

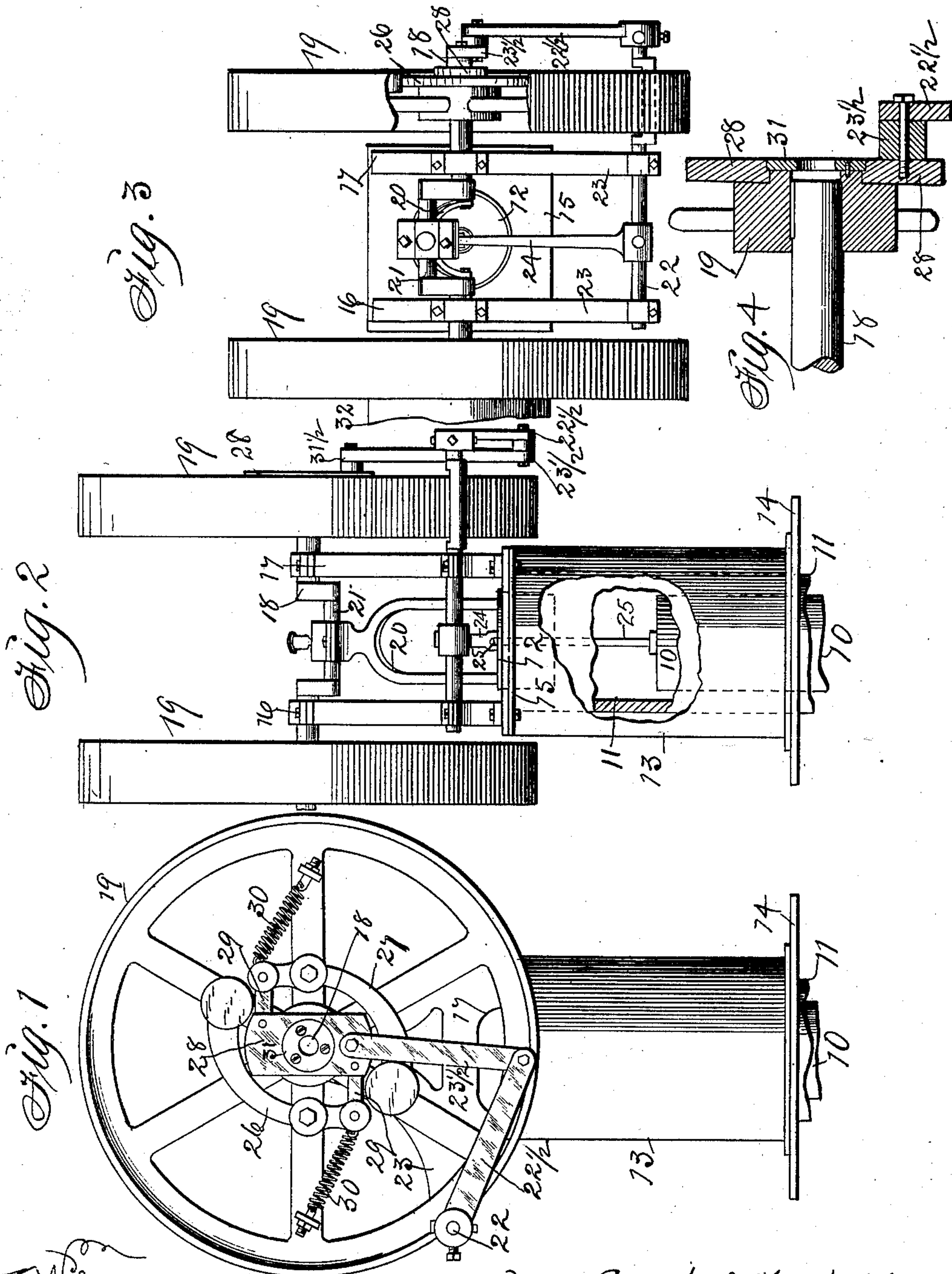
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PATENTED APR. 5, 1904.

E. A. HORNOSTEL, JR.
GOVERNOR FOR HYDROPNEUMATIC ENGINES.

APPLICATION FILED MAR. 27, 1903.

NO MODEL.



Witnesses:
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UNITED STATES PATENT OFFICE.

ERNEST A. HORNBOSTEL, JR., OF DES MOINES, IOWA.

GOVERNOR FOR HYDROPNEUMATIC ENGINES.

SPECIFICATION forming part of Letters Patent No. 756,791, dated April 5, 1904.

Application filed March 27, 1903. Serial No. 149,775. (No model.)

To all whom it may concern:

Be it known that I, ERNEST A. HORNBOSTEL, Jr., a citizen of the United States, residing at Des Moines, in the county of Polk and State of Iowa, have invented a new and useful Governor for Hydropneumatic Engines, of which the following is a specification.

My invention relates to the hydropneumatic engine for which United States Letters Patent No. 368,952 were granted August 30, 1887; and it consists in the construction and application of a governor with a rotatable crank-shaft, a rock-shaft, a piston, and a float to regulate the reciprocating motions of the piston in the cylinder and the float in the boiler, as hereinafter set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation that shows the relative positions of the different parts of the governor that are combined with each other on one of the balance-wheels. Fig. 2 is a view taken at right angles to Fig. 1 and shows the connection of the governor with the crank-shaft, the rock-shaft, the piston, and the float as required for practical use. Fig. 3 is a top view showing a part of one of the balance-wheels broken away. Fig. 4 is an enlarged sectional view that shows the manner of connecting an evenner with the rotatable shaft and the two weighted levers of the governor.

The numeral 10 designates the float, 11 the boiler, 12 the cylinder, and 13 the condenser that incloses the cylinder, jointly fixed on top of the base-plate 14. A plate 15 is fixed on top of the condenser and cylinder, as required to close the annular space between the cylinder and condenser and to support the operative mechanism mounted on top of them.

Bearings 16 and 17, fixed on top of the plate 15, support a crank-shaft 18, that has balance-wheels 19 on its ends. A yoke 20 is pivotally connected with the crank 21 at the center of the shaft 18 and extends down into the cylinder 12, to be connected with a piston in the cylinder, but not shown.

A rock-shaft 22 is mounted in branches 23, that extend horizontally from the bearers 16 and 17, and an arm 24 extends from the center of the rock-shaft and is pivotally connect-

ed with a jointed stem 25, that extends down through the cylinder and is connected with the top of the float 10, as required to reciprocate the float in the boiler 11. An arm 22 $\frac{1}{2}$ extends from the end of the rock-shaft 22 and is connected with one end of the evenner 28 by a link 23 $\frac{1}{2}$.

Curved levers 26 and 27 are fulcrumed to spokes of one of the balance-wheels 19 to extend in reverse ways relative to each other and the axis of the wheel, and each is provided with a weight on the end of its long arm. An evenner 28 is pivotally connected with the hub of the wheel 19 and the crank-shaft 18, as shown in Fig. 4, or in any suitable way in such a manner that the evenner can vibrate when the shaft rotates. The short arm of each of said levers is pivotally connected with one end of the evenner 28 by means of a link 29, and each lever is normally retained in position, as shown in Fig. 1, by a spring 30, fixed to the balance-wheel and to the short arm of the lever. An aperture in the center of the evenner 28 admits the end of the hub of the wheel 19, and a ring plate 31, fitted and fixed against the outside face of the hub of the wheel, aids in keeping the evenner in place, as required to retain the center of motion of the evenner concentric with the axis of the shaft 18.

In practical operation the long arms of the weighted levers 26 and 27 will move outward, as required to maintain a uniform velocity of the crank-shaft 18, a regular vibratory motion of the rock-shaft 22, and steady reciprocating motions of the piston in the cylinder and the float in the boiler, as required to transmit power and motion from the engine to extraneous machinery when connected with a band-wheel 32 on the end of the shaft 18.

The main object of the invention consists in keeping the piston and the float from varying in motion relative to each other—in other words, one going faster than the other in the varying speed of the engine. The action of the governor is direct and simultaneous upon the piston and the float and uniform in speed, regardless of the speed of the engine.

Having thus described the purpose, construction, application, and operation of my invention, its practical utility will be readily

understood by persons familiar with the art to which it pertains.

What I claim as new, and desire to secure by Letters Patent, is—

5 1. In a hydropneumatic engine containing a reciprocating piston and also a reciprocating float, a rotatable crank-shaft, a balance-wheel on one end portion of the shaft, two levers fulcrumed to the balance-wheel to project in reverse ways relative to each other and
10 the axis of the shaft, weights on the ends of the long arms of the levers, an evenner pivotally connected with the hub of the balance-wheel to vibrate concentrically with the axis
15 of the shaft, links connecting the ends of the evenner with the short arms of the levers and means for normally retaining the weights on the ends of the long arms of the levers at the central portion of the wheel, a rock-shaft in
20 parallel position with the crank-shaft, an arm extended from the end of the rock-shaft, a link pivotally connected with said arm and with one end of said evenner, an arm at the center of the rock-shaft and a stem pivotally
25 connected with said arm and with the float, arranged and combined to operate in the manner set forth for the purposes stated.

2. In a hydropneumatic engine containing a reciprocating piston and also a reciprocating float, a governor comprising a wheel on
30 the end of a rotatable shaft having a crank at its center, an evenner pivotally connected with the hub of the wheel to rotate concentrically with the shaft upon which the wheel is mounted, two levers provided with weights on the
35 ends of their long arms fulcrumed to the wheel, links connecting the short arms of the levers with the ends of the evenner, springs connected with the wheel and the short arms of the

levers, a rock-shaft in parallel position with
40 the rotatable shaft, a yoke pivotally connected with the crank of the rotatable shaft and a piston in a cylinder, an arm on the rock-shaft, a link connecting the said arm with one end of said evenner and an arm at the center of
45 the rock-shaft pivotally connected with the float by means of a stem, arranged and combined to operate in the manner set forth for the purposes stated.

3. A hydropneumatic engine comprising a
50 cylinder, a piston in the cylinder, a rotatable crank-shaft, connected with the piston, a boiler connected with the cylinder, a float in the boiler, a balance-wheel on one end portion of
55 the shaft, two levers fulcrumed to the balance-wheel to project in reverse ways relative to each other and the axis of the shaft, weights on the ends of the long arms of the levers, an evenner pivotally connected with the hub of the
60 wheel to vibrate concentrically with the axis of the shaft, links connecting the ends of the evenner with the short arms of the levers and means for normally retaining the weights on the ends of the long arms of the levers at the
65 central portion of the wheel, a rock-shaft in parallel position with the crank-shaft, an arm extended from the end of the rock-shaft, a link pivotally connected with said arm and with one end of said evenner, an arm at the center
70 of the rock-shaft and a stem pivotally connected with said arm and with the float, arranged and combined to operate in the manner set forth for the purposes stated.

ERNEST A. HORNBOSTEL, JR.

Witnesses:

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