June 16, 1925. 1,541,996

I. A. OLIVER

GOVERNOR FOR POWER DRIVEN PUMPS

Filed Jan. 26, 1924 2 Sheets-Sheet 1

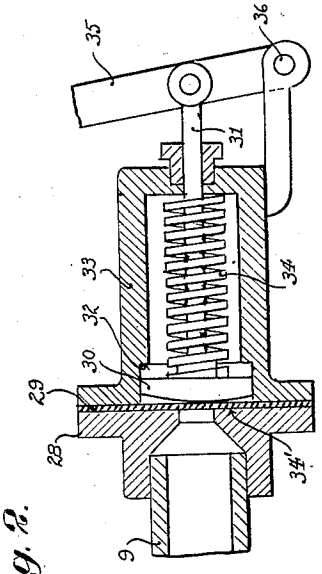

Fig. 2.

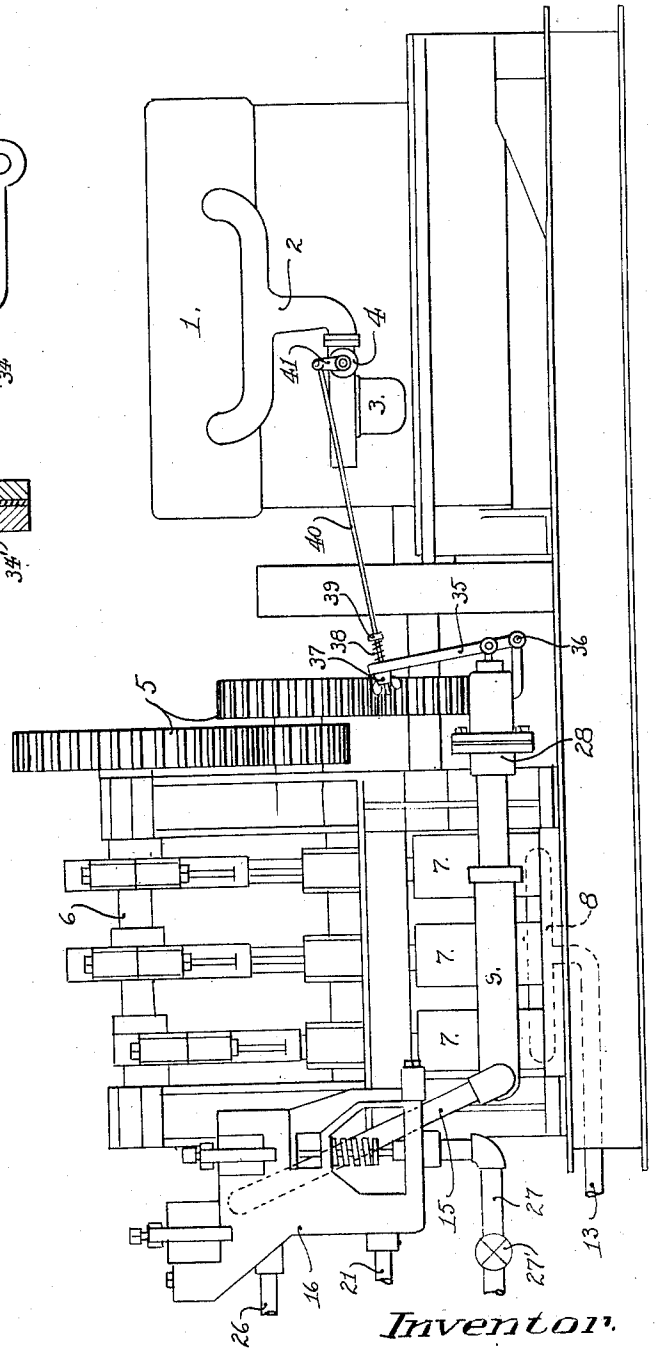

Fig. 1.

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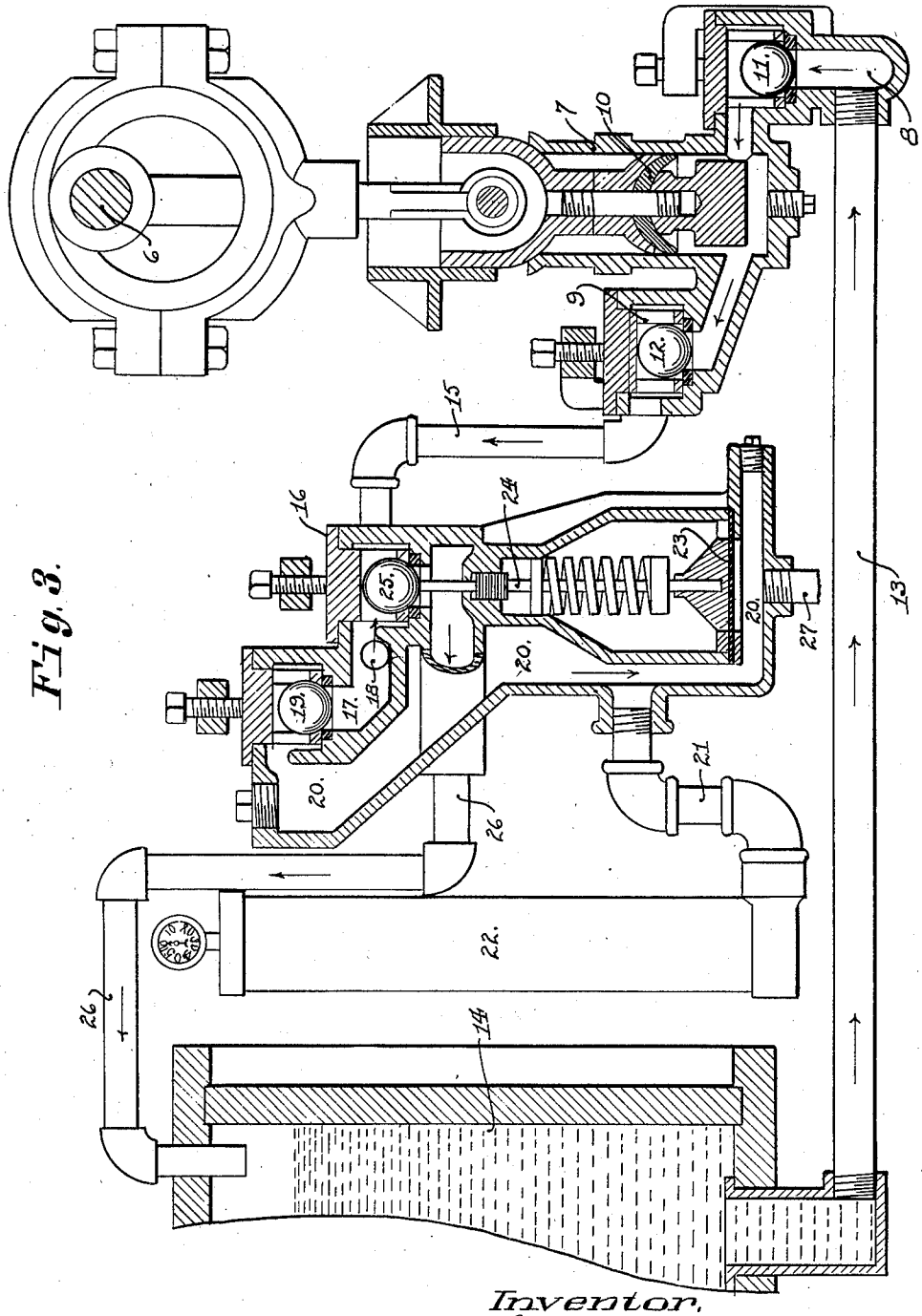


Fig. 3.

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# UNITED STATES PATENT OFFICE.

IMMANUEL ALVIN OLIVER, OF SANTA CLARA, CALIFORNIA, ASSIGNOR TO BEAN SPRAY PUMP CO., OF SAN JOSE, CALIFORNIA, A CORPORATION OF CALIFORNIA.

## GOVERNOR FOR POWER-DRIVEN PUMPS.

Application filed January 26, 1924. Serial No. 688,896.

*To all whom it may concern:*

Be it known that I, IMMANUEL ALVIN OLIVER, a citizen of the United States, residing at Santa Clara, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Governors for Power-Driven Pumps, of which the following is a specification.

My invention relates to governors for controlling the speed of power driven pumps, and is particularly adapted for pumps in which the load is automatically relieved when the discharge flow is cut off.

The principal object of my invention is to provide a simple and efficient governor for spray pumps, which will function instantaneously, and which will operate successfully under conditions of the severe vibration to which such pumps are subjected, especially when used for spraying trees. Under such conditions, the usual types of speed governors have been found unsuitable, on account of their delicacy of construction and adjustment. Moreover, the common types of governors have an appreciable lag, which, although not important when the variation in the load is gradual, is extremely undesirable when such load variations are sudden and of considerable extent, permitting the pump to race for an instant when the load is suddenly relieved, and causing it to slow down considerably when the load is taken up. By means of my present invention, the power mechanism is controlled, without appreciable lag, directly by the pressure at the pump discharge, in a manner to be fully described hereinafter.

My invention will be described and illustrated as applied to a spray pump of well known type driven by an internal combustion engine, but it will be apparent to anyone skilled in the art that it is equally applicable to pumps driven by other types of motors, or to pumps used for other purposes. It is to be understood, moreover, that the form and construction of the apparatus may be varied from that shown and described, within the limits of the claims hereto appended, without departing from the essential principles of the invention.

With this in view my invention will now be described with reference to the accompanying drawings, wherein—

Fig. 1 is a partly diagrammatic side elevation of an engine driven spray-pump equipped with my governor.

Fig. 2 is a vertical section, enlarged, of the governor actuating device.

Fig. 3 is a part sectional elevation, enlarged, showing a portion of the pump and the fluid passages and valves associated therewith.

In the drawings, and referring for the moment to Fig. 1 thereof, the reference numeral 1 designates a gasoline engine, having the usual intake manifold 2, carbureter 3, and throttle valve 4. Said engine is connected, as by suitable gearing 5, with the shaft 6 of a pump, said pump being shown as of a common type used in spraying outfits, and having three cylinders 7 with intake and discharge manifolds 8 and 9 respectively.

One of the pump cylinders 7 is shown in section in Fig. 3. 10 is the piston, 11 is the intake valve, and 12 is the discharge valve leading into the discharge manifold 9. The intake manifold 8 is connected by a suction pipe 13 with a reservoir 14 adapted to hold a supply of the liquid being pumped. From the discharge manifold 9 a pipe 15, Figs. 1 and 3, leads to a relief valve structure 16 which is shown in detail in Fig. 3.

The discharge from the pump, flowing through the pipe 15, enters a chamber 17 at 18, and passes a check valve 19 into a chamber 20, from which a pipe 21 leads to an air cushion or pressure chamber 22. A flexible diaphragm 23 is exposed to the pressure in the chamber 20, and said diaphragm, when said pressure rises to a predetermined value, operates through a spring returned rod 24 to open a valve 25, thereby permitting the discharge from the pump to flow from the chamber 17 through said valve 25 and a pipe 26 into the reservoir 14. The liquid is thus by-passed, at a comparatively low pressure, from the discharge of the pump to its intake, when the pressure in the chamber 20 rises above a predetermined value, such pressure being trapped in the chambers 20 and 22 by the check valve 19.

The delivery system, which may comprise the usual spray nozzle, hoses, etc., has been

omitted from the drawings, but is understood to be connected with a pipe 27 leading from the chamber 20, and for purposes of illustration, I have indicated a stop-cock at 27′ in Fig. 1, for the purpose of cutting off the delivery of fluid from the chamber 20. Thus when the delivery of liquid is cut off, by the stop-cock 27′ or otherwise, the pressure in the chamber 20 rises, causing the relief or by-pass valve 25 to open, and permitting the liquid to flow, at comparatively low pressure, from the pump discharge back into the reservoir 14, and this by-passing continues as long as the comparatively high pressure remains in the chamber 20. When the delivery stop-cock 27′ is opened, however, the pressure in the chamber falls, causing the relief valve 25 to close, and forcing the pump to work against the full pressure of the chamber 20.

In actual practise, the pressure maintained in the chambers 20 and 22 may be as high as 300 pounds per square inch, whereas when the by-pass valve 25 is opened the pressure at the pump discharge drops at once to about 30 pounds or less. Thus it will be seen that the variations in the pressure at the pump are not only sudden, but of considerable extent, and in order to keep the speed of the engine fairly constant under such wide fluctuations in load, I provide means actuated directly by the pressure variations at the pump discharge for controlling the power output, and therefore the speed of the engine.

This pressure actuated device is indicated at 28 in Fig. 1, and shown in detail in Fig. 2. A flexible diaphragm 29 is exposed to the pressure in the pump discharge manifold 9, and said diaphragm is backed by a plunger having a head 30 and a stem 31. The head 30 coacts with a shoulder 32 formed in the cap or casing member 33, to limit the diaphragm in its outward, or distending movement. A spring 34 is housed within the cap 33, and holds the plunger against the diaphragm, a shoulder 34′ being provided to limit the return movement of said diaphragm. The stem 31 of said plunger is connected with a lever 35, fulcrumed at 36, and the free end of said lever is adjustably connected, by means of a wing nut 37, a cushioning spring 38, and a collar 39, with a rod 40, as shown in Fig. 1, said rod being connected with a lever 41 which operates the engine throttle valve 4, as shown. The connections thus described are so arranged that the engine throttle valve 4 is fully open when the diaphragm 29 is distended by the pressure in the pump discharge manifold 9, and partially or nearly closed when said diaphragm is in its normal position as shown in Fig. 2.

Thus when the pressure in the pump discharge manifold is suddenly increased by the closing of the by-pass valve 25, the diaphragm 29 is distended, forcing the plunger 30—31 outwardly, and opening the throttle 4, thereby increasing the power output of the engine and preventing it from slowing down; and when the pressure at the pump discharge is relieved by the opening of the by-pass valve 25, the spring 34 returns said plunger 30—31, thereby partially closing the throttle 4 and decreasing the power output of the engine to prevent it from racing. By means of the nut 37, the operation of the throttle 4 may be properly adjusted to provide the desired engine speed.

It should be noted that, by actuating the engine throttle directly by the pressure variations at the pump discharge, I provide the least possible amount of lag in the operation of the device. It should also be noted that my advice is of study and rugged construction, with few moving parts, thereby rendering it suitable for use under the hard conditions usually found in spraying operations.

I claim:

1. The combination with a power driven pump having a fluid discharge and a pressure chamber connected therewith, of means for reducing the fluid pressure at said discharge when the pressure in said chamber rises above a pre-determined value; and means actuated by the pressure reduction at said discharge for reducing the power output of the driving means.

2. The combination with a power driven pump having a fluid discharge, of means for relieving the pressure at said discharge, when the flow of fluid from said discharge is cut off; and means actuated by the relief of the pressure at said discharge for reducing the power output of the driving means.

3. The combination with a power driven pump in which the fluid pressure at the discharge is reduced when the discharge flow is cut off, of means actuated by the pressure reduction at said discharge for reducing the power output of the driving means.

4. The combination with a power driven pump having a fluid intake and a fluid discharge, of a controllable delivery system connected with said discharge; means for by-passing the fluid from said discharge to said intake to reduce the pressure at said discharge when the flow is cut off at said delivery system; and means actuated by the pressure reduction at said discharge for reducing the power output of the driving means.

5. The combination with a power driven pump having a fluid intake, a fluid discharge, and a pressure chamber connected with said discharge, of means responsive

to variations in the pressure in said chamber for by-passing the fluid from the discharge to the intake to reduce the pressure at said discharge; and means actuated by the pressure reduction at said discharge for reducing the power output of the driving means.

6. The combination with a power driven pump in which the fluid pressure at the discharge is reduced when the discharge flow is cut off, of a diaphragm constantly exposed to the fluid pressure at said discharge; and a connection between said diaphragm and the driving means whereby the power output of the latter is reduced when said discharge flow is cut off.

7. The combination with a power driven pump having a fluid discharge and a pressure chamber connected therewith; means for unloading said discharge when the pressure in said chamber rises above a pre-determined point and for re-connecting said discharge with said chamber when the pressure in the latter falls below a predetermined point; and means actuated by the unloading and loading of said discharge for respectively reducing and increasing the power output of the driving means.

In testimony whereof I have signed my name to this specification.

IMMANUEL ALVIN OLIVER.