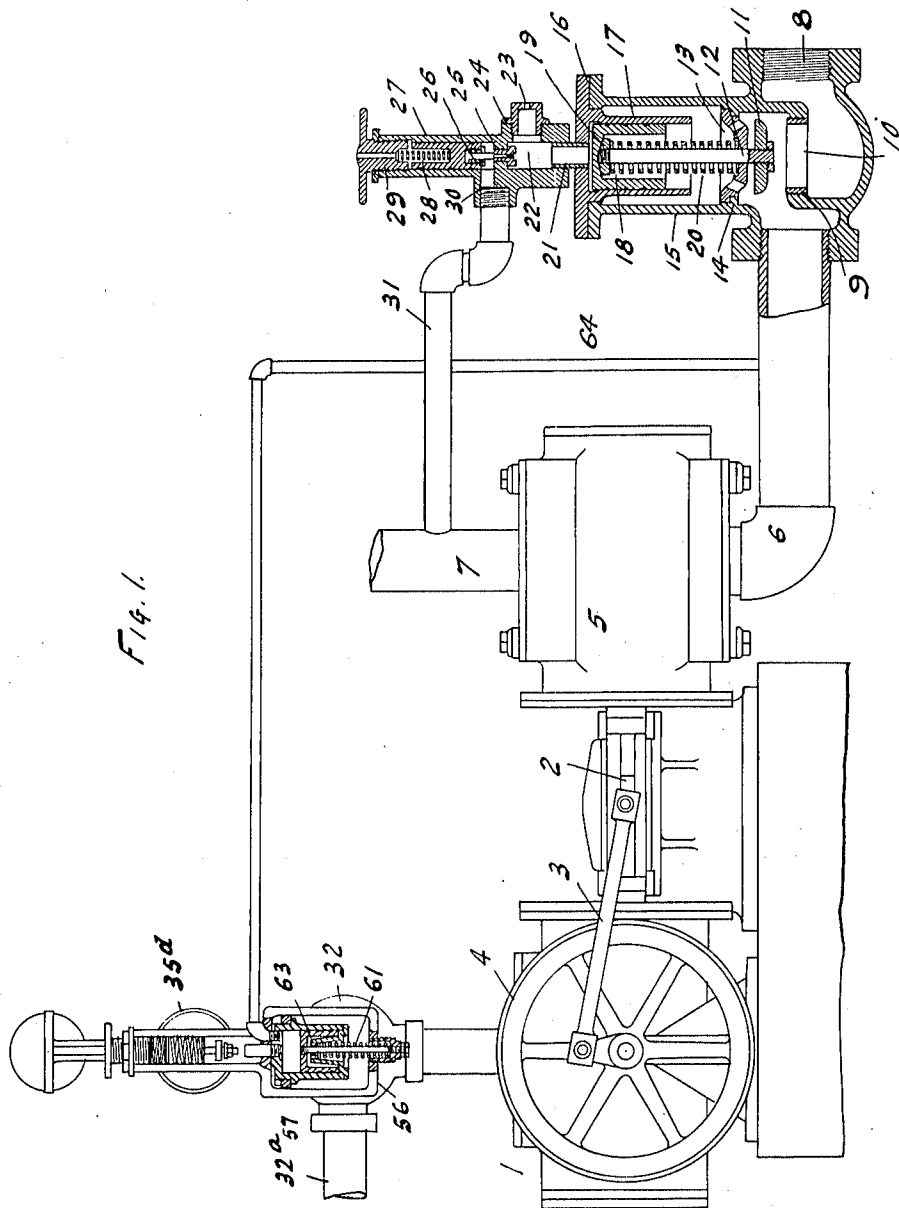


R. CONRADER.
PUMPING APPARATUS.
APPLICATION FILED JUNE 24, 1909.

1,055,139.

Patented Mar. 4, 1913.

2 SHEETS—SHEET 1.



Witnesses
Margaret Beyle
Vinnir C. Hess

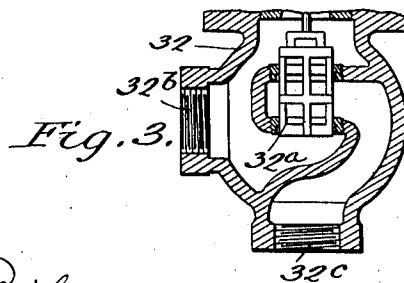
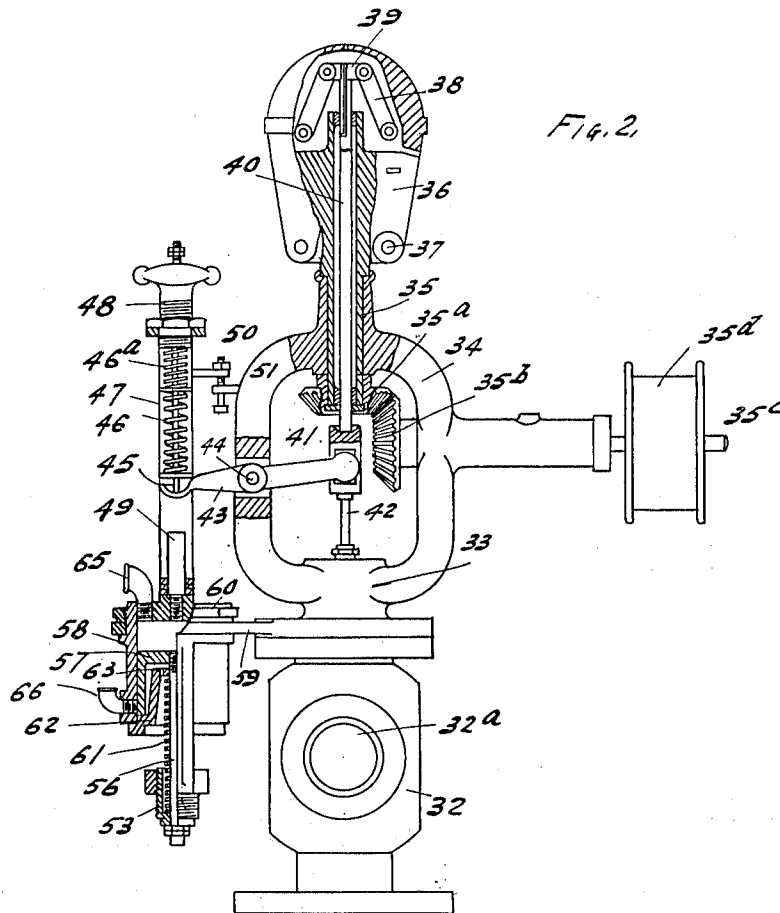
Inventor
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Witnesses
Margaret Bigle
Carrin B. Allen

Inventor
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UNITED STATES PATENT OFFICE.

RUDOLPH CONRADER, OF ERIE, PENNSYLVANIA.

PUMPING APPARATUS.

1,055,139.

Specification of Letters Patent.

Patented Mar. 4, 1913.

Application filed June 24, 1909. Serial No. 504,190.

To all whom it may concern:

Be it known that I, RUDOLPH CONRADER, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented new and useful Improvements in Pumping Apparatus, of which the following is a specification.

This invention relates to pumping apparatus and consists in certain improvements in the construction thereof, as will be hereinafter fully described and pointed out in the claims.

The object of the invention is to control the motor driving a pump so that as the pump is unloaded, the speed of the motor will be similarly varied, or, in other words, to so control the motor that its power will vary as the charges pumped vary.

In a former application by me, filed September 25th, 1905, patented October 19, 1909, No. 937,228, I have connected a pump governor and a relief device so that the same reduction in receiver pressure acts similarly on both the governor and the relief device. This requires a nice adjustment of the two mechanisms to get a corresponding result. I have found that by arranging a relief device on the intake of the pump, and then controlling the speed governor by variations in the intake pressure, this nicety of adjustment is entirely void, and all that is necessary to get the proper regulation, after the initial adjustment, is to regulate the relief device. In the completed mechanism, therefore, the relief device closes, more or less, the intake of the compressor. This, of course, reduces the pressure at the intake. If there is a complete closure, at the intake, the pressure will be so reduced as to nearly form a vacuum, depending somewhat upon the clearance of the pump. The load of the pump is proportioned to this pressure. In other words, each charge is proportioned to the pressure at which the discharge stroke commences. Of course, if there were a complete vacuum, no fluid whatever would be discharged; on the other hand, if there is no reduction in pressure at the intake, there will be a full charge expelled with each stroke. In this apparatus, therefore, the governor or controlling device for the motor is controlled by this reduction in pressure, and in the specific mechanism shown, the controlling device is actuated by atmospheric

pressure as opposed to the reduced pressure in the intake.

The invention, as illustrated, in the accompanying drawings, is as follows:

Figure 1 shows a side elevation, partly in section, of the apparatus. Fig. 2, an end elevation of the governor. Fig. 3 is a section through the governor body and motor controlling valve.

The governor herein shown is similar in many respects to that shown by me in a patent issued November 22, 1904, No. 775,391, and the relief device is that shown and described by me in an application filed December 26th, 1906, Serial No. 349,519.

1 marks the steam cylinder; 2, the piston rod; 3, the pitman; 4, a fly wheel; 5, the pump cylinder; 6, the intake; and 7, the discharge pipe, which, for the purpose of this application, may be considered as the receiver.

The relief device is made up of the body 8 with the diaphragm 9, through which extends the valve controlled passage. Valve 11 controls passage 10. It is carried by the stem 12. The stem extends through a guide piece 13, which rests on the shoulder 14 in the cylinder 15, the cylinder extending from the body of the relief device. The cylinder 15 has the cap 16 from which extends the cylinder 17. The piston 18 is arranged in the cylinder 17. A cap 19 is arranged on the stem 12, and operates against the piston 18. Spring 20 is tensioned between the guide piece 13 and the cap 19, and opposes the movement of the piston to close the valve. The cylinder 17 is connected by a passage 21 with a leak chamber 22. The leak chamber has the vent 23 of minute size. The passage 24 leads to the leak chamber 22, and the needle 25 controls the passage 24. The needle valve is carried by the piston 26. The piston 26 is arranged on the cylinder 27. A spring 28 opposes the movement of the piston. The tension of this spring is controlled by the screw 29. The cylinder 27 is provided with an inlet 30 between the passage 24 and the piston 26, so that the piston 26 is subjected to receiver pressure, the inlet being connected with the pipe 7 by the pipe 31. This relief device operates in the manner described in my before mentioned application. The fluid passing to the intake 6 passes through the body against the closing

movement of the valve 11. As the receiver pressure rises, the piston 26 is operated, and opens the needle valve 25. This admits pressure to the cylinder 17. If the pressure in the receiver is so low as to open the needle valve but slightly, the vent 23 prevents leakage in such proportion that but slight pressure results in the cylinder 17. If, however, the receiver pressure is such as to fully open the valve, the vent is so out of proportion to the supply that practically full receiver pressure is delivered to the cylinder, and the valve 11 is entirely closed. Different pressures accomplish different positions of valve 11, the needle valve and vent intensifying the pressure, so as to assure the closing action of the valve 11.

The governor has the governor body 32 in which is the controlling valve 32^a. The governor body has the steam inlet 32^b and the steam outlet 32^c leading to the motor. The governor frame 33 is attached to the governor body, and has the usual yoke 34. The governor head 35 is journaled in the top of the yoke, and carries the weights 36. These are pivoted at 37 and are connected by the links 38 with the cross head 39 on the stem 40. The stem 40 is stepped on the yoke 41, and the yoke 41 is fixed on the stem 42 of the valve 32^a. The head is driven through the gears 35^a and 35^b, the gear 35^b being fixed on the shaft 35^c which is provided with the belt pulley 35^d. These weights are driven, forming the centrifugal element of the governor.

A lever 43 is pivoted in the yoke 34 by means of the pin 44, and its end extends into the yoke 41. The outer end of the lever 43 supports a rod 45. Springs 46 and 46^a are arranged around the rod, and the frame 47 has its side parallel with the rod, and its top above the springs, the initial tension of the springs being adjusted by the screw 48. These springs form the actuating part of the centripetal element. The frame 47 is mounted on the guides 49 and 50. The guide 50 slides in a projection 51 on the yoke 34, and the guide 49 extends upwardly from the top 60 of the governor motor. A yoke 52 extends from the frame 47 around the cylinder 58. A spring supporting cup 53 is screwed into the bottom of this yoke, and the stem 55 screws into this spring supporting cup, and extends upwardly and is secured in the piston 57. This piston operates in the cylinder 58, which is supported from the frame of the governor by the projection 59. The spring 61 is tensioned between the spring cup of the yoke, and head 62, arranged in the bottom of the cylinder. A vent 63 permits the admission of air through this head. A pipe 64 leads from the intake 6 to the intake 65 of the cylinder 58, so that the cylinder has the pressure of the intake. A piston 57 is

subject at one side, (the top) to the intake pressure and on the opposite side to the atmospheric pressure. Oil is preferably delivered through a small elbow 66, and maintains some slight elevation in the cylinder. This makes a liquid seal on the piston and lubricates the parts.

In the operation of the mechanism, the governor operates in the manner of the governor above mentioned. As the load decreases, the pressure above the piston 57 decreases, and the air pressure moves the piston 57 upwardly against the tension of the spring 61. This, of course, raises the frame 47, and reduces the tension of the spring 46, and consequently reduces the force of the centripetal element so that the adjusted speed of the governor is reduced; in other words, the centripetal element is varied within the limits of the power of the centrifugal element, but the centrifugal governor still has control of the mechanism, and with the increase of pressure at the intake, the reverse movement of the parts takes place and the governor is speeded up. The spring 61 should be of sufficient strength to overcome the spring 46^a. It will be noted that after the initial adjustment, all that is necessary to vary the pre-determined receiver pressure is to vary the relief device. The governing mechanism will follow this, and take care of itself entirely.

What I claim as new is:

1. In a pumping apparatus, the combination of a pump; a motor actuating the pump; a relief device operating upon the intake of the pump; a controlling mechanism controlling the speed of the motor; and means controlled by the pressure at the intake of the pump for varying the action of the controlling device.

2. In a pumping apparatus, the combination of a pump; a motor actuating the pump; a relief device operating upon the intake of the pump; a controlling mechanism for the motor, adapted to maintain different speeds between the desired maximum and minimum; and means controlled by the pressure at the intake of the pump for varying the action of the controlling mechanism.

3. In a pumping apparatus, the combination of a pump; a motor actuating the pump; a relief device operating upon the intake of the pump; a controlling mechanism, for the motor, comprising a centrifugal governor; and means controlled by the pressure at the intake for varying the action of the governor.

4. In a pumping apparatus, the combination of a pump; a motor actuating the pump; a relief device operating upon the intake of the pump; a centrifugal governor controlling the motor, said motor having a centrifugal element and a centripetal ele-

ment, opposed to each other; and means controlled by the pressure at the intake for varying the power of one of said governing elements within the limits of the power of the other of said elements.

5 5. In a pumping apparatus, the combination of a pump; a motor actuating the pump; a relief device operating upon the intake of the pump; a controlling mechanism for the motor; and means controlled by the pressure at the intake for varying the controlling mechanism to vary the speed of the motor as the charges of the pump vary.

15 6. In a pumping apparatus, the combination of a pump; a motor actuating the pump; a relief device operating on the intake of the pump and controlling the speed of the motor; and means controlled by the pressure at the intake of the pump for varying the different speeds between the desired maximum and the desired minimum, varying as the charges pumped vary.

20 7. In a pumping apparatus, the combination of a pump; a motor actuating the pump; a relief device operating upon the intake of the pump; a controlling mechanism for the motor comprising a centrifugal governor; and means controlled by the pressure at the intake for varying the action of the governor to vary the speed of the motor as the pump charges vary.

25 8. In combination, a compressing pump, means for automatically reducing pressure in the pump intake, a motor for driving the pump and a motor regulator under control of the reduction in pressure in the pump intake.

30 9. In combination, a compressing pump, means under the control of an increase of pressure on the discharge side of the pump for automatically reducing pressure on the intake side of the pump by shutting off the supply of fluid thereto, a motor for driving the pump and a motor regulator under control of the reduction in pressure in the pump intake.

45 10. In combination, a compressing pump, a motor for driving it, a regulator for vary-

ing the pressure in the pump intake and a regulator for the motor controlled by variations in pressure in the pump intake.

11. In combination, a compressing pump, a fluid pressure operated motor for driving it, a regulator for varying the pressure in the pump intake and a regulator for the motor pressure fluid supply, controlled by variations in pressure in the pump intake.

12. In combination, a compressing pump, a steam operated motor for driving it, a regulator for varying the pressure in the pump intake and a regulator for the steam supply controlled by the variations in pressure in the pump intake.

13. In combination, a compressing pump, a fluid pressure operated motor for driving it, a choking controller valve for opening and closing the pump intake and a choking controller valve for the motor pressure fluid supply, controlled by variations in pressure in the pump intake due to the operation of the choking controller valve for the pump.

14. In combination, a compressing pump, a fluid pressure operated motor for driving it, a choking controller valve for reducing the pressure in the pump intake and means controlled by a reduction of pressure in the pump intake for cutting off the fluid pressure supply to the motor.

15. In combination, a compressing pump, a fluid pressure operated motor for driving it, a choking controller valve operated by an increase in pressure on the discharge side of the pump for cutting off the supply on the intake side of the pump, whereby a reduction of pressure is produced in the pump intake and means controlled by the reduction of pressure in the pump intake for cutting off the fluid pressure supply to the motor.

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

RUDOLPH CONRADER.

Witnesses:

C. D. HIGBY,
H. C. LORD.