A. E. DAVIS.

PUMP AND THE LIKE.

APPLICATION FILED MAY 16, 1905.

900,357.

Patented Oct. 6, 1908.

2 SHEETS—SHEET 1.

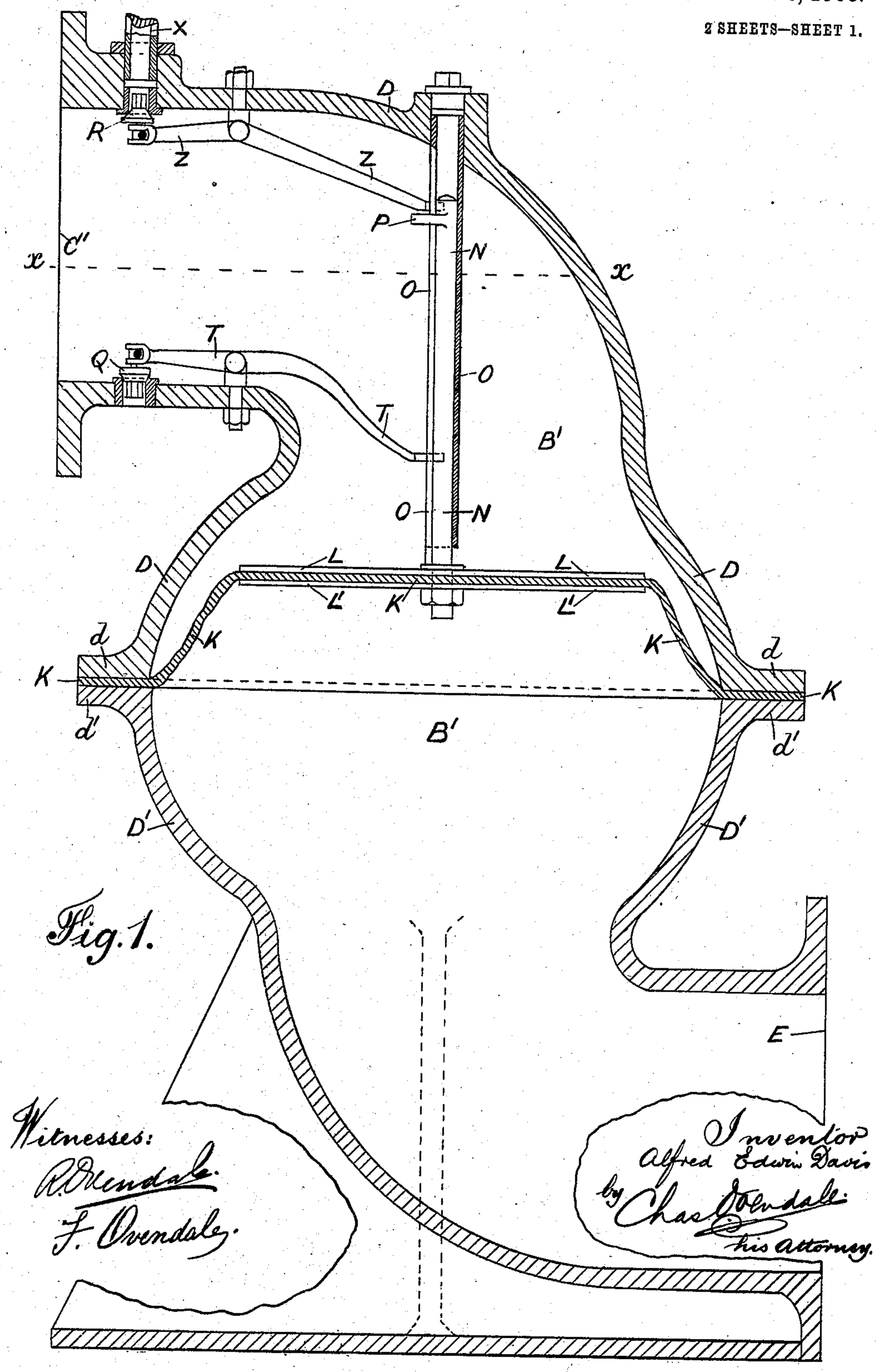

Fig. 1.

Witnesses:
R. Ovendale.
F. Ovendale.

Inventor
Alfred Edwin Davis
by Chas. J. Ovendale
his attorney.

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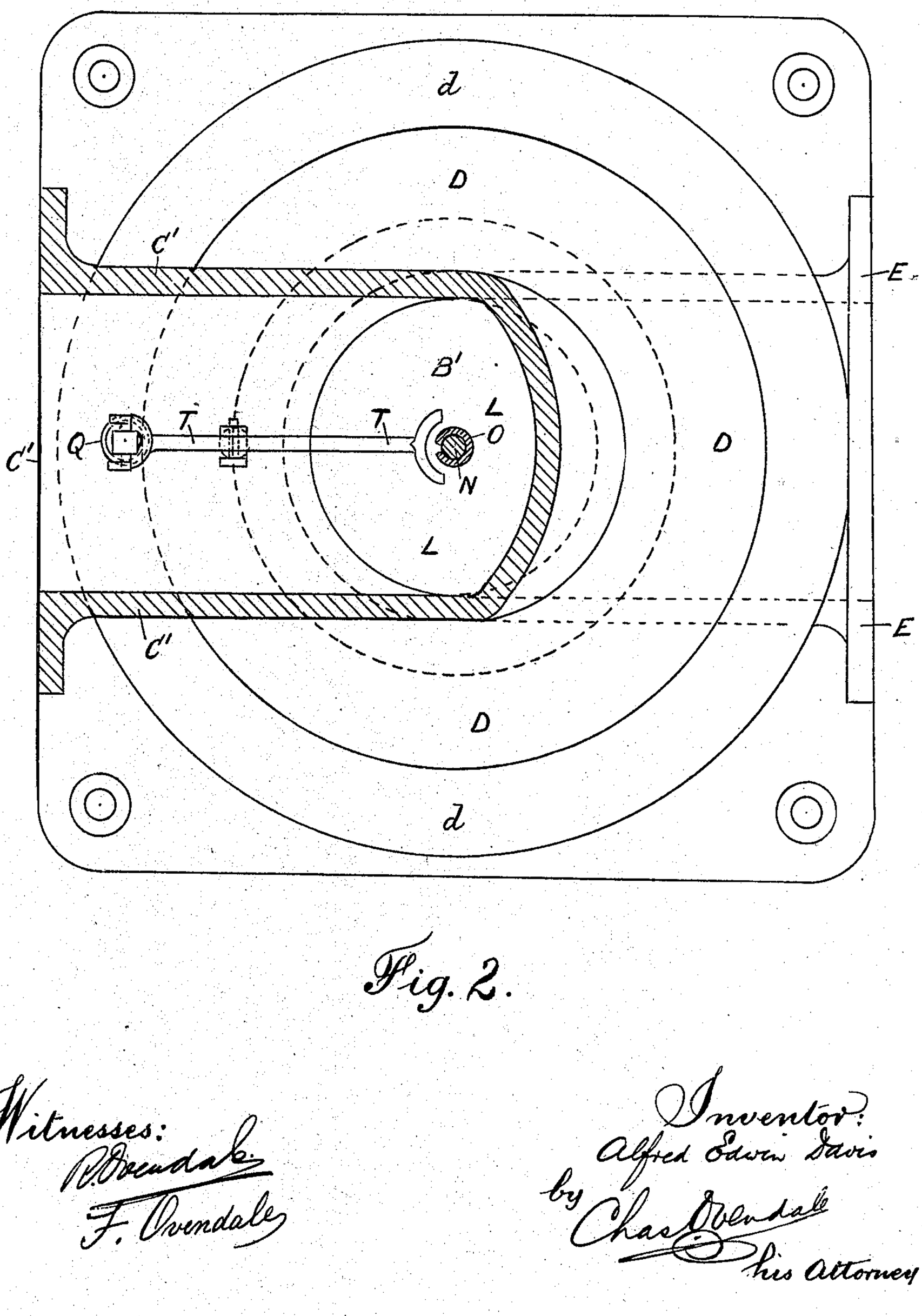

Fig. 2.

Witnesses:
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UNITED STATES PATENT OFFICE.

ALFRED EDWIN DAVIS, OF JOHANNESBURG, TRANSVAAL.

PUMP AND THE LIKE.

No. 900,357. Specification of Letters Patent. Patented Oct. 6, 1908.

Application filed May 16, 1905. Serial No. 260,657.

To all whom it may concern:

Be it known that I, ALFRED EDWIN DAVIS, a subject of the King of Great Britain, and resident of Johannesburg, Transvaal, have invented certain new and useful Improvements in Pumps and the Like, of which the following is a specification.

The present invention relates to pumps applicable for pumping mine tailings, or particles of pulverized ore mixed with water or other liquids, liquids containing other gritty or solid matter in suspension, acids or the like.

The improvements may be applied either in the manufacture of pumps specially intended for any of the above purposes, or to any of the existing types of oscillatory pumps, to adapt them for the purposes hereinbefore enumerated.

The object of the invention is to avoid the circulation through the main operative parts of the pump, of the liquid containing the solid matter, and so obviate the excessive wear and tear which results when the pumps of the ordinary construction are utilized for any of the above mentioned purposes.

My invention consists of a chamber or vessel (or chambers or vessels) interposed between the oscillatory media or mechanism of a pump and the main valves thereof, in which chamber a flexible vibrating diaphragm is so arranged and fixed as to separate the clean water on the oscillatory or operating side thereof from the liquid or water charged with tailings, slime, gritty or solid matter, acid et cetera, on the side thereof in connection with the main suction and delivery valves of the pump. This arrangement allows the clean water circulating in the working parts of the pump to be constantly retained therein, oscillating backwards and forwards in the said working and vital parts of the pump, while by means of the flexible diaphragm, the water containing the tailings, slime or other solid matter, acid, et cetera is retained in that portion of the pump containing the main suction and delivery valves, and circulates in this portion only of the pump.

In existing pumps employed for the purposes specified the liquid pumped is allowed to enter, and circulate through the working portions of the pump, which causes excessive wear in such parts through friction, corrosion, and otherwise.

I preferably provide means for limiting or regulating the movement of the flexible diaphragm in each direction, thereby obviating the transmission of any appreciable strain to said diaphragm. I also preferably provide a supply and relief mechanism by means of which the quantity of clean water circulating in the working parts of the pump and on each side of the piston thereof, is kept constant, so that the effective working of the pump will not be impeded or impaired by any leakage of the fluid through the glands or past the piston.

The invention will now be described in detail by aid of the accompanying drawings, wherein

Figure 1 is a vertical sectional elevation of a diaphragm chamber and flexible vibrating diaphragm, also illustrating a form of supply and relief mechanism. Fig. 2 is a part sectional plan of Fig. 1, on line *x*—*x*.

In applying the invention to an ordinary Cornish or plunger pump, or to a pump in which the suction and delivery valves are detachable from the pump body, and are available for use as the main suction and delivery valves for the circulation of the dirty water, tailings, slimes, et cetera, I insert the diaphragm chamber between the pump barrel and the main valves, and to insure the efficient working of the pump I provide small supplementary suction and delivery valves for each pump barrel, providing also a suitable port or ports for these valves, either on the pump barrel, connecting pipe, or clean water side of the diaphragm chamber.

In the drawings I illustrate a diaphragm chamber, flexible vibrating diaphragm and supply and relief mechanism, suitable for a Cornish or other pump in which the suction and delivery valves are available for use as the main suction and delivery valves.

B^1 is a chamber or vessel of any convenient shape and size. The chamber or vessel B^1 is formed by the upper and lower parts D D^1 which may be bolted or otherwise suitably fastened together round the edges of the central flanges *d* d^1, and between which is secured the rim or edge of the flexible vibrating diaphragm K. The diaphragm can be made of any suitable material such as leather, canvas or other textile fabric of suitable texture, et cetera, or even thin corrugated metal, provided that it will not allow the tailings or other solid matter to pass through it, though it may be of such a nature as to allow water to filter or pass through it

if so desired. The lower part D^1 is shaped to form a flanged coupling or connecting piece or pipe E which connects the portion of the chamber B^1 below the diaphragm K with and between the main suction and delivery valves. The upper part D of the vessel B^1 is also shaped to form a flanged coupling or connecting piece or pipe C^1 which may be connected to an ordinary reciprocating pump having its suction and delivery valves attached thereto in the usual manner; that is to say, the connecting pipe C^1 is attached either to the working barrel or to the valve chambers of the pump in such a manner that it (the pipe C^1) is in direct communication with a space provided above the ordinary suction valve at either end of the pump. These ordinary suction valves and delivery valves, that is to say those which are directly attached to and form an integral portion of the said pump, are so loaded or weighted by springs, weights, or otherwise, that during the ordinary working of the pump the main suction and delivery valves are operated, while the ordinary valves attached to the pump, being weighted, remain closed and inoperative. Further, in the event of the pressure in the working barrel of the pump being increased from any cause, this increase of pressure overcomes the load or increased resistance of the ordinary valves, and thus causes water to be taken in at the pump suction pipe, or forced out at the pump delivery pipe, in the ordinary manner.

In the construction illustrated the central portion of the flexible vibrating diaphragm K is arranged and secured between two disks L L^1 which may be made of metal or other suitable material and be bolted or otherwise suitably fastened together on each side of the diaphragm K in order to render the central portion of the diaphragm stiff and unyielding. Any other equivalent means may be employed provided that this result is attained.

In the upper portion D of the diaphragm chamber B^1 and attached to the disks L L^1 is a guide rod N. This rod N is bolted or otherwise attached to the disks L L^1 at the center, and is arranged vertically thereon.

A tubular guide O is screwed or otherwise fixed in the upper part D immediately above the center of the diaphragm K in which the rod N works, thus guiding the diaphragm K so that it vibrates centrally and uniformly in the chamber B^1. The rod N is provided near its upper extremity with a projection P which slides in a longitudinal slot in the tubular guide O, and is adapted under certain conditions to engage the bifurcated extremities of two levers or arms T and Z pivoted in the upper portion of the chamber B^1.

Q is a valve which closes against the pressure in the pipe C^1 and is operated by the lever T. Should the projection P engage with the arm or lever T the valve Q is raised and allows the clean water in the pipe C^1 to flow away to exhaust. R is a similar valve also closing against the pressure in the pipe C^1 which is operated by the other lever Z. Should the projection P engage the arm or lever Z the valve R is opened, thereby allowing clean water to enter the pipe C^1 through the supply pipe X. These valves Q and R can be kept closed by suitably weighting the levers Z and T or by means of springs, or in any other suitable manner.

The sole function of the diaphragm K is to keep the clean water in the top portion of the chamber B^1 and the water carrying the tailings et cetera, in the bottom of the chamber B^1 or below the diaphragm K, from coming in contact, and so mixing. Thus the clean water is confined to the barrel B and the connections above the diaphragm K, and the water carrying the tailings, slime or other solid matter in suspension, is confined to the lower portion of the chamber B^1 and the connections between the diaphragm K and the main suction and delivery valves.

The operation of the relief valves Q and R may be described as follows:—In the first place the diaphragm K is so arranged that in its ordinary working stroke it vibrates within such limits that the projection P on the rod N moves between the extremities of the two levers T and Z without actually touching them. Should the water in the chamber B^1 above the diaphragm K become diminished, the diaphragm is drawn upwards beyond the limit of its normal upward stroke and the projection P thereupon engages the extremity of the lever Z which opens the valve R and allows clean water to pass into the pipe C^1 from the relief pipe X, and thus supply any deficiency. On the other hand, should there be a surplus of water in the chamber B^1 above the diaphragm K, the diaphragm K is forced below the limit of its normal downward stroke, and the projection P on the rod N engages the extremity of the lever T which operates the valve Q to allow the surplus water to be forced out to waste. The diaphragm is so arranged that it allows the valves Q and R to open fully without becoming taut or strained. Thus no strain is placed on the diaphragm, due to leakage or otherwise of the clean water in any of the parts of the apparatus above said diaphragm, and any deficiency or surplus is thus automatically rectified.

I will here remark that my invention is not restricted to, nor do I limit myself to the particular arrangement of valves or mechanism shown or described. I may use any other alternative arrangement by which the essential results described may be produced. Valves, or other suitable means may be also provided for the purpose of allowing the es-

cape of air from the diaphragm chamber, et cetera, due to starting the apparatus, or forking the main suction and delivery valves during working, if these be found necessary.

What I claim as my invention and desire to protect by Letters Patent is:—

1. In a pump of the nature indicated, a diaphragm chamber interposed between the oscillatory mechanism and the main suction and delivery valves of the pump, a flexible vibrating diaphragm arranged in said chamber, relief valves interposed between said flexible vibrating diaphragm and the oscillatory mechanism of the pump, and means actuated by the flexible diaphragm for operating said relief valves, substantially as described.

2. In a pump of the nature indicated, a diaphragm chamber interposed between the oscillatory mechanism and the main suction and delivery valves of the pump, a flexible vibrating diaphragm arranged in said chamber, a rod fixed to said diaphragm and a guide for said rod fixed inside the chamber, relief valves in said chamber, and levers actuated by the diaphragm through the rod to operate said relief valves, substantially as described.

3. In a pump of the nature indicated, a diaphragm chamber interposed between the oscillatory mechanism and the main suction and delivery valves of the pump, a flexible vibrating diaphragm arranged in said chamber, a disk at either side of said diaphragm and a rod fixed to said disks, said rod formed with a projection or lug, a slotted tubular guide for said rod fixed inside the chamber, relief valves fitted in the chamber and levers pivoted inside the chamber which are adapted to operate the valves when engaged by the projection on the rod, substantially as described and shown.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ALFRED EDWIN DAVIS.

Witnesses:

CHAS. OVENDALE,

R. OVENDALE.