No. 760,052. PATENTED MAY 17, 1904.

C. ANDREWS.

ENGINE GOVERNOR.

APPLICATION FILED NOV. 9, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig 1

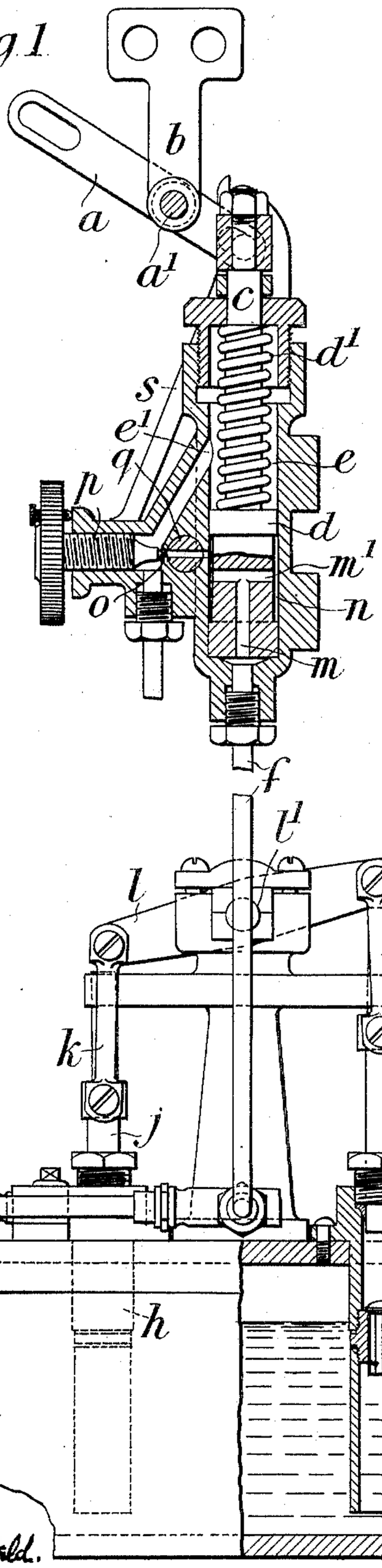
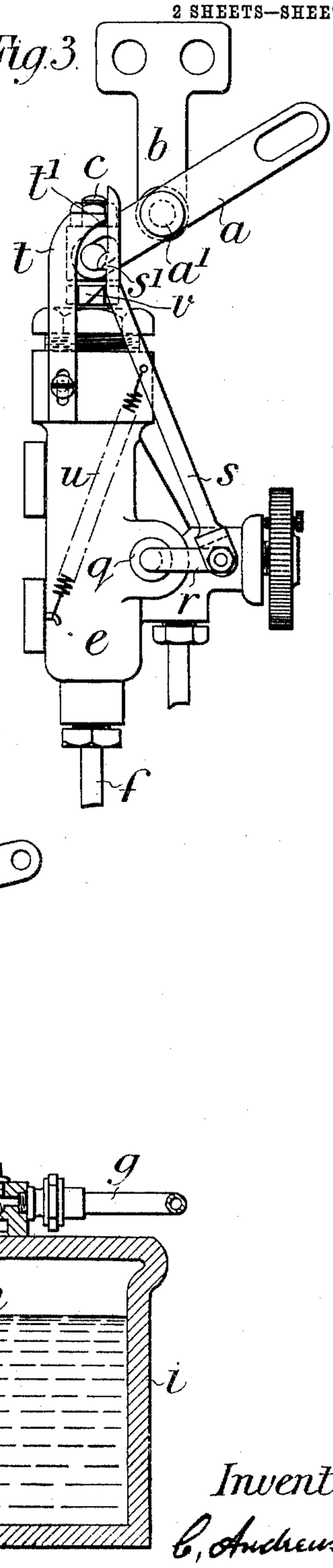


Fig 3



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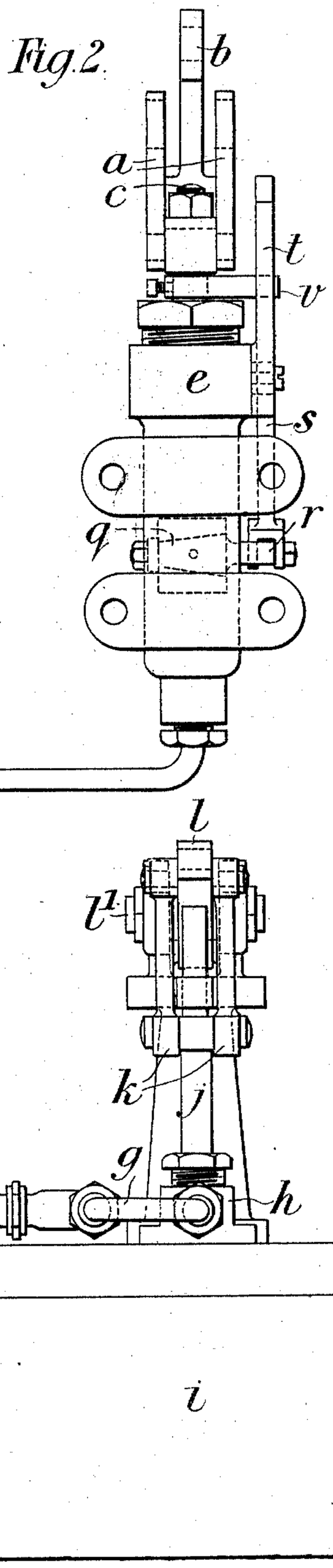
NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.



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UNITED STATES PATENT OFFICE.

CHARLES ANDREWS, OF DEPTFORD, ENGLAND.

ENGINE-GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 760,052, dated May 17, 1904.

Application filed November 9, 1903. Serial No. 180,467. (No model.)

To all whom it may concern:

Be it known that I, CHARLES ANDREWS, a subject of the King of Great Britain, residing at 16 Prince street, Deptford, Kent, England, have invented new and useful Improvements in Engine-Governors, of which the following is a specification.

This invention relates to improved apparatus for governing or regulating the speed of engines or motors using steam, gas, or a liquid as motive power.

According to the invention I provide a throttle or other valve controlling the admission or exhaust of the motive fluid, the said throttle-valve being adapted to be actuated by a piston-rod the plunger of which works in a cylinder supplied beneath the plunger with liquid or gas from a tank or other supply by a pump or pumps operated by the engine or motor to be governed. The cylinder in which works the plunger actuating the throttle or other valve has an outlet with which the liquid or gas forced into it is in communication, and the area of this outlet can be adjusted so that the amount of liquid or gas forced into the cylinder by the pumps when the motor is running at the normal speed is allowed to flow through the aforesaid outlet without actuating the valve-operating piston. As soon, however, as the speed of the engine accelerates the quantity of liquid or gas pumped into the cylinder increases, so that the plunger is raised, and thus operates the throttle or other controlling valve. I also advantageously provide means whereby when the plunger rises to shut off the admission of the motive fluid to the engine the outlet-passage from the cylinder is completely cut off, so that the plunger is operated more quickly, and thus effects a more rapid regulation of the speed of the engine.

In the accompanying drawings, Figure 1 is a sectional front elevation of a suitable form of governing apparatus made according to the invention. Fig. 2 is a side elevation of the apparatus, and Fig. 3 is a rear elevation of the gear controlling the throttle or other cut-off valve.

a is a lever, which is adapted to be connected at one end in any suitable manner to the throttle or other governing valve, (not shown in the drawings,) the said lever being pivoted at *a'* to a fixed bracket *b*. The other end of the lever *a* is connected by a slot and pin to the upper end of the piston-rod *c* of the piston or plunger *d*, which works in the cylinder *e*, being normally held in the position shown in the drawings by the spring *d'*. The lower end of the cylinder *e* is in connection, by means of the pipes *f* and *g*, with two force-pumps *h h*, arranged inside the tank or reservoir *i*, containing a gas or liquid—say water. These pumps are of the ordinary force-pump type, and their plungers *j j* are connected, by means of the links *k k*, to the two ends of the rocking beam or arm *l*, pivoted at *l'* and adapted to be oscillated from any suitable reciprocating part of the engine or motor to be governed. The plunger *d* is provided with the longitudinal passage *m* at its lower end, this said passage communicating, by means of the transverse branch *m'*, with the lower part of the cylinder *e*, the plunger *d* being reduced in diameter at this part, so as to provide an annular passage *n*. The annular passage *n* is in communication with the outlet *o*, formed in the cylinder-wall, and the area of which can be regulated by the screw-pin valve *p*.

The operation of the device is as follows—that is to say: When the engine is running, the rocking arm *l* is oscillated from the reciprocating part of the engine with which it is connected and reciprocates the pump-plungers *j j*, which thus force a continual supply of liquid from the tank *i* through the pipes *g*, *g*, and *f* into the lower part of the cylinder *e*. The liquid which is in the lower part of the cylinder passes through the passages *m* and *m'* in the plunger *d* into the annular space *n* and escapes through the lateral outlet *o* in the cylinder. The screw-pin valve *p* is set so that the effective area of the outlet *o* is such that it is just sufficient to take the quantity of liquid which is pumped into the cylinder *e* at the normal speed of the engine. When now the speed of the engine accelerates, the pump-plungers *j j* are reciprocated more rapidly, and this forces a larger quantity of the liquid into the cylinder *e* than can pass out through the outlet *o*, whereupon the

plunger *d* is pushed upward and operates the lever *a* so as to shut the throttle, or other valve controlling the admission of the motive fluid to the engine. The speed of the engine is thereby diminished, and the plunger *d* is returned to its normal position under the action of the spring *d'*. When the piston *d* uncovers the passage *e'* in its upward movement, it stops, and the pressure liquid overflows through the said passage into the discharge.

As in practice it is advisable that the upward movement of the plunger *d* should be as rapid as possible to more quickly control fluctuations in speed, I provide means whereby as soon as the plunger *d* commences its upward movement the outlet *o* is completely shut off, so that the full effect of the liquid pumped into the cylinder *e* is felt by the plunger *d*. A suitable arrangement is shown in the drawings and comprises the plug *q*, which is provided in the outlet *o*, the said plug having a passage which is normally in position to form a part of the outlet-passage *o*, as shown in Fig. 1. This plug is secured outside the cylinder *e* to a lever *r*, connected to an arm *s*, the upper end of which is provided with a lip *s'* and is securely held against the fixed stop *t* by the spring *u*. The piston-rod *c* carries a beveled tappet-arm *v*, adapted to act in conjunction with the aforesaid arm *s* as follows—that is to say: As the piston-rod *c* rises in the manner before described the tappet-arm *v* engages the lip *s'*, and thus raises the arm *s*, so as to turn the lever *r*, and consequently the plug *q*, to shut the passage *o*. As the piston-rod *c* rises to its uppermost position the upper surface of the lip *s'*, which is curved, as shown, comes into contact with the upper end or nose *t'* of the fixed stop *t*, so that the arm *s* is pushed aside laterally out of engagement with the tappet-arm *v* and is sprung back into its normal position by the spring *u* to again open the passage-way *o* and allow the liquid from the bottom of the cylinder *e* to escape and permit the piston *d* to descend under the action of its spring *d'*, or in lieu of the cock above described I can employ any other type of cock or valve, such as a piston-valve adapted to be operated in the manner above set forth.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In an engine-governor, the combination with a fluid-forcing device actuated by the engine, the speed of which is to be controlled, of a cylinder operatively connected with the forcing device and provided with an outlet to permit the fluid to flow through said cylinder, a piston in said cylinder, operative connections between said piston and the controlling-valve of said engine whereby during the operation of the engine at normal speed the fluid from the forcing device will pass through said cylinder without operating said piston, substantially as described.

2. In an engine-governor, the combination with a fluid-forcing device actuated by the engine, the speed of which is to be controlled, of a cylinder operatively connected with the forcing device and provided with an outlet to permit the fluid to flow through said cylinder, a piston in said cylinder, operative connections between said piston and the controlling-valve of the engine, whereby during the operation of the engine at normal speed the fluid from the forcing device will pass through said cylinder without operating said piston, and means for regulating the area of said outlet, to vary the normal speed of the engine, substantially as described.

3. In an engine-governor, the combination with a fluid-forcing device actuated by the engine, the speed of which is to be controlled, of a cylinder adapted to receive fluid from said forcing device, a reciprocating piston located in said cylinder, operative connections between said piston and the governing-valve of said engine, whereby the reciprocation of the former will operate the latter, said cylinder being provided with an outlet-port, means for regulating the area of said port to permit the escape of the fluid forced into said cylinder by the engine at normal speed without operating the piston, whereby an increase of fluid-pressure caused by the increase of speed of said engine will operate said piston to close said valve, and means operated by the piston for closing said outlet-port during the forward stroke of said piston to cause the same to reciprocate more quickly, substantially as and for the purpose described.

4. In an engine-governor, the combination with a fluid-forcing device actuated by the engine, the speed of which is to be controlled, of a cylinder provided with an admission-port for fluid from said forcing device, a reciprocating piston located in said cylinder, a lever pivoted to a fixed bracket and having its ends connected respectively to said piston and the governing-valve of the engine, said piston being provided with an annular passage, and an internal passage adapted to afford communication between said annular groove and said fluid-admission port, said cylinder being provided with an outlet-port adapted to communicate with said annular groove around said piston when the latter is in normal position, means for regulating the area of said outlet-port to permit the escape of fluid forced into said cylinder by said engine at normal speed whereby an increase of fluid caused by an increase of speed of said engine will operate said piston to close said valve, an overflow-passage for said cylinder adapted to communicate with said annular groove around said piston when the latter is forced forward to permit the escape of excessive fluid, a spring adapted to return said

piston to normal position when the speed of said engine has been regulated and means for closing said outlet-port in said cylinder during the forward stroke of said piston whereby the same is caused to operate more quickly substantially as and for the purpose described.

5. In an engine-governor, the combination with a fluid-forcing device actuated by the engine the speed of which is to be controlled, of a cylinder provided with an admission-port for fluid from said forcing device, a reciprocating piston located in said cylinder, a lever pivoted to a fixed bracket and having its ends connected respectively to said piston and the governing-valve of the engine, said piston being provided with an annular passage, and an internal passage adapted to afford communication between said annular groove and said fluid-admission port, said cylinder being provided with an outlet-port adapted to communicate with said annular groove around said piston when the latter is in normal position, a screw-pin valve adapted to regulate the area of said outlet-port to permit the escape of fluid forced into said cylinder by said engine at normal speed whereby an increase of speed of said engine will operate said piston to close said valve, an overflow-passage for said cylinder adapted to communicate with said annular groove around said piston when the latter has been forced forward, to permit the escape of excessive fluid, a spring adapted to return said piston to normal position when the speed of said engine has been regulated and means for closing said outlet-port in said cylinder during the forward stroke of said piston whereby the same is caused to operate more quickly, substantially as and for the purpose described.

6. In an engine-governor, the combination with a fluid-forcing device actuated by the engine the speed of which is to be controlled, of a cylinder adapted to receive fluid from said forcing device, a reciprocating piston located in said cylinder, operative connection between said piston and the governing-valve of said engine whereby the reciprocation of the former operates the latter, said cylinder being provided with an outlet-port, means for regulating the area of said outlet-port to permit the escape of fluid forced into said cylinder by said engine at normal speed, whereby an increase of fluid caused by an increase of speed of said engine will operate said piston to close said valve, a controlling-valve in said outlet-port, a pivoted arm connected to said valve, a guide engaging said arm, a beveled tappet on the piston-rod adapted upon its forward stroke to engage a part connected to said arm to operate said valve and a spring connected to said arm to permit it to pass said tappet on the return stroke of said piston, substantially as and for the purpose described.

7. In an engine-governor, the combination with a fluid-forcing device actuated by the engine the speed of which is to be controlled, of a cylinder provided with an admission-port for fluid from said forcing device, a reciprocating piston located in said cylinder, a lever pivoted to a fixed bracket and having its ends connected respectively to said piston and the governing-valve of said engine, said piston being provided with an annular passage and an internal passage adapted to afford communication between said annular groove and said fluid-admission port, said cylinder being provided with an outlet-port adapted to communicate with said annular groove around said piston when the latter is in normal position, a screw-pin valve adapted to regulate the area of said outlet-port to permit the escape of fluid forced into said cylinder by said engine at normal speed whereby an increase of fluid caused by an increase of speed of said engine will operate said piston to close said valve, an overflow-passage for said cylinder adapted to communicate with said annular passage around said cylinder when the latter has been forced forward to permit the escape of excessive fluid, a spring adapted to return said piston to normal position when the speed of said engine has been regulated, a controlling-valve in said outlet-port, a pivoted arm connected to said valve, a guide engaging said arm, a beveled tappet on the piston-rod adapted upon its forward stroke to engage a part connected to said arm to operate said valve and a spring connected to said arm to permit it to pass said tappet on the return stroke of said piston, substantially as and for the purpose described.

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