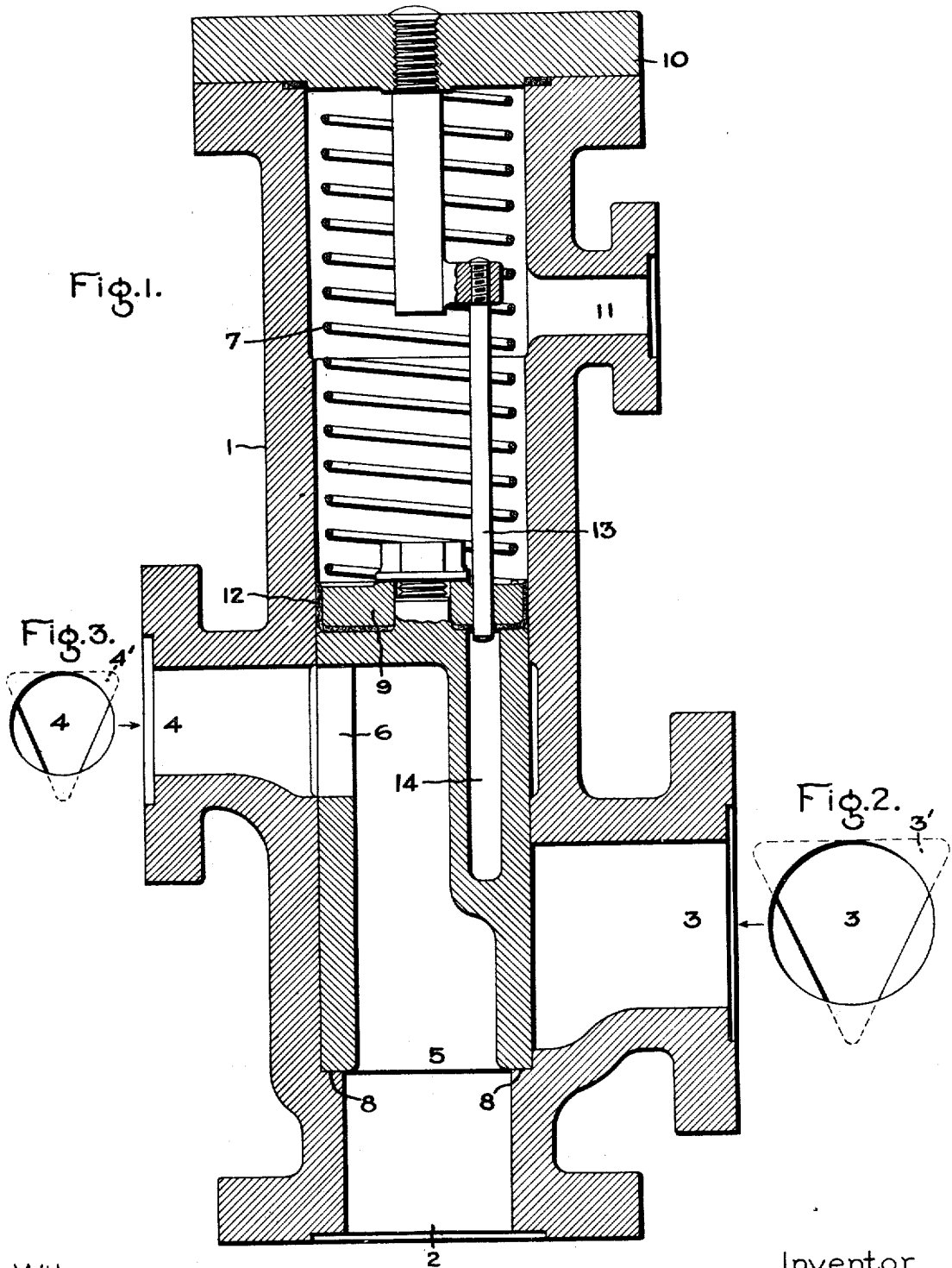


E. TAYLOR.
PUMP UNLOADING VALVE.
APPLICATION FILED JAN. 8, 1914.

1,128,077.

Patented Feb. 9, 1915.



Witnesses
Marcus J. Youmans
J. Ellis Elen.

Inventor
Edward Taylor
by *Alfred S. Davis*
His Attorney

UNITED STATES PATENT OFFICE.

EDWARD TAYLOR, OF CHICAGO, ILLINOIS.

PUMP-UNLOADING VALVE.

1,128,077.

Specification of Letters Patent.

Patented Feb. 9, 1915.

Application filed January 9, 1914. Serial No. 811,127.

To all whom it may concern:

Be it known that I, EDWARD TAYLOR, a subject of the King of Great Britain, residing at Chicago, county of Cook, State of Illinois, have invented certain new and useful Improvements in Pump-Unloading Valves, of which the following is a specification.

My invention relates to pump unloading valves.

It is well known that it is often difficult to start a pump, such as a hydraulic pump, when it is operating against a high head, as this requires that the motor driving the pump must start under full load conditions.

My invention has for its object to overcome this difficulty by unloading the pump while it is starting and then gradually applying the load, and consists in a novel construction of valve in which a discharge opening and a relief opening smaller than the discharge opening are provided, the relief opening being gradually closed while the discharge opening is being simultaneously gradually opened.

Other features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the following description taken in connection with the accompanying drawing, in which—

Figure 1 is a sectional view of an unloading valve constructed in accordance with my invention; Fig. 2 is a view of the discharge opening looking in the direction of the arrow, and Fig. 3 is a view of the relief opening looking in the direction of the arrow.

Referring to the drawing, 1 is a casing of a pump unloading valve provided with an inlet opening 2, a discharge opening 3 and a relief opening 4, the relief opening being of smaller area than the discharge opening for a reason that will be pointed out hereinafter. A valve member 5 is arranged in the casing so that it will gradually close the relief opening and simultaneously gradually open the discharge opening. This valve member is preferably a hollow plug pro-

vided with an opening 6 which registers with the relief opening when the discharge opening is closed. In order to return the valve member 5 to the position in which the discharge opening is closed, I preferably employ a spring member 7. As shown in Figs. 2 and 3, the discharge and relief ports 3' and 4' are triangular in shape, the apex of the triangular shaped relief port being covered as the apex of the triangular shaped discharge port is opened by the valve member 5. The inlet opening 2 of the valve is suitably connected up to a fluid pump, not shown, the discharge opening 3 is connected up to a discharge pipe which may lead to a suitable reservoir and the relief opening may be connected up to the suction pipe of the pump or to the supply of fluid.

The movement of the valve member 5 is limited in one direction by shoulders 8 in the casing 1 and in the other direction by the spring member 7. The spring member is mounted in the chamber of the casing formed by the head 9 of the valve member and the cover 10 of the casing. This chamber may communicate with the discharge pipe by means of an opening 11. The head of the valve member may be provided with suitable packing 12. The valve member is shown as being guided in its movement by a rod 13 which enters a hole 14 in the valve member.

The operation of my pump unloading valve is as follows: Assume that the pump has stopped and therefore that the pressure on the inlet side of the valve member 5 has been reduced practically to zero, then the member 5 will be in the position shown in the drawing, in which the discharge opening 3 is closed and the opening 6 in the valve registers with the relief opening 4. The valve member 5 is retained in this position by the spring member 7, or if the opening 11 of the spring chamber is connected to the discharge end of the valve, the valve member is retained in this position by the pressure of the spring member 7 plus the pressure in the discharge pipe. As the inlet opening is now directly connected to the relief opening, any pressure existing on

the inlet side of the valve member is relieved by the fluid escaping through the relief opening as the pump starts and the pressure on the inlet side of the valve member will remain at a low value. As the pump accelerates, the pressure will increase and since the relief opening is restricted in area, it will not be large enough to properly carry off all the fluid pumped, this causes a pressure to be exerted on the valve member. As soon as this pressure exceeds the pressure on the head 9 of the valve member it will move so as to open the discharge opening and simultaneously close the relief opening. Since the discharge and relief ports are triangular in shape as explained above, the apex of the triangular shaped discharge port will be gradually opened while the apex of the triangular shaped relief port will be gradually closed. This gradual opening of the discharge port and gradual closing of the relief port prevents the occurrence of the phenomena known as "water hammer" in the discharge pipe. As the relief opening closes, less fluid can escape therethrough and consequently the pressure on the valve member increases until the relief opening is entirely closed and the discharge opening is wide open, allowing all the fluid pumped to enter the discharge pipe. This will continue as long as the pump continues to operate. When the pump stops, the pressure on both sides of the valve member due to the fluid, will equalize and the spring member will tend to force the valve member to its original position as shown in the drawing, allowing the pressure on the inlet side of the valve to escape through the relief opening, in which position, the valve will again be ready for the next starting of the pump.

If the chamber above the valve member is connected to the discharge pipe by means of the opening 11, the spring 7 may be made quite light as it must then only overcome the friction of the valve member to close the same when the pump has stopped. Under these conditions, the pressure of the spring is substantially balanced by the friction of the valve member, and when the pump is operating, the valve will remain in the open position due to the fact that the pressure in the discharge pipe at the point where the opening 11 is connected thereto is less than that at the inlet opening 2, because of the friction and wire drawing of the fluid in the valve between the inlet opening 2 and the discharge opening 3 and in the discharge pipe between the discharge opening 3 and the opening 11. As shown in the drawing, the area of the opening 11 is small compared with the area of the discharge opening 3, and consequently as compared with the area of the discharge pipe, so that fluctuation of pressure in the discharge pipe will

not be communicated to the chamber above the valve member.

The size of the relief opening depends on the pressure and volume of fluid moved by the pump and as this may vary in different installations, which otherwise would require the same size of unloading valves, a suitable device may be employed for changing the area of the relief opening. For this purpose an ordinary valve, or a suitable diaphragm having a hole therein may be located in the relief passage.

I desire it to be understood that my invention is not limited to the particular arrangement shown and described, and I aim in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

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

1. A pump unloading valve comprising a casing provided with an inlet opening, a discharge opening and a relief opening, said relief opening being smaller than such discharge opening, and means comprising a valve member in said casing for gradually closing said relief opening and for simultaneously gradually opening said discharge opening.

2. A pump unloading valve comprising a casing provided with an inlet opening, a discharge opening and a relief opening, said relief opening being smaller than said discharge opening, and a hollow plug valve member in said casing, said valve member having an opening registering with said relief opening when said discharge opening is closed, said relief opening being gradually closed as said discharge opening is simultaneously gradually opened upon the application of fluid pressure on said valve member from the inlet opening.

3. A pump unloading valve comprising a casing provided with an inlet opening, a discharge opening and a relief opening, said relief opening being smaller than said discharge opening, and means comprising a hollow plug valve member in said casing for gradually closing said relief opening and for simultaneously gradually opening said discharge opening, said valve member having an opening registering with said relief opening when said discharge opening is closed.

4. A pump unloading valve comprising a casing provided with an inlet opening, a discharge opening and a relief opening, said relief opening being smaller than said discharge opening, means comprising a valve member in said casing for gradually closing said relief opening and for simultaneously gradually opening said discharge opening, and a spring member for returning said valve member to the position in which the

discharge opening is closed when the fluid pressure from said inlet opening on said valve member is removed.

5 5. A pump unloading valve comprising a casing provided with an inlet opening, a discharge opening and a relief opening, said relief opening being smaller than said discharge opening, a hollow plug valve member in said casing, said valve member having an opening registering with said relief opening
10 when said discharge opening is closed, said relief opening being gradually closed as said discharge opening is simultaneously gradually opened upon the application of fluid
15 pressure on said valve member from the inlet opening, and a spring member for returning said valve member to the position in which the discharge opening is closed when the fluid pressure from said inlet
20 opening on said valve member is removed.

6. A pump unloading valve comprising a casing provided with an inlet opening, a discharge opening and a relief opening, said relief opening being smaller than said discharge opening, means comprising a hollow plug valve member in said casing for gradually closing said relief opening and for simultaneously gradually opening said discharge opening, said valve member having an opening registering with said relief opening when said discharge opening is closed, and a spring member for returning said valve member to the position in which the discharge opening is closed when the fluid pressure from said inlet opening on said valve member is removed.

7. A pump unloading valve comprising a casing provided with an inlet opening and triangular shaped relief and discharge
40 ports, said relief port being smaller than said discharge port, and means comprising a valve member in said casing for gradually closing said relief port and for simultaneously gradually opening said discharge
45 port, said triangular shaped ports being so positioned that the apex of the triangular shaped relief port is covered as the apex of the triangular shaped discharge port is opened.

50 8. A pump unloading valve comprising a casing provided with an inlet opening and triangular shaped relief and discharge ports, said relief port being smaller than said discharge port, and means comprising
55 a hollow plug valve member in said casing for gradually closing said relief port and for simultaneously gradually opening said discharge port, said valve member having an opening therein registering with said relief port when said discharge port is closed, said triangular shaped ports being so positioned that the apex of the triangular shaped relief port is covered as the apex of the triangular shaped discharge port is
60 opened.
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9. A pump unloading valve comprising a casing provided with an inlet opening, and triangular shaped relief and discharge ports, said relief port being smaller than said discharge port, means comprising a
70 valve member in said casing for gradually closing said relief port and for simultaneously gradually opening said discharge port, said triangular shaped ports being so positioned that the apex of the triangular
75 shaped relief port is covered as the apex of the triangular shaped discharge port is opened, and a spring member for returning said valve member to the position in which the discharge opening is closed when the fluid pressure from said inlet opening on
80 said valve member is removed.

10. A pump unloading valve comprising a casing provided with an inlet opening and triangular shaped relief and discharge
85 ports, said relief port being smaller than said discharge port, means comprising a hollow plug valve member in said casing for gradually closing said relief port and for simultaneously gradually opening said
90 discharge port, said valve member having an opening therein registering with said relief port when the said discharge port is closed, said triangular shaped ports being so positioned that the apex of the triangular
95 shaped relief port is covered as the apex of the triangular shaped discharge port is opened, and a spring member for returning said valve member to the position in which the discharge opening is closed when the fluid pressure from said inlet opening on
100 said valve member is removed.

11. A pump unloading valve comprising a casing provided with an inlet opening, triangular shaped relief and discharge
105 ports, said relief port being smaller than said discharge port and a hollow plug valve member in said casing, said valve member having an opening therein registering with said relief port when said discharge port is closed, said relief port being gradually closed as said discharge port is simultaneously gradually opened upon the application of fluid pressure on said valve from the inlet opening, said triangular shaped
115 ports being so positioned that the apex of the triangular shaped relief port is covered as the apex of the triangular shaped discharge port is opened.

12. A pump unloading valve comprising a casing provided with an inlet opening, triangular shaped relief and discharge
120 ports, said relief port being smaller than said discharge port, a hollow plug valve member in said casing, said valve member having an opening therein registering with said relief port when said discharge port is closed, said relief port being gradually closed as said discharge port is simultaneously gradually opened upon the applica-
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tion of fluid pressure on said valve from the inlet opening, said triangular shaped ports being so positioned that the apex of the triangular shaped relief port is covered as the apex of the triangular shaped discharge port is opened, and a spring member for returning said valve member to the position in which the discharge port is closed

when the fluid pressure from said inlet opening on said valve is removed.

In witness whereof, I have hereunto set my hand this third day of January, 1914.

EDWARD TAYLOR:

Witnesses:

WALTER LEON,

H. M. FREW.

It is hereby certified that in Letters Patent No. 1,128,077, granted February 9, 1915, upon the application of Edward Taylor, of Chicago, Illinois, for an improvement in "Pump-Unloading Valves," an error appears in the printed specification requiring correction as follows: Page 3, lines 92-93, for the word "rerief" read *relief*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 23rd day of March, A. D., 1915.

[SEAL.]

J. T. NEWTON,

Acting Commissioner of Patents.