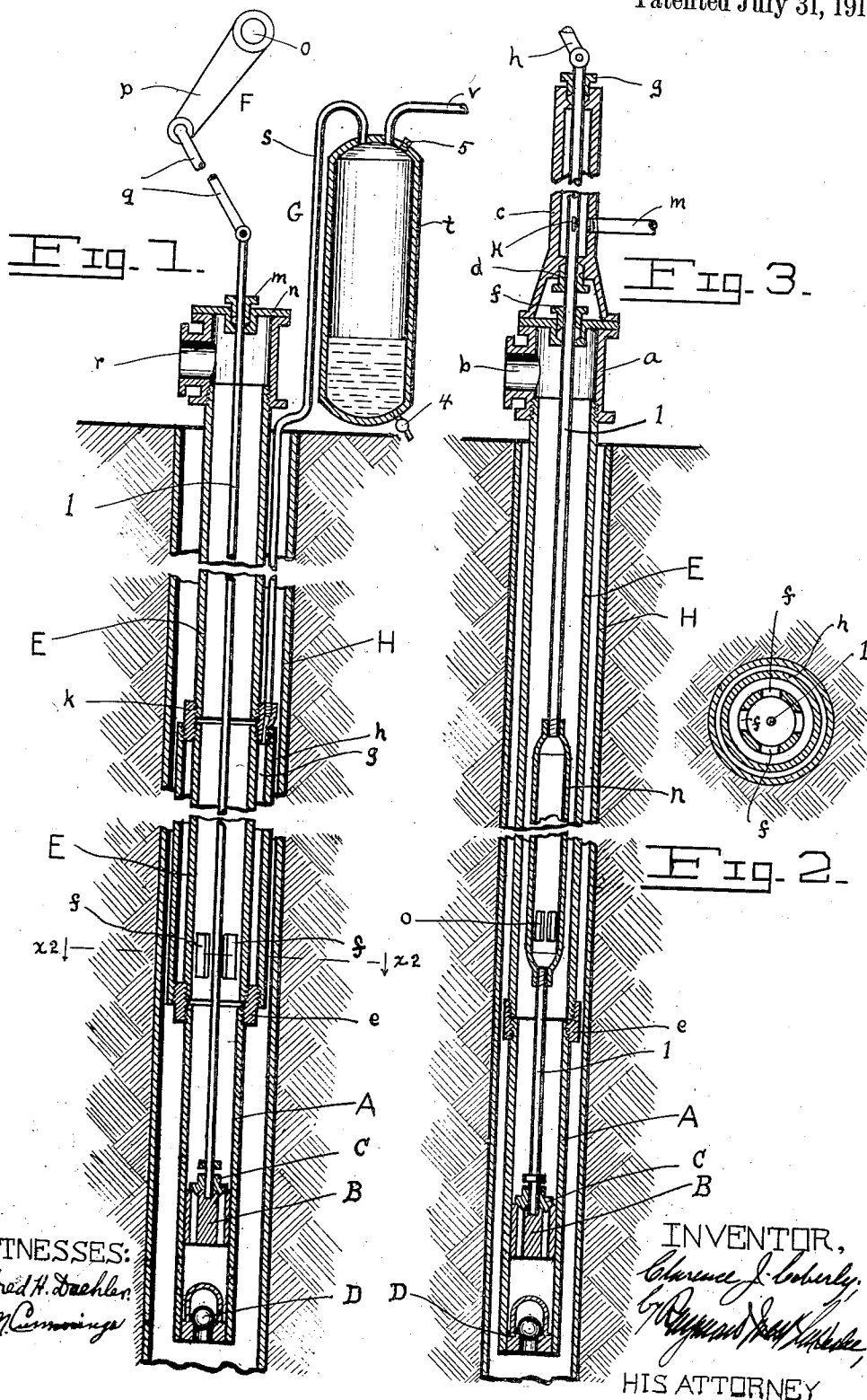


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PUMP,
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1,235,112.

Patented July 31, 1917.



WITNESSES:
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PUMP.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CLARENCE J. COBERLY, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Pumps, of which the following is a specification.

This invention relates to pumps for elevating water, oil and other fluids, and more particularly to pumps utilizing one or more pistons and pump rods for moving the column or columns of fluid. Ordinarily, in the use of such pumps, the fluid is elevated or moved and discharged by a succession of impulses imparted to the fluid upon operation of the pistons. It results that the fluid issues or is discharged in a broken stream, and it further results that the smooth operation of the piston or pistons and attendant features of the pump are disturbed by the intermittent movement and lag or backlash of the column of water.

It is the object of the present invention to provide a pump of the general character stated the operation of which is devoid of the pulsations ordinarily occurring as above pointed out, and by which fluid may be moved or elevated and discharged in a constant stream or stream of approximately constant or even volume, the operation of the pump being smooth and void of the backlash and jar and disturbing stresses which ordinarily accompany the operation of this class of pumps. In carrying out the invention, I provide, in communication with the stream or streams of fluid which is or are elevated by the piston or pistons, an air chamber within which a predetermined air pressure is maintained, greater than that of one atmosphere, the same being in communication with the pump line and preferably at or closely adjacent to the working pump barrel, to the end that the fluid, upon each working stroke of the piston, may act upon or be acted upon by the compressed air of such chamber. A yielding relation is thus established in the column of liquid above or beyond the piston and this yielding relation or flexibility in this part of the pump line eliminates the jars and stresses and backlash ordinarily encountered in such pumps, and further produces a positive reaction maintaining even flow of the fluid and discharge therefrom by the pump both during working and return stroke of the

piston. Thus the pump is operated smoothly and without the jars and disturbances usually encountered, and the discharged stream of fluid is approximately even in flow and without the inequalities and splash ordinarily present.

The invention has for its object to provide improvements in pumps of the general nature above set forth, which will be superior in point of relative simplicity and inexpensiveness in construction and organization, positiveness in operation, durability, freedom from liability to get out of repair, and facility in control, and which will be generally superior in efficiency and serviceability.

With the above and other objects in view, the invention consists in the novel and useful provision, formation, construction, combination, association and relative arrangement of parts, members and features, all as hereinafter described, shown in the drawing, and finally pointed out in claims.

In the drawing:

Figure 1 is a central sectional elevation of a pump organized in accordance with the invention, the same being shown in place in a well hole and provided with the various features and adjuncts incident to its use and operation;

Fig. 2 is a detail transverse sectional view, taken on the lines x^2-x^2 , Fig. 1, and looking in the direction of the accompanying arrows; and

Fig. 3 is a view similar to Fig. 1 of a modified form of construction.

Corresponding parts in all the figures are designated by the same reference characters.

Referring with particularity to the drawing, and to Figs. 1 and 2 thereof, A designates a pump barrel within which operates a piston B having a working valve C, a foot valve D being provided at the lower end of the pump barrel and opposing the operation of the working valve. E designates a discharge pipe coupled onto the upper end of the pump barrel by a coupling e , two such lengths of discharge pipe being shown, one above the other, the lowermost of the same being provided adjacent to its lower end with a plurality of ports f arranged in an annular series, and communicating with an air chamber g provided between such lower length of pipe E and an annular jacket or pipe h , of larger diam-

eter, coupled onto said lower pipe length E and the pump barrel A, at its lower end, by the same coupling *e*, and coupled onto the upper end of said lower pipe length E and on the lower end of said upper pipe length E by a common coupling *k*. A pump rod *l* extends upwardly through the pump and the length of discharge pipe, carrying the piston B at its lower end, and passes through a gland *m* provided in the crown or dummy-head *n* at the top of the discharge pipe. F designates means for operating the pump rod and piston, the same being shown as a shaft *o* and crank *p* which latter is joined by connecting rod *q* with the upper end of the pump rod. A lateral discharge opening *r* is provided in the dummy-head *n*. G designates means for supplying compressed air to the air chamber *g*, the same being illustrated in the drawing as comprising a pipe *s* leading to a compressed air receiver or reservoir *t*, which receives its supply of compressed air through a supply pipe *v* leading to a suitable compressor or pump (not shown). Within the receiver *t* may be contained a certain amount of water, oil or other fluid, to determine the normal supply or volume of air in such receiver and in the air chamber and line including such receiver and air chamber, or the normal working efficiency of the compressed air contained in such line. It is evident that the receiver *t* may be dispensed with and a direct connection made between the air chamber *g* and the means for supplying compressed air thereto. The particular advantage in using the receiver *t* is to provide a total compressed air line or system of greater capacity than would be possible if the entire system were installed within the well. The pump is shown as installed within the usual well casing H. 4 designates a drain valve at the lower end of the receiver *t*, and 5 designates a plug or cap at the upper end of such receiver, whereby liquid may be withdrawn from or added to such receiver.

In operation, the pump rod and piston are reciprocated in the usual manner by the means F, and successive quantities of fluid are elevated by the piston and urged upwardly toward the discharge opening *r* and upper end of the discharge pipe. Upon each such piston movement the water moved thereby is forced outwardly through the ports *f* and into the compressed air chamber *g*, until the action of the compressed air counterbalances the elevating action of the piston, whereupon the water column will ascend through the discharge pipe and find egress through the opening *r*. This yield in the water column, consisting of the escape of a portion thereof through the ports *f*, against the resilient cushion of compressed air, eliminates the backlash or back

thrust or jars which the sudden elevation of such column of water would otherwise impose upon the piston and connected parts. As soon as the piston commences to descend the water introduced within the air chamber, as stated, is forced therefrom by the compressed air and caused to rise in the discharge pipe, compensating for the otherwise occurring diminution or cessation of flow and maintaining, on the contrary, a constant flow from the discharge opening.

Referring to Fig. 3, A similarly designates the pump barrel of a pump installed in a well having the usual casing H, D designates the foot valve at the lower end of the pump barrel, B designates the working piston, C designates the working valve thereof and *l* designates the pump rod. On to the upper end of the pump barrel is coupled, as at *e*, the lower length of a string of discharge pipe E, and the pump rod *l* plays within the discharge pipe and through a dummy-head or crown *a* having a lateral discharge opening *b*, and upon which rests a cylindrical casing *c* through which said pump rod also plays, glands or stuffing boxes *d* and *f* being provided in the bottom of the casing *c* and in the top of the dummy-head *a* respectively, and a similar gland *g* being provided in the upper end of the casing *c*, above which the pump rod is reciprocated by a connecting rod *h* which may be actuated similarly to the actuation of the connecting rod *q* shown in Fig. 1. The pump rod *l* is hollow or tubular and is provided with a lateral port or vent *k* which at all times communicates with the interior of the cylindrical casing *c*, so that the interior of the pump may receive compressed air supplied to such casing *c* by a supply pipe *m* which may lead to a receiver such as the receiver *t* shown in Fig. 1, and which may be supplied by a suitable compressor or pump, or which may lead directly to such compressor or pump, in accordance with expediency or the particular service to be met with. The pump rod *l* is broken or interrupted, within the discharge pipe line E, to include an air chamber *n* having a plurality of lateral ports *o* arranged in an annular series and whereby said air chamber communicates with the discharge pipe line E.

In the operation of the form of construction shown in Fig. 3, the reciprocation of the pump rod and piston causes the elevation of successive quantities of fluid which are urged upwardly to be discharged through the discharge opening *b* in the dummy-head. As each such contribution to the water column above the piston is elevated by the piston it tends to flow into the air chamber *n* through the ports *o*, and does so flow until checked by the resilient resistance of the compressed air in such chamber, such re-

silient resistance, and yield of the water column subject to such resistance, taking off from the piston the back lash and jar and stress militating against smooth action and which would otherwise be present. Upon the downward stroke or return stroke of the piston, the fluid which has entered the compression chamber flows therefrom under the pressure of the compressed air in the chamber, and is added to the water column above the piston, maintaining the otherwise diminished or interrupted movement of such column to and through the discharge opening *b*, and thus maintaining constant and even discharge or flow.

The air chamber *g* and receiver *t* in effect, and in their working relation, constitute the separate units or subdivisions of a single chamber the function of one of which is to neutralize oscillations of pressure in the other; such units being connected by a surge pipe of material length within which such fluctuations may be accommodated.

It is manifest that many variations may be made, with respect to the provision, formation, construction, combination and association of parts, members and features, all with respect to the similar aspects of the disclosure of the drawing and the foregoing description and statement, and without departing from a fair interpretation of the invention.

Having thus disclosed my invention, I claim and desire to secure by Letters Patent:

1. An improved pump, comprising a pump barrel, means for elevating fluid therein, a discharge pipe through which the fluid is passed from the pump barrel, a pressure chamber communicating with the discharge pipe, and a further or cushion pressure chamber communicating with said first-named pressure chamber to tend to neutralize the oscillations of pressure therein.

2. An improved pump, comprising a pump barrel, a piston for moving fluid therein, a working valve for the piston, a discharge pipe through which the fluid passes from the pump barrel, a pressure chamber communicating with the discharge pipe, and a further or cushion pressure chamber communicating with said first-named pressure chamber to tend to neutralize the oscillations of pressure therein.

3. An improved pump, comprising a pump barrel, a piston for advancing fluid through the pump barrel, a discharge pipe leading from the pump barrel, a pressure chamber communicating with the discharge pipe, and a further pressure chamber communicating with said first-named pressure chamber to maintain constant the pressure therein; said piston being provided with a hollow pump rod interrupted between its ends, and said first-named pressure chamber being carried by the pump rod and installed in the inter-

rupted portion thereof and being perforated to communicate with the discharge pipe.

4. An improved pump, comprising a pump barrel, a piston for advancing fluid through the pump barrel, a discharge pipe leading from the pump barrel, and an air chamber communicating with the discharge pipe and in which an air pressure in excess of one atmosphere is maintained; and compressed air supply means communicating with said air chamber; said compressed air supply means including a receiver adapted to contain a variable quantity of liquid and by which variance the compressed air capacity of such receiver may be varied.

5. An improved pump, comprising a pump barrel, a piston for advancing fluid through the pump barrel, a discharge pipe leading from the pump barrel, and an air chamber communicating with the discharge pipe and in which an air pressure in excess of one atmosphere is maintained; and compressed air supply means communicating with said air chamber; said piston being provided with a hollow pump rod interrupted between its ends, and said air chamber being carried by the pump rod and installed in the interrupted portion thereof and being perforated to communicate with the discharge pipe; and a casing within which said pump rod plays, said pump rod being provided with a port within said casing, and said compressed air supply means communicating with said casing.

6. In an improved pump, a pump barrel, a piston operating in the pump barrel, a discharge pipe whereby fluid passes from the pump barrel, a compressed air chamber communicating with the discharge pipe, and means for supplying compressed air to the compressed air chamber; said latter means including a receiver and means for varying the capacity of said receiver.

7. An improved pump, comprising a pump barrel, a piston for advancing fluid through the pump barrel, a discharge pipe leading from the pump barrel, a hollow piston rod, and an air chamber communicating with the discharge pipe and carried by and communicating with the hollow piston rod.

8. An improved pump, comprising a working chamber, means for moving fluid therein, a discharge pipe through which the fluid is passed from the working chamber, and a pressure chamber communicating with the working chamber and subdivided into two intercommunicating units one of which directly communicates with the working chamber and the other of which tends to neutralize the oscillations of pressure therein.

9. An improved pump, comprising a working chamber, means for moving fluid therein, a discharge pipe through which the fluid is passed from the working chamber, and a pressure chamber communicating with said

working chamber; said pressure chamber
comprising two units one of which directly
communicates with the working chamber,
and there being a pipe connection between
5 said units whereby pressure surges may be
accommodated as between said units and the
tendency exerted to neutralize oscillations of
pressure therein.

In testimony whereof, I have signed my
name to this specification in the presence of 10
two subscribing witnesses.

CLARENCE J. COBERLY.

Witnesses:

G. ROY PENDELL,
ALFRED H. DAEHLER.