

No. 726,841.

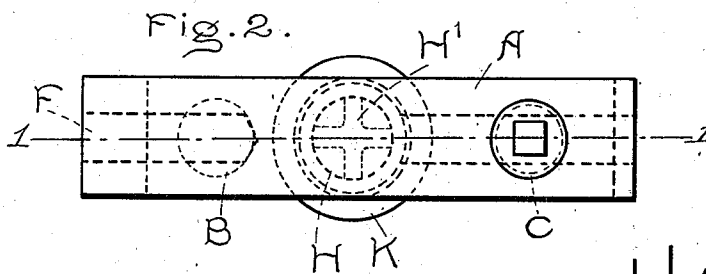
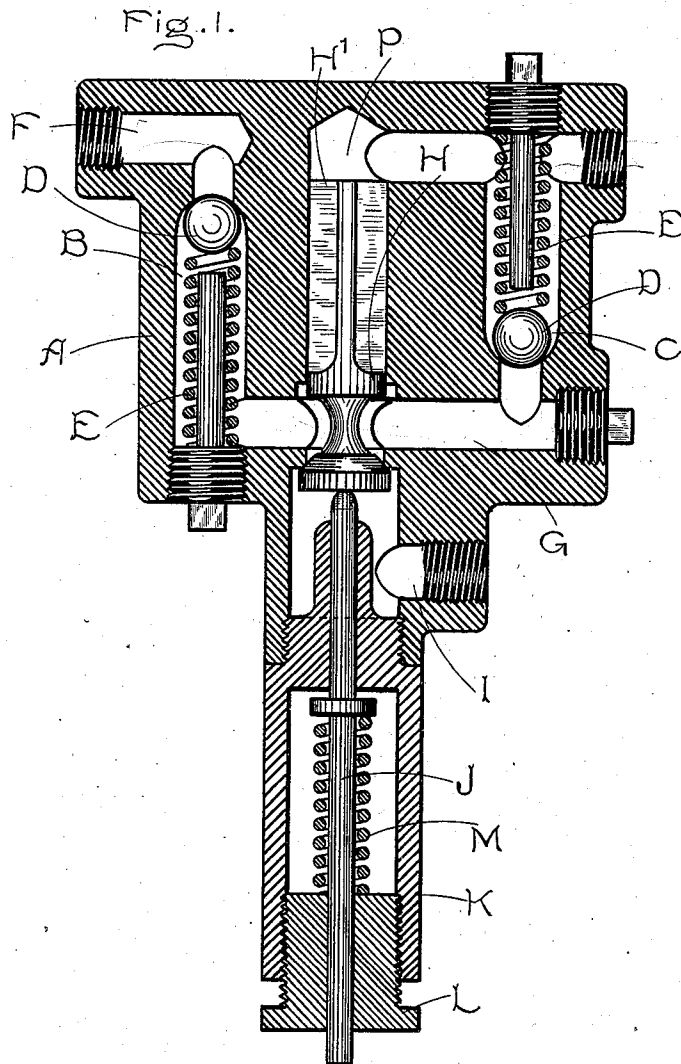
PATENTED MAY 5, 1903.

A. A. BALL, JR.
PUMP REGULATOR.

APPLICATION FILED JAN. 24, 1901.

NO MODEL.

2 SHEETS—SHEET 1.



WITNESSES.

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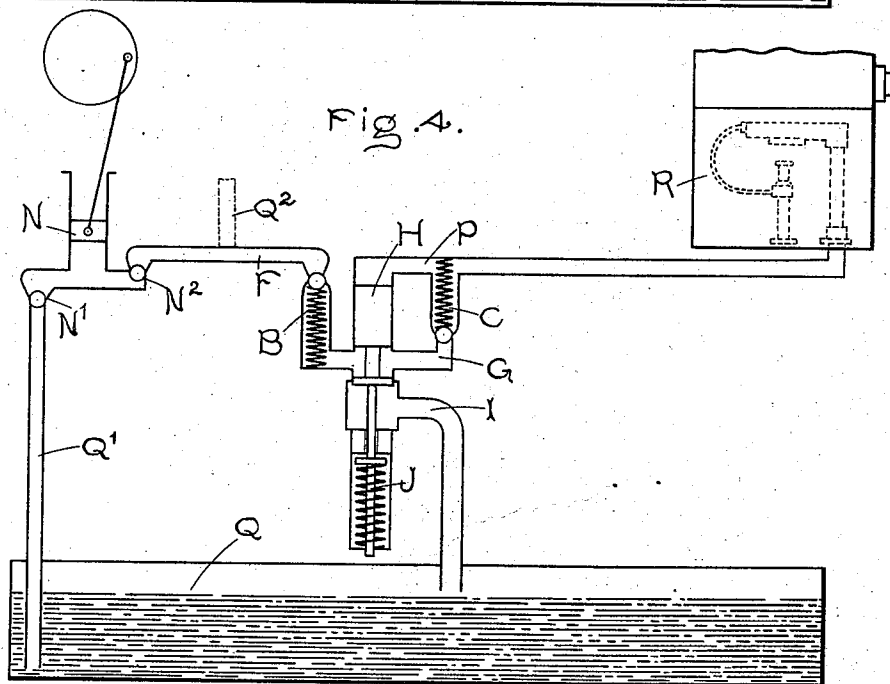
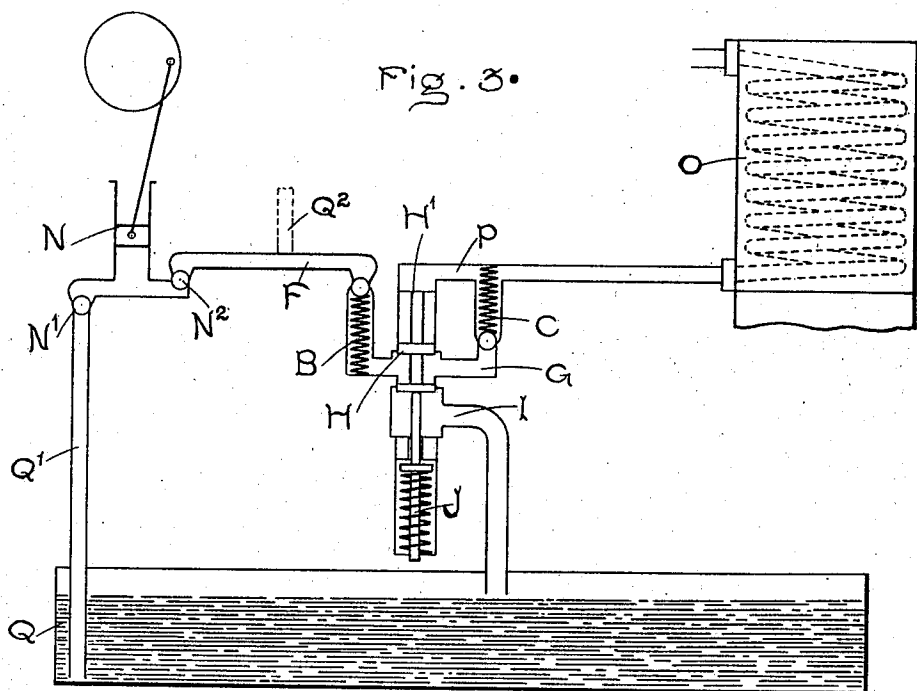
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2 SHEETS—SHEET 2.



WITNESSES:

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UNITED STATES PATENT OFFICE.

AUGUSTUS A. BALL, JR., OF LYNN, MASSACHUSETTS.

PUMP-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 726,841, dated May 5, 1903.

Application filed January 24, 1901. Serial No. 44,536. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS A. BALL, Jr., a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Pump-Regulators, of which the following is a specification.

In certain classes of work it frequently becomes necessary to maintain a definite head or pressure in a tank or other receptacle from which fluid is being drawn, either in definite or varied amounts. This is commonly done by providing a pump capable of supplying the demand at all times and locating in the pipe connecting the pump with the tank or other receptacle an adjustable relief-valve, which is so arranged that when the predetermined head or pressure is maintained it will open and permit the excess fluid to return to the source of supply or otherwise be taken care of. In certain other instances the tank or receptacle is arranged with an overflow. It is obvious that with either of the systems referred to the pump is compelled to do a maximum amount of work at all times. In other words, no relief is provided for the pump, whatever the amount or pressure of the fluid in the tank may be. Such systems are satisfactory in some instances—as, for example, where the consumption of energy required to drive the pump is of secondary consideration; but where the question of economy has to be especially considered quite a different problem is presented.

The object of my invention is to provide a pumping system wherein the pump and regulator are so related or connected that when the requisite head or pressure is attained in the tank or other receptacle the pump is automatically relieved of its load, although allowed to continue its movements as before, but without doing any useful work. In other words, the pump is entirely under automatic control after it has once been started, and when the maximum pressure in the receiving apparatus has been attained the pump will run idle, or virtually so, as will be more fully described hereinafter.

In the accompanying drawings, which illustrate an embodiment of my invention, Figure 1 is a vertical section of a pressure-regulator taken on line 1 1 of Fig. 2. Fig. 2 is a plan

view of the regulator. Fig. 3 is a diagram illustrating its operation, and Fig. 4 is a diagrammatic view of a slight modification.

In the drawings, A represents the base or casing and may be of any desired configuration, the one shown having been found to be very satisfactory. Mounted within the base are two check-valves B and C, the former controlling the inlet and the latter the outlet passage of the regulator. These valves are simple in construction, each consisting of a cylindrical opening having a restricted end in which is mounted a ball D, the latter being pressed against the restricted end or seat by a coiled extension-spring E. The end of each opening is screw-threaded, and mounted therein is a plug, which has a pin acting as a guide for the spring.

Referring to check-valve C, the opening on one side of the ball communicates with the pipe leading to the tank or other apparatus designed to receive fluid from the pump. In addition to this it communicates with the passage P. I may dispense with check-valve B, if desired, without interfering with the operation of my improved regulator, although it is useful in certain instances—as, for example, where the supply of fluid to the inlet-passage F is delivered by two or more pumps or other sources of supply, which may or may not work in unison or be of the same capacity.

In addition to the valves mentioned there is a third or by-pass valve H, which controls the passage of fluid to the conduit I, the latter being connected with the pipe for returning the excess fluid to any desired point. The plug for the by-pass or relief valve is provided with a double piston-like head, the areas of the heads being the same, or virtually so, in order that there shall be no, or virtually no, tendency to open. The lower head is provided with a conical surface which engages with a similar surface formed on the base or casting A. The upper head is cylindrical and makes a working fit with the openings in which it is located. By this arrangement the fluid which flows in the passage G has no, or practically no, effect thereon. The upper end of the plug is formed with wings or ribs H', and these act as guides therefor, while the spaces between the ribs form pas-

sages to enable the fluid to pass from the passages P and G to the conduit I, as will be more fully described. The valve is normally weighted or held closed by means of the adjustable spring-pressed plunger or rod J, the latter being mounted in bearings or guides in the detachable piece K. The upper end of the piece or holder K is screw-threaded, by means of which it is attached to the base.

The lower end is provided with a screw-threaded plug L, which acts as a guide for the rod, and between the plug and a fixed abutment on the rod J is a compression-spring M. By changing the position of the plug the pressure necessary to open the by-pass valve can be varied at will. When the back pressure in the passage P, or, in other words, the pressure in the tank or receptacle, exceeds a predetermined amount, the valve H opens and allows the fluid to escape through the conduit I. It will readily be seen that the opening of this valve can only be accomplished when the back pressure in the outlet-passage exceeds the pressure exerted by the spring M.

Referring to Fig. 3, I have illustrated in diagram my improved regulator in connection with a pump N, which is constantly driven by any suitable means and is capable at all times of supplying an excess of fluid at predetermined pressure. N' and N² are respectively inlet and outlet valves for the pump. O represents a receptacle into which fluid is pumped. In the present instance I have shown my invention in connection with a boiler of the flash type, since it has been found to have great utility in connection therewith; but I do not desire to be understood as limiting myself to this, for the apparatus is well adapted for other uses—such, for example, as operating hydraulic rams or actuating the valves of engines. In the class of work for which the regulator has been used it has been found to operate satisfactorily at from one hundred to five hundred pounds pressure; but of course it can be used on higher or lower pressures to suit the particular installation. Q represents the fluid-supply tank, and extending into the tank is a pipe Q', that is connected to the pump. Q² illustrates in dotted lines a pipe extending from any suitable source of fluid-supply to the regulator. It may or may not have a pump for furnishing the necessary pressure.

Assuming that the system of Fig. 3 is in operation and that the by-pass valve H is set at two hundred and fifty pounds pressure, the pump on being started into operation will force fluid past the check-valves B and C into the receiver or boiler O, the valves preventing the return of the fluid. When the pressure in the receptacle O exceeds the predetermined point, which point in the present instance is two hundred and fifty pounds, the by-pass valve H will be forced downward, and the fluid from the pump instead of being forced into the receptacle O against a head more or less great flows freely back to

the supply-tank Q. It will thus be seen that the pump is relieved of practically all its work, the exception being the effort required to overcome the friction of the moving parts and also of the passage of fluid through the local pipe-circuit.

The device as shown also provides a safety arrangement.

Referring to Fig. 1, it will be seen that the upper piston-valve head is cylindrical, while the lower one is conical. When the plug moves downward the least possible amount, it will open the valve having the conical seat; but the cylindrical valve will not open until the back pressure has still further increased, which increase may be due to expansion of the fluid in the receptacle O or to other causes. When this back pressure increases to a certain amount, the cylindrical valve will open and fluid from the passage P will flow into the conduit I and mingle with that from the pump. A decrease in back pressure—or, in other words, pressure on the receptacle side of the regulator—will permit the spring-pressed rod J to close the cylindrical valve, leaving the conical valve open, while a further decrease will permit the conical valve to close also, and the pump will again resume its work.

In Fig. 4 is shown diagrammatically a modification of the invention, wherein the essential difference lies in the omission of the safety-valve. This change is accomplished by making the upper end of the piston cylindrical instead of providing it with webs or ribs H', as in the previous figures. A second difference—of minor importance, however—lies in the fact that the apparatus is used in connection with a vapor-burner R, the latter being of any desired construction. In cases of this kind there is generally no need for the safety-valve feature, and so it has been omitted; but it can be used if found desirable.

With the parts as shown the pump would supply fluid directly to the burner; but as soon as the back pressure—or, in other words, pressure on the burner side of the regulator—exceeded a certain amount the piston-valve H would move downward, permitting the fluid or a certain amount of it to return to the tank. The load on the pump in this case, as well as in the one previously described, would be dependent upon the position of the valve H.

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

1. In combination, a casing containing a fluid-passage, a fluid-receptacle, a piston acted upon by the fluid-pressure of the receptacle, a weighted relief-valve which is normally held closed, a check-valve located beyond the relief-valve for preventing the return of fluid from the receptacle, and a connection between the piston and the relief-valve for opening the latter when the pressure in the receptacle exceeds a certain point.

2. In combination, a fluid-receptacle, a cas-

ing having a passage through which the fluid normally flows, a relief-passage, a weighted valve governing the relief-passage, a piston for actuating the valve against its weight
5 when the pressure in the receptacle increases beyond a certain point, and a second or safety valve also controlled by the piston, which opens under a predetermined pressure and permits the discharge of fluid from the receptacle, the safety-valve being so arranged that
10 it opens after and closes before the relief-valve.

3. In combination, a constantly-driven pump, a fluid-receptacle directly connected
15 therewith, a regulator in the connection between the pump and the receptacle, comprising a base, a check-valve, a by-pass valve which is subjected to the backwater pressure of the receptacle, but is unaffected by the
20 pump pressure, and means for opposing the back pressure and closing the valve.

4. In combination, a pump, a fluid-receptacle connected to the pump, a regulator between the pump and the receptacle containing
25 a by-pass valve, which valve is composed of a piston-like structure having two heads, one of which is conical and the other cylindrical, and so arranged that the conical valve will open first, a passage connecting the receptacle with one end of the piston-valve so
30 that the latter is always subjected to the pressure of the fluid in the receptacle, and means for opposing said pressure.

5. In combination, a constantly-driven

pump capable of delivering an excess of fluid
35 at all times, a receptacle for the fluid, a combined regulator and safety device having a valve which is acted upon at all times by the back pressure from the receptacle, and a second valve mechanically connected with the
40 first and controlling a relief-passage which is arranged to open when the back pressure increases above a certain point.

6. In a regulator, the combination of a base or support, a check-valve comprising a spring-
45 pressed ball-valve mounted therein, a balanced piston-valve acted upon by the back pressure, a detachable holder, a spring-pressed rod mounted in the holder and arranged to exert its force against the piston-valve, and
50 a screw-threaded plug which acts as a guide for the rod.

7. The combination of a receptacle, a pump for delivering fluid under pressure to the receptacle, a by-pass connection around the
55 pump, a valve in said connection, with a regulator comprising inlet and outlet valves, and a piston which opens the valve in the by-pass connection and is itself acted upon by the pressure of the fluid in the receptacle, whereby
60 the pump is relieved of its load when the pressure exceeds a predetermined amount.

In witness whereof I have hereunto set my hand this 21st day of January, 1901.

AUGUSTUS A. BALL, JR.

Witnesses:

DUGALD MCK. MCKILLOP,
ROBERT SHAND.