No. 718,132. PATENTED JAN. 13, 1903.

F. LAMPLOUGH.

RECIPROCATING PUMP.

APPLICATION FILED DEC. 14, 1901.

NO MODEL. 2 SHEETS—SHEET 1.

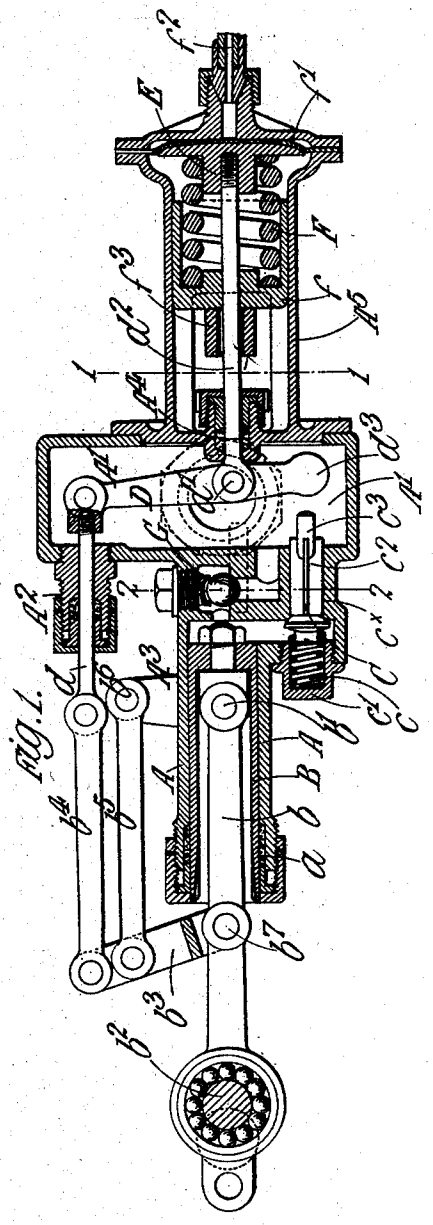


Fig. 1.

WITNESSES

E. A. Allen.

M. E. Lowney.

INVENTOR

FREDERICK. LAMPLOUGH.

BY HIS ATTORNEY

Edward S. Beach.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

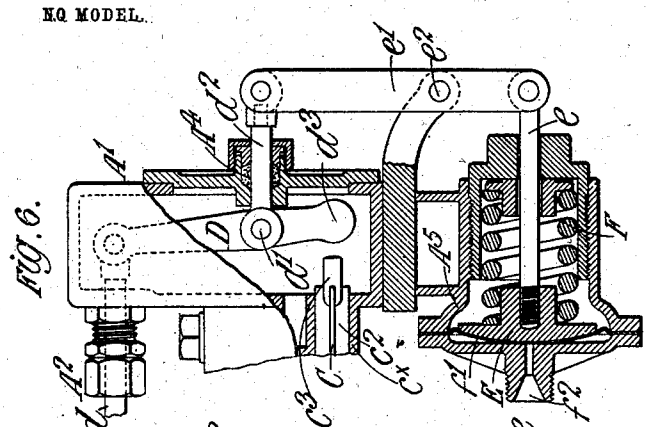
No. 718,132. PATENTED JAN. 13, 1903.

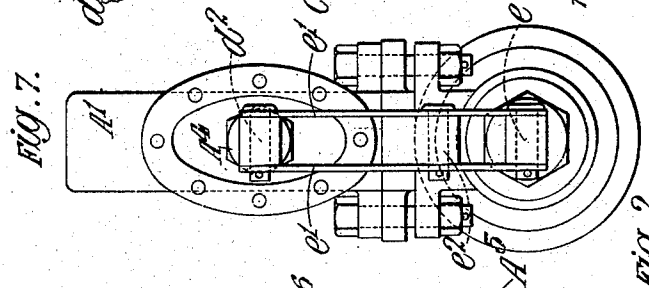
F. LAMPLOUGH.

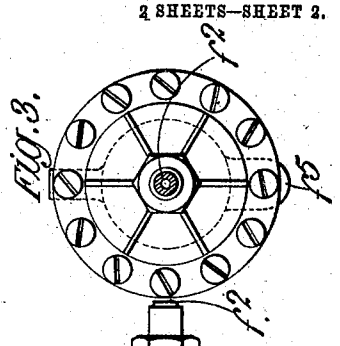
RECIPROCATING PUMP.

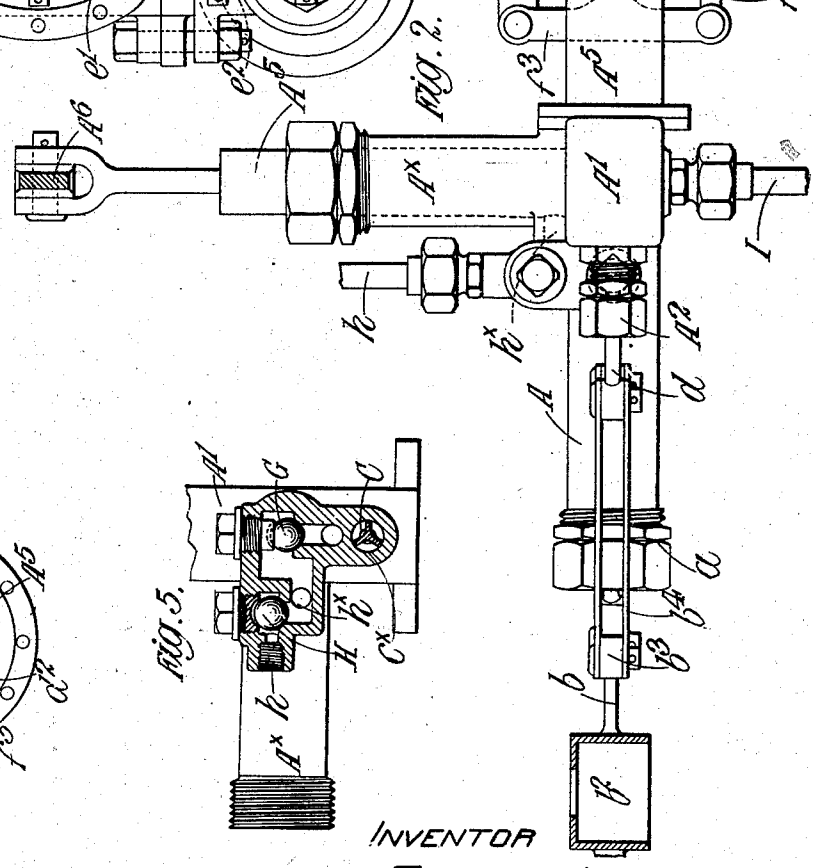
APPLICATION FILED DEC. 14, 1901.

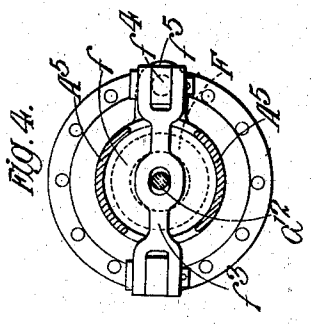
NO MODEL. 2 SHEETS—SHEET 2.











WITNESSES

E. A. Allen.

M. F. Lowney.

INVENTOR

FREDERICK LAMPLOUGH.

BY HIS ATTORNEY Edmund L. Reed

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

FREDERICK LAMPLOUGH, OF WILLESDEN, LONDON, ENGLAND.

RECIPROCATING PUMP.

SPECIFICATION forming part of Letters Patent No. 718,132, dated January 13, 1903.

Application filed December 14, 1901. Serial No. 85,863. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK LAMPLOUGH, engineer, a subject of the King of Great Britain, residing at 6 Scrubbs Lane, Cumberland Park, Willesden, in the county of London, England, have invented certain new and useful Improvements in Reciprocating Pumps, of which the following is a specification.

This invention has reference to reciprocating pumps, and has for its chief object to render them self-controlling in accordance with the variation of pressure that occurs in a vessel arranged in connection therewith. This vessel may be a steam-generator, in which case the variation in the steam-pressure could be utilized for the purpose of controlling the supply of water to the generator by the pump or for the purpose of controlling the supply of liquid fuel by the pump to the burner employed for heating the generator, or the said vessel might serve as a reservoir for the fluid forced into it by the pump, so that when the pressure in such reservoir reached a predetermined degree it would control the working of the pump accordingly. The pump may be of the bucket, plunger, or ram type and may be either single or double acting; but I prefer it to be of the plunger or ram type.

According to my invention the pump-barrel is provided with a by-pass controlled by a relief-valve which is adapted to be opened automatically by means of suitable devices which are under the influence of a flexible diaphragm that is subject to the fluctuating pressure within the aforesaid vessel. For this purpose the plunger or some other appropriate moving part of the pump is connected, through the intervention of suitable mechanism, to one end of a lever having its fulcrum in a sliding piece which is adapted to be shifted against the resistance of a spring by the pressure in the aforesaid vessel acting on said diaphragm. Adjacent to the other or free end of this lever is the relief-valve, which normally remains closed by the action of a spring and lies out of the path of the free end of the lever. When, however, the sliding piece to which said lever is pivoted is shifted by the pressure in the aforesaid vessel rising, the fulcrum of the said lever is brought nearer to the said valve, with the result that it is opened by the lever and permits the fluid in the pump-barrel to be forced back into the suction-chamber through the by-pass instead of being forced through the delivery-valve. As the pressure in the aforesaid vessel falls to the predetermined degree the said spring reacts and returns the sliding piece with the lever to the normal position, with the result that the aforesaid valve closes again and the pump forces the fluid through the delivery-valve.

In order that my said invention may be clearly understood and readily carried into effect, I will describe the same more fully with reference to the accompanying drawings, in which—

Figure 1 is a longitudinal section, Fig. 2 a plan, and Fig. 3 an end view, of a feed-pump constructed in accordance with my invention and intended for supplying water to a steam-generator. Fig. 4 is a transverse section on the line 1 1 of Fig. 1, and Fig. 5 is a transverse section on the line 2 2 of Fig. 1. Fig. 6 is a sectional elevation, and Fig. 7 an end elevation, showing a modification of the invention.

A is the pump-barrel; A′, the suction-chamber forming part thereof; B, the plunger or ram; C, the relief-valve; D, the valve-actuating lever; E, the sliding piece, and F its spring.

Referring more particularly to Figs. 1 to 5, the aforesaid pump-barrel A is furnished with a stuffing-box a, through which the ram B works in its reciprocating movement. The said ram is provided with a connecting-rod b, hinged thereto at b', its free end being connected to the crank-shaft of any suitable form of motor or engine by means of the roller-bearing b^2. Pivotally connected with the said rod b is an arm b^3, the free end of which is coupled by a double link b^4 to a rod d, adapted to slide in a stuffing-box A^2 on the suction-chamber A′. The said arm b^3 is also, by means of a double link b^5, connected at a point b^6 with a fixed bracket A^3 on the pump-barrel A. During the reciprocations of the ram B the arm b^3 oscillates about the point b^7 and imparts rectilinear reciprocating movement to the said rod d. The inner end of this rod is coupled to the valve-actuating lever D, which is located in a vertical position within the suction-chamber A′ and is pivotally connected at d' to a rod d^2, which works

in a stuffing-box A^4 and is connected with the sliding piece E. This sliding piece is in the form of a flanged head, upon one side of which bears the spring F, contained in a cap or casing f. At the other side of said head is a flexible diaphragm f', which is acted upon by the pressure of the steam or other fluid passing to it through a passage f^2. The spring-casing f is contained within an extension A^5, with which the suction-chamber A′ is provided. The said spring-casing is maintained in place by means of a hinged arm f^3, extending transversely across and bearing against the end of said casing. This arm f^3 is hinged to a screw f^4, that passes through a lug f^5 on said extension A^5 and receives at its extremity a screw-nut f^6. By turning this nut in one or other direction the position of said hinged arm f^3 can be adjusted so as to approach toward or recede from the casing f, and thereby cause the spring it contains to be placed under more or less pressure, whereby said spring will exert more or less resistance to the movement of the said sliding piece or head under the influence of the steam or other pressure acting thereon through the diaphragm. The said relief-valve C is located near the lower part of the suction-chamber in the by-pass $c^\times$, leading from the pump-barrel to the suction-chamber, and is normally kept closed by a spring c, inclosed in a detachable plug c'. The said valve has guiding-wings c^2 and is furnished with a prolongation c^3, which lies opposite the free end d^3 of the said lever D. When the parts are in the position represented in Fig. 1, the fulcrum d' of this lever D is situated too far away from the prolongation c^3 of the relief valve to enable the free end of the said lever to strike the latter, and consequently the valve remains closed by its spring. If, however, the sliding piece and its rod d^2 are shifted toward the left by the steam or other pressure acting on the diaphragm f', then the fulcrum of the lever D will be brought nearer to the said prolongation of the relief-valve, with the result that said valve will be opened by the free end of the lever and a portion of the liquid in the pump-barrel be allowed to pass back into the suction-chamber during a portion of the inward stroke of the pump-ram. A diminished quantity of liquid will therefore be delivered by the pump. The duration of time that the said valve C remains open, and therefore the quantity of liquid delivered by the pump during the stroke of the ram, will depend upon the position of the fulcrum d', or, in other words, upon the degree of pressure acting upon the diaphragm and the sliding piece. So long as the said relief-valve remains closed the ram will draw liquid from the suction-chamber into the pump-barrel past the valve G and will discharge liquid from the pump-barrel past the valve H through the delivery-outlet h, Fig. 5. The inlet to the pump is through the pipe I. The said suction-chamber A′ is preferably provided with a second pump-barrel $A^\times$ to receive a ram $A^{\times\times}$, that can be actuated by hand through the intervention of a lever A^6 when the apparatus is to be worked independently of the ram B, in which case the liquid is forced from the suction-chamber A′ through the passage $h^\times$ and past the delivery-valve H into the pipe h.

By this construction of feed-pump it will be possible to accurately regulate the amount of feed-water entering the steam-generator in proportion to the amount of steam withdrawn from the generator for working the motor or engine, thereby insuring a perfect balance or ratio between the feed-water forced into the generator and the pressure of steam therein.

In the modified form of the apparatus illustrated by Figs. 6 and 7 the said sliding piece E, spring F, and diaphragm f' are located immediately below the suction-chamber A′, and the rod d^2, to which the valve-actuating lever D is fulcrumed, is coupled to the rod e of the sliding piece by means of a double link e', pivoted at e^2. This arrangement permits of the apparatus occupying much less space lengthwise than in the arrangement illustrated in the preceding figures of the drawings.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a pump, the combination with the pump-barrel, a ram adapted to reciprocate therein with uniform strokes, and inlet and delivery valves; of a relief-valve, of a by-pass from the pump-barrel controlled by said relief-valve, and of means for varying the period of lift of the relief-valve in relation to the stroke, and thereby gradually and automatically diminishing the supply of water as a predetermined pressure is reached.

2. In a pump, the combination with the pump-barrel, a ram adapted to reciprocate therein with uniform strokes, and inlet and delivery valves; of a relief-valve, of a by-pass from the pump-barrel controlled by said relief-valve, of a flexible diaphragm subject on one side to the fluctuating pressure of a fluid, and of an oscillatory lever for actuating said relief-valve to a greater or less extent in accordance with the extent to which the said diaphragm is shifted, substantially as and for the purpose specified.

3. In a pump, the combination with the pump-barrel, a ram adapted to reciprocate therein with uniform strokes, and inlet and delivery valves; of a relief-valve, of a by-pass from the pump-barrel controlled by said relief-valve; of a flexible diaphragm subject on one side to the fluctuating pressure of a fluid, of a lever adapted to actuate said relief-valve, of a movable piece carrying the fulcrum of said lever and located on the opposite side of said diaphragm in a position to be actuated thereby, and of means for operating said lever from the pump-ram, substantially as and for the purpose specified.

4. In a pump, the combination with the pump-barrel, a ram adapted to reciprocate

therein with uniform strokes, and inlet and delivery valves; of a relief-valve, of a by-pass from said pump-barrel controlled by said relief-valve, of a flexible diaphragm subject on one side to the fluctuating pressure of a fluid, of a lever situated within the suction-chamber of the pump and of a sliding piece carrying the fulcrum of said lever and located on the opposite side of said diaphragm to that on which the pressure acts and in a position to be actuated by said diaphragm, of a prolongation on the relief-valve lying in the path of the free end of said lever, and of lever mechanism coupling the connecting-rod of the pump-ram with said lever for rocking the latter about its fulcrum, substantially as and for the purpose specified.

5. In a pump, the combination with the pump-barrel, the uniformly-reciprocating ram, the inlet and delivery valves, the relief-valve, the flexible diaphragm, the sliding piece and means for transmitting the movements of the sliding piece to the relief-valve; of a spring for resisting the movement of the sliding piece, of a casing inclosing said spring, of a pivoted transverse arm adapted to bear against said casing, of a hinged screw on the free end of said pivoted transverse arm, of a lug on the framing of the pump with which said screw engages, and of a nut on said screw for adjusting the position of the pivoted transverse arm relatively to the spring-casing substantially as and for the purpose specified.

6. In a pump, the combination with the pump-barrel, the uniformly-reciprocating ram, the inlet and delivery valves, the diaphragm, the sliding piece and its spring, and the relief-valve and the by-pass from the pump-barrel to the suction-chamber of the pump; of an oscillatory lever located in the said suction-chamber so that its free end is capable of actuating said relief-valve, of a rod extending from said sliding piece into said suction-chamber and receiving the fulcrum of the lever, of a stuffing-box on said suction-chamber through which said rod works, of a sliding rod connected with the upper end of said lever, of a stuffing-box on said suction-chamber for the sliding rod to work in, of a link connecting said sliding rod with an arm hinged to the connecting-rod of the pump-ram, and of a link connecting said hinged arm at a point intermediate of its ends to a fixed point on the pump-framing, substantially as and for the purpose specified.

In testimony whereof I have hereunto set my hand, in presence of two subscribing witnesses, this 21st day of November, 1901.

FREDERICK LAMPLOUGH.

Witnesses:
THOS. P. WARDLE,
WALTER J. SKERTEN.