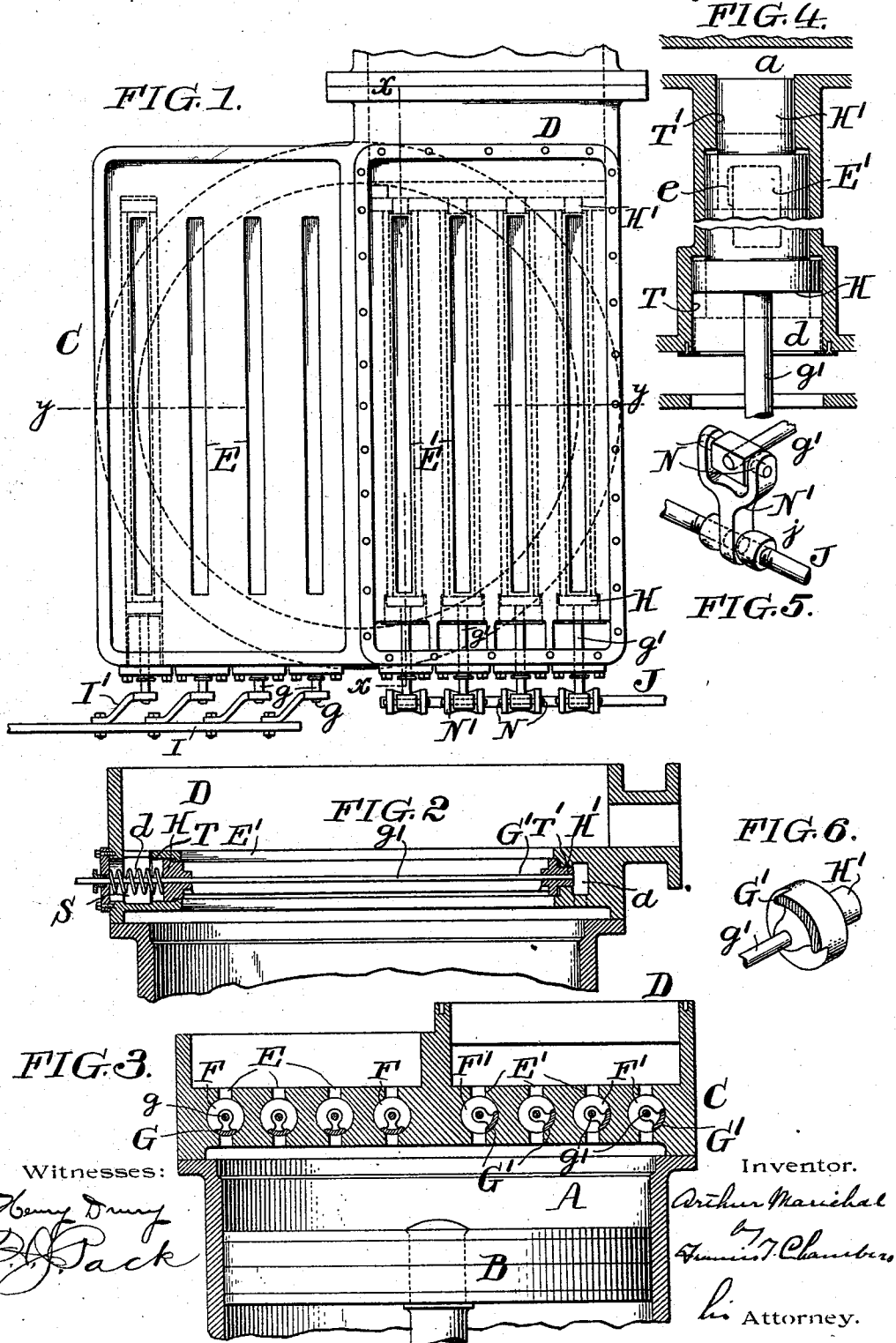


A. MARICHAL.
PUMP.

No. 538,877.

Patented May 7, 1895.



(No Model.)

2 Sheets—Sheet 2.

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FIG. 7.

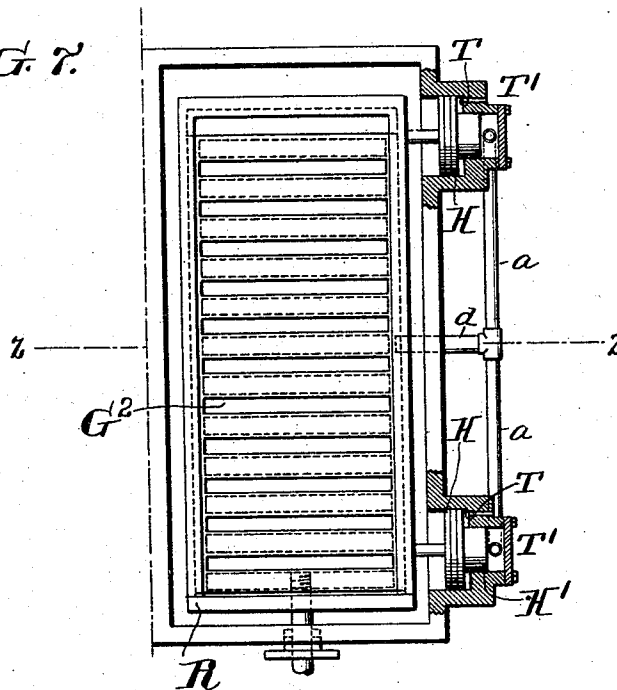
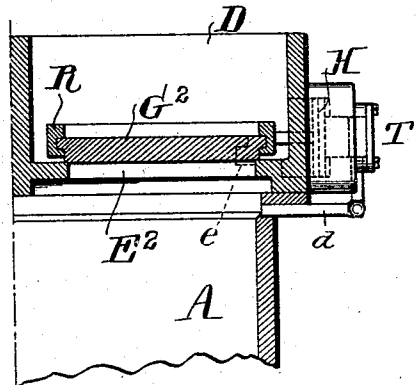


FIG. 8.



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PUMP.

SPECIFICATION forming part of Letters Patent No. 538,877, dated May 7, 1895.

Application filed January 14, 1895. Serial No. 534,787. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR MARICHAL, a subject of the King of Belgium, residing at 135 Rue Verte, Brussels, Belgium, have invented a certain new and useful Improvement in Pumps, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to pumps, and has for its object to prevent the danger of blowing out of cylinder heads in water pumps, or the loss of power in pumps for compressing air or other gas which results when the valves which permit the egress of fluid from the pump cylinder to a suitable receiver are not opened at the proper moment.

To effect this my invention consists in so arranging the valve relatively to the part which is between the cylinder and receiver that it can have, not only a transverse motion across said port preferably given it by some positively acting mechanism, but also a longitudinal motion along the port, and so that when moved longitudinally in one direction that the end of the port will be uncovered, permitting a free escape of the fluid pumped. This longitudinal motion I preferably give the valves by the pressure of fluid in the cylinder, so that when such pressure reaches a certain height the port will be uncovered by the longitudinal motion of the valve, and I preferably oppose the cylinder pressure by receiver pressure, so that the valve will be opened by the excess of pressures in the cylinder over that in the receiver, the valve in this case being opened when the pressure in the cylinder exceeds that in the receiver by some predetermined amount.

My invention will be best understood as explained in connection with the accompanying drawings, in which—

Figure 1 is an end view of a pump-cylinder, showing the outlet valve provided with my improvements. Fig. 2 is a section on the line xx of Fig. 1. Fig. 3 is a section on the line yy of Fig. 1. Fig. 4 is an enlarged broken view of one of the valves shown in Fig. 3, illustrating the manner in which the end of the port is uncovered. Fig. 5 is a detail showing

the adjustable connections for the valve. Fig. 6 is a section showing the piston connected to one end of the valve. Fig. 7 is a plan view of the outlet-valve, showing my invention applied to an ordinary slide-valve; and Fig. 8 is a section on the line zz of Fig. 7.

A is a cylinder and B a piston operating therein. E, (Figs. 1 and 3) are inlet ports, shown provided with seats F for an oscillating rotary valve. G G are inlet valves arranged in the seats F. g are the valve stems, and I is an operative rod for the inlet valves connected to each valve stem by means of cranks I'.

In the figures on Sheet 1, I have illustrated substantially the same general construction as applied to the outlet valves, E' being ports which are arranged between the cylinder C and the receiver D. F' are cylindrical valve seats and G' are rotary valves for governing the ports E'.

In order to give the longitudinal movement to the outlet valves I secure to each a piston to which fluid pressure can be admitted, and, I prefer, as shown, to employ a differential piston to one face of which the cylinder pressure is admitted, and to the other face of which the receiver pressure is admitted. A convenient mode of arranging this piston is illustrated in the drawings where two piston heads H H' of different areas are arranged, one on each end of the cylindrical valves G', and each fitting in cylindrical extensions T and T' of the valve seats E'. A passage a leads from the cylinder A to one end of the cylinder T' and a passage d leads to the other cylinder T from the receiver.

A very similar arrangement is shown in Figs. 7 and 8, where my improvement is shown applied to a slide valve. E², E², are the outlet ports leading from the cylinder to the receiver. G² is a slide valve, shown as a grid valve, which opens and closes these ports as usual by a transverse motion across them. I also provide means for giving the valve a longitudinal movement. As shown, the valve G² operates in a frame R. The differential piston H H' is connected to this frame and serves to move it, and the valve is guided thereby longitudinally relatively to the ports, the passages d , and a leading, as has been explained,

from the receiver and cylinder respectively to cylinders T and T'.

Instead of moving the valves by the difference in the pressures existing in the cylinder and receiver, as is done when a differential piston is used, I may in some cases oppose the force of the cylinder pressure by some constant force, as that of a spring, so that the valve will always uncover the end of its port when the pressure in the cylinder exceeds a certain determined pressure. This arrangement is illustrated in Fig. 2, where the spring S may be arranged, as shown, to oppose the force of the fluid pressure exerted against the piston H'. In this case of course the passage d would be dispensed with.

In operating the valves E' it is necessary to arrange a compensating connection between the valve stems g' and their operating rod. Such a connection is shown in Figs. 1 and 5, where the valve stem is shown pivoted at N to a link N' which is held between cone bearings j on the rod J, thus enabling the rod J to oscillate the valves irrespective of their longitudinal position.

In operation, if the pressure in the cylinder exceeds the predetermined pressure, or if the pressure in the cylinder exceeds that in the receiver, and if the valves are not opened, or are not opened promptly enough by the rod J or other operative means, the pressure against the piston H' will move the valve longitudinally to the position shown in Fig. 4, in dotted lines, uncovering the end of the port E', the uncovered portion being indicated by e. When the pressures are equalized in the cylinder and receiver, the receiver pressure acting on the piston H, preferably made somewhat larger than the piston H', will move the valve to its original position over the end of the port. If a spring is used at S the same result is effected when the pressure falls to the desired limit.

It will, of course, be evident that the same construction can be applied to the inlet valves, if desired, and in this case these valves would be operated to uncover the ends of their seats if the pressure in the cylinder fell below that of the atmosphere.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination in a pump with a cylinder and a piston moving therein, of a receiver for fluid forced out from the cylinder, a port or ports between the cylinder and receiver, a valve or valves adapted to open and close said port or ports by a motion in one direction across them, said valves also being capable of a longitudinal motion lengthwise of said port or ports and adapted, when moved lengthwise in one direction, to uncover one end thereof, and means for giving the valve or valves these two motions.

2. The combination in a pump with a cylinder and a piston moving therein, of a receiver for fluid forced out from the cylinder, a port

or ports between the cylinder and receiver, a valve or valves adapted to open and close said port or ports by a motion in one direction across them, said valves also being capable of a longitudinal motion lengthwise of said port or ports and adapted, when moved lengthwise in one direction, to uncover one end thereof, positively acting means for giving the valves their transverse motion across the seats, and means governed by the pressure in the cylinder for operating the valve or valves longitudinally and uncovering the ends of the ports.

3. The combination in a pump with a cylinder and a piston moving therein, of a receiver for fluid forced out from the cylinder, a port or ports between the cylinder and receiver, a valve or valves adapted to open and close said port or ports by a motion in one direction across them, said valves also being capable of a longitudinal motion lengthwise of said port or ports and adapted, when moved lengthwise in one direction, to uncover one end thereof, positively acting means for giving the valves their transverse motion across the seats, and means governed by the difference in the pressures in the cylinder and receiver for operating the valve or valves longitudinally and uncovering the ends of the ports.

4. The combination in a pump with a cylinder and a piston moving therein, of a receiver for fluid forced out from the cylinder, a port or ports between the cylinder and receiver, a valve or valves adapted to open and close said port or ports by a motion in one direction across them, said valves also being capable of a longitudinal motion lengthwise of said port or ports and adapted, when moved lengthwise in one direction, to uncover one end thereof, a differential piston connected to said valve or valves and adapted, when operated, to give it or them the longitudinal motion described, a passage for conducting fluid pressure from the receiver to one face of said piston and a passage for conducting pressure from the cylinder to the other face of the piston all substantially as and for the purpose specified.

5. In a pump the combination of a cylinder and piston working therein with a receiver for fluid forced out from the pump, one or more ports between the receiver and cylinder and having seats for rotary cylindrical valves, a conduit leading from the cylinder to one end of the valve seat, a conduit leading from the receiver to the other end of the valve seat, a cylindrical valve normally oscillating in the valve seat to open and close the port but capable of longitudinal movement in its seat, the valve and seat being so arranged that such longitudinal movement of the valve will also partly open the port and piston extensions of the valve arranged at each end to fit in the cylindrical extremities of the seat, said pistons being of different areas as and for the purpose specified.

6. The combination in a pump with a cylinder and piston moving therein, of a reservoir into which the fluid is forced from the cylinder, a port or ports between the cylinder and receiver having seats for cylindrical valves, means for giving these valves a longitudinal motion along their seats to the end of the ports as described, stems as g' , means, as the rods J, for oscillating these stems and the valves connected therewith, and a compensating connection between the rod J and the valve stems whereby the longitudinal position of the valves will not affect their transverse motion.

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Witnesses:

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