J. C. HAGAN.

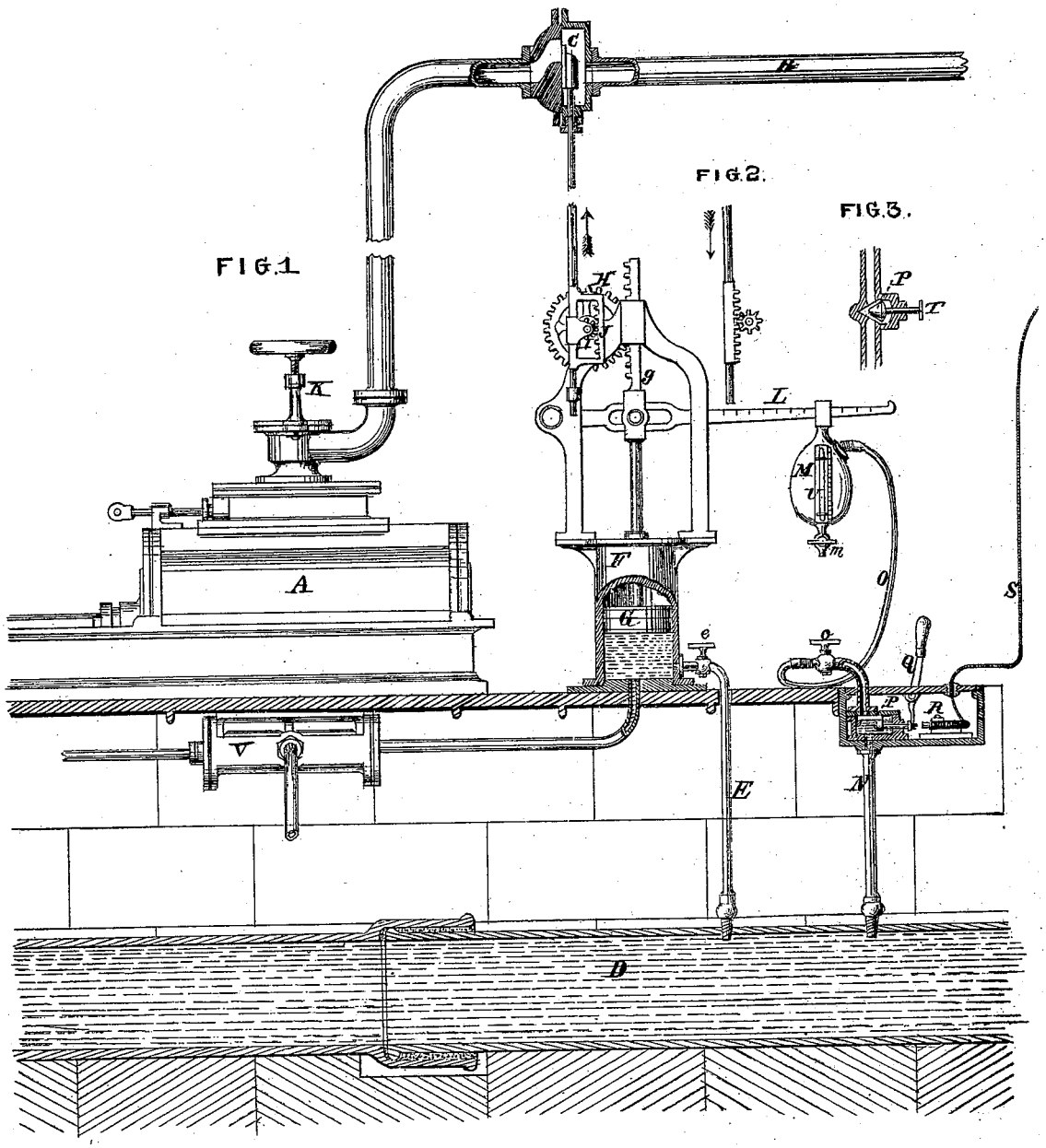
STEAM AND WATER SUPPLY AND PRESSURE REGULATOR.

No. 108,905. Patented Nov. 1, 1870.

FIG. 1

FIG. 2.

FIG. 3.



WITNESSES.

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IMPROVEMENT IN STEAM AND WATER SUPPLY AND PRESSURE REGULATORS.

Specification forming part of Letters Patent No. 108,905, *dated November* 1, 1870.

To all whom it may concern:

Be it known that I, JOHN C. HAGAN, of Nashville, in the county of Davidson and State of Tennessee, have invented a new and useful Pressure and Supply Regulator for Water and Steam Apparatus, of which the following is a specification.

My invention consists—

First, in a device whereby the pressure of water or steam to be governed is applied to a piston or its equivalent, communicating indirectly with the safety or regulating valve, so as to either open or close the said valve under increase of pressure, accordingly as the purpose for which the apparatus is constructed may render desirable.

Second, in a device whereby increased pressure in hydraulic pipes is sustained, when required, by the application of increased weight to the lever through or by which the regulating-valve is controlled.

Third, in combination with a pump or pumps employed to supply a city with water, and with a system of regulating-valves, an electro-magnetic connection, whereby the force of the pumping-engines can be instantaneously increased by an operator at any part of the town or city to which the water-pipes may extend. The pumps may thus be made to work under moderate pressure for the ordinary water-supply, and on the breaking out of a fire at any point the water may be immediately forced through the pipes with sufficient head to project it over or upon a burning building, and extinguish the fire without the aid of portable engines.

Fourth, in cases where the pumps are driven by water-power, my invention is also used to regulate the supply of water to one or more water-wheels, proportionately either to the force of the head or to the pressure required in the pipes, as hereinafter explained.

That the nature and operation of my invention may be clearly understood, I will describe an application of it to hydraulic apparatus. From this description the adaptation of certain parts of the invention to steam-enginery will be clearly apparent.

Figure 1 is in part a side elevation and in part a longitudinal section of a water-supply apparatus illustrating my invention. Fig. 2 is a diagram illustrating a modification in the valve-connection hereinafter described. Fig. 3 is a section illustrating a modified form of valve which may be used with my invention.

A may represent the steam-cylinder of a steam-pump of common form; B, the steam-supply pipe thereof, and C a throttle-valve in said pipe. D represents a water-main, through which water is forced by the said steam-pump.

From the main D rises a pipe, E, communicating with the lower part of a cylinder, F, which cylinder may be either open or closed at top, and is provided with a piston, G, the rod of which communicates with the rod *c* of the throttle-valve C, through the medium of the diminishing-gear H I J, or in any other mechanically equivalent manner which will produce a like result, the object being to regulate the opening of the valve proportionately to the pressure in the pipes, except when increased pressure is required for any purpose, as will be presently explained.

The engine A may also be provided with a hand-throttle, as shown at K, for use when required.

L is a lever employed to hold down the piston G, and carrying a weight, M, which is made hollow, so that it may be filled with water to increase its effect upon the lever L when required.

Water is forced up into the hollow weight M through pipes N O, guarded by a valve or cock, P, of any suitable form, which may be opened either by a hand-lever, Q, or by an electro-magnet, R, from which conducting-wires S may lead to any number of stations throughout the city.

For the purposes of the valve P, I prefer to employ the form of valve shown in Fig. 3. This is a solid conical valve, working in a chamber, which permits an equal pressure on both sides of the valve to balance it.

T, in Figs. 1 and 3, may represent the armature of an electro-magnet.

The pipe O is made flexible, to permit the adjustment of the weight M upon the lever. The pipes E and O may further be provided with cocks *e* and *o*, to be opened or closed by hand.

U represents a gage to indicate the quantity

or weight of water within the hollow weight M.

It will be apparent that the device represented in Fig. 1, consisting of the cylinder F, piston G, valve C, and connections H I J, constitutes an effective governor to be applied to steam-engines, the pressure of steam beneath the piston G, counteracted by an air-cushion or by a spring, in any customary manner, serving to regulate the extent of opening of the valve C.

For a steam safety-valve attachment, the connection would be as illustrated in Fig. 2, or in some equivalent manner, so that the elevation of the piston G by increased pressure of steam would open the valve C to discharge steam.

Operation: The various parts being in the positions shown in Fig. 1, any increase of pressure within the main D will raise the piston G and close the valve C until an equilibrium is restored. When it is desired to maintain a higher pressure within the pipes, this may be done to any necessary extent by introducing water into the weight M by opening the valve P, either by means of the hand-lever Q or by the electro-magnet R, which may be operated from distant points, as explained; or it may be so connected with the fire-alarm telegraph that whenever an alarm of fire is given, the pressure in the pipes will be immediately increased automatically.

When the normal condition of the parts is to be restored, the water may be allowed to escape from the weight M through a faucet, *m*; or, if the pipe O be connected where the faucet *m* is represented, at the lowest part of the weight, the water may flow out by the same pipe through which it enters.

The valve P may, by a simple connection, be opened automatically whenever a great increase of discharge from the service-pipes from the opening of one or more fire-plugs may indicate that increased pressure is needed. The connection may be made from the piston-lever to the valve P through the medium of a bell-crank or a wedge.

The first effect of opening a plug or plugs will be to reduce the pressure in the pipe D. The piston G and lever L immediately descend, causing the lever to depress the horizontal arm of a bell-crank, to which it may be permanently connected, or which it may strike after descending a certain distance, thus imparting a horizontal movement to the vertical arm of the bell-crank, which may be connected to the valve P to open it. The ball then will be immediately filled with water, and will load the piston G until the water is discharged from the ball by hand. A similar effect may be produced by means of a wedge attached to a rod to be forced down by the depression of the lever.

The piston G and valve C, and their intermediate connections, are applicable, for the purposes of a steam-governor, in the manner above described, excepting only that the piston G rests on steam from the boiler, the pressure of said steam being counteracted either by the elasticity of air confined within the upper part of the cylinder, or by a metallic spring of any common and suitable form; or, instead of applying steam-pressure to the piston, a pump, V, of any suitable construction, may be so connected with the engine that on any increase of motion of the latter a larger quantity of water will be forced into the cylinder F, so as to elevate the piston G.

The capacity of the discharge-pipe E will be graduated to equalize the ordinary action of the pump V, so as to maintain an equilibrium under such ordinary action, and to permit the fall of the piston when the engine is retarded.

For a steam safety-valve, the valve C will be adapted to permit the escape and discharge of steam, as before stated.

For the purposes either of a governor or a safety-valve attachment, my invention is especially valuable in connection with marine engines. A governor constructed as described is free from all the objections attaching to governors working by gravitation or centrifugal force.

As a safety-valve, the pressure-piston G and lever L may be located in the engine-room or in the pilot-house or cabin, and may communicate with a steam-valve so located as to discharge steam under the water or at any convenient distance.

For the purpose of regulating the supply of water to water-wheels for any purpose, the cylinder F is so connected with the pen-stock, or other container from which the water flows onto the wheels, that the water will rise within said cylinder in proportion to the head of water by which the wheels are driven. The rising or falling of the piston G will thus act to close or open the gates through which water is supplied to the wheel or wheels, or to open a larger or smaller number of gates, so that a single wheel may be made to pump water for ordinary consumption, but on the breaking out of a fire any necessary number of wheels may be brought into action.

For many purposes, my regulator L M N O P may be used without the cylinder and piston F G, a spring being employed to resist ordinary pressure on the rod *g*, and the weight being increased to open the supply-valve when required; or a common safety-valve, instead of the cylinder and piston F G, may be used in connection with my said regulator.

I claim as my invention—

1. The piston G, working in a cylinder, F, and regulating a valve, C, through the medium of suitable connections, substantially as herein set forth.

2. The hollow weight M, in combination with the lever L, and with a pipe, O, through which the said weight may be supplied with water to increase its effect, as required.

3. The electro-magnetic connection R S, op-

erating the regulator from distant points, substantially as specified.

4. The balanced valve P, Fig. 3, constructed and operating in the manner and for the purpose stated.

5. The combination, with the water-main D and a suitable pump or pumps, A, of the pipe E, cylinder F, piston G, and valve C, to automatically regulate the pressure in said main D, substantially as described.

6. The combination, with the water-main D, of the pipes N O, valve P, hollow weight M, and a regulating-valve of any suitable form, to admit of maintaining increased pressure in the pipes when required.

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Witnesses:
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