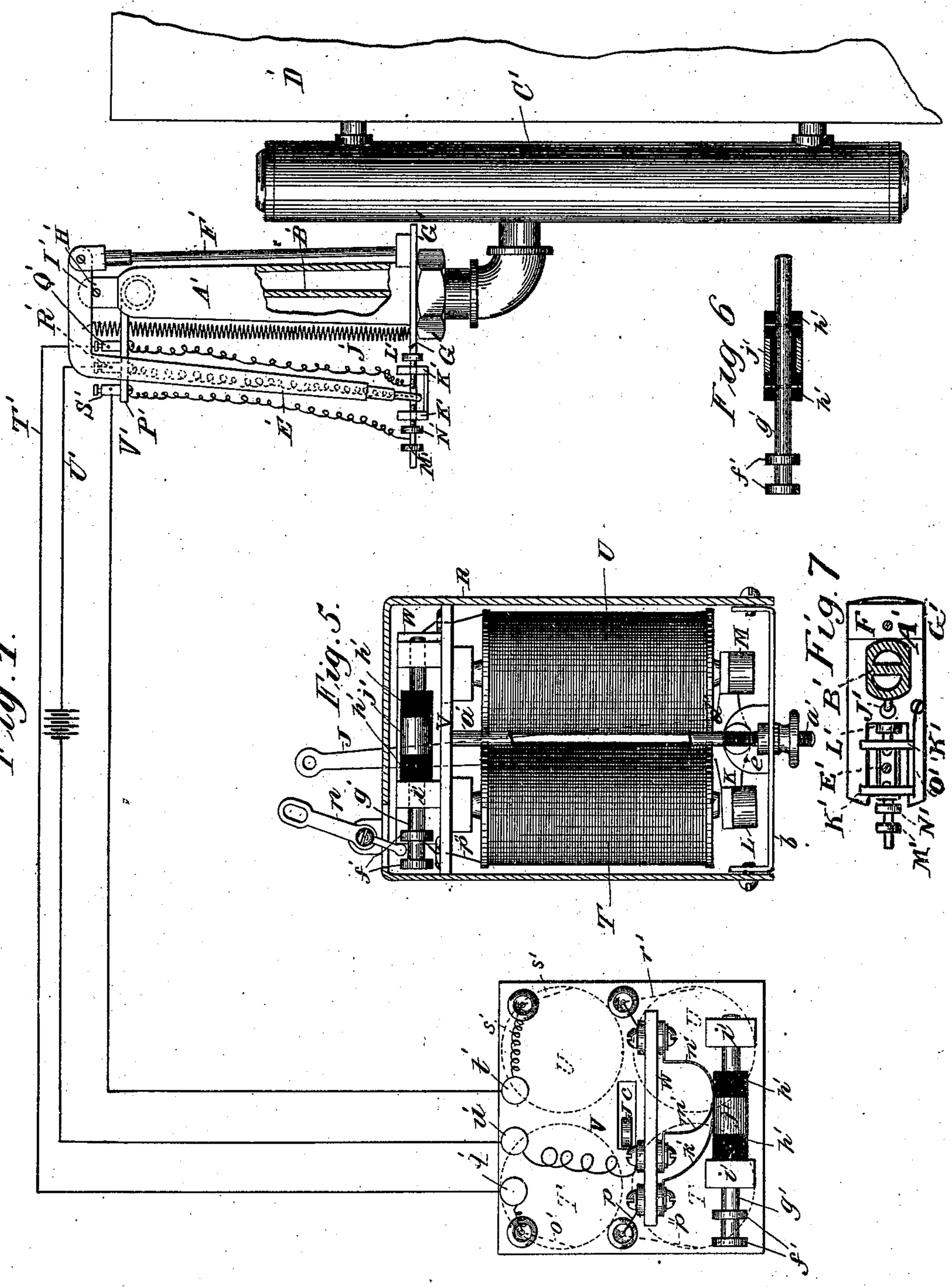
(No Model.) 3 Sheets—Sheet 1.

N. E. NASH & G. A. EDDY.

WATER REGULATOR FOR STEAM BOILERS.

No. 504,234. Patented Aug. 29, 1893.



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(No Model.) 3 Sheets—Sheet 2.

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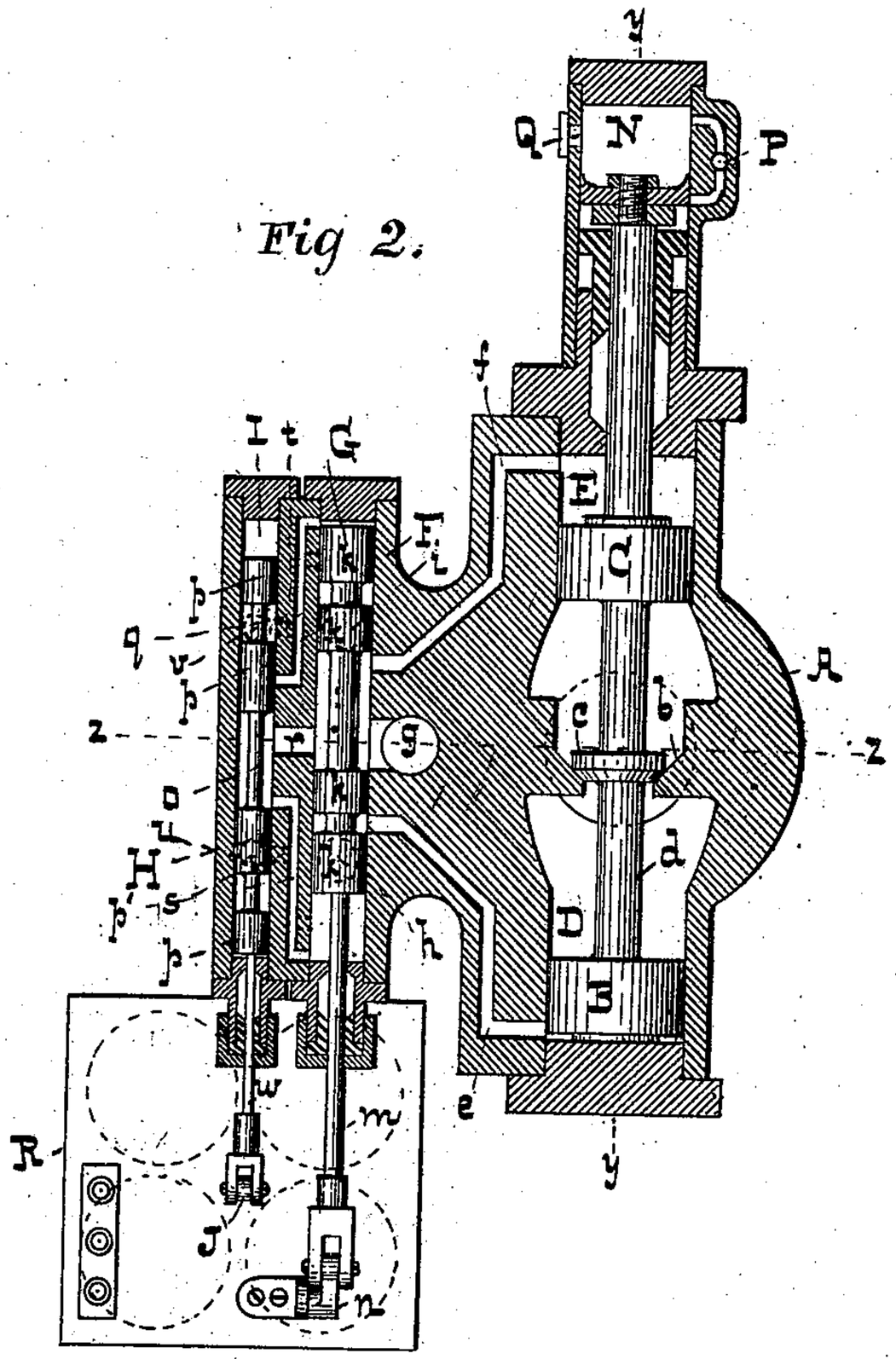
Fig 2.



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(No Model.) 3 Sheets—Sheet 3.

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Fig 3.

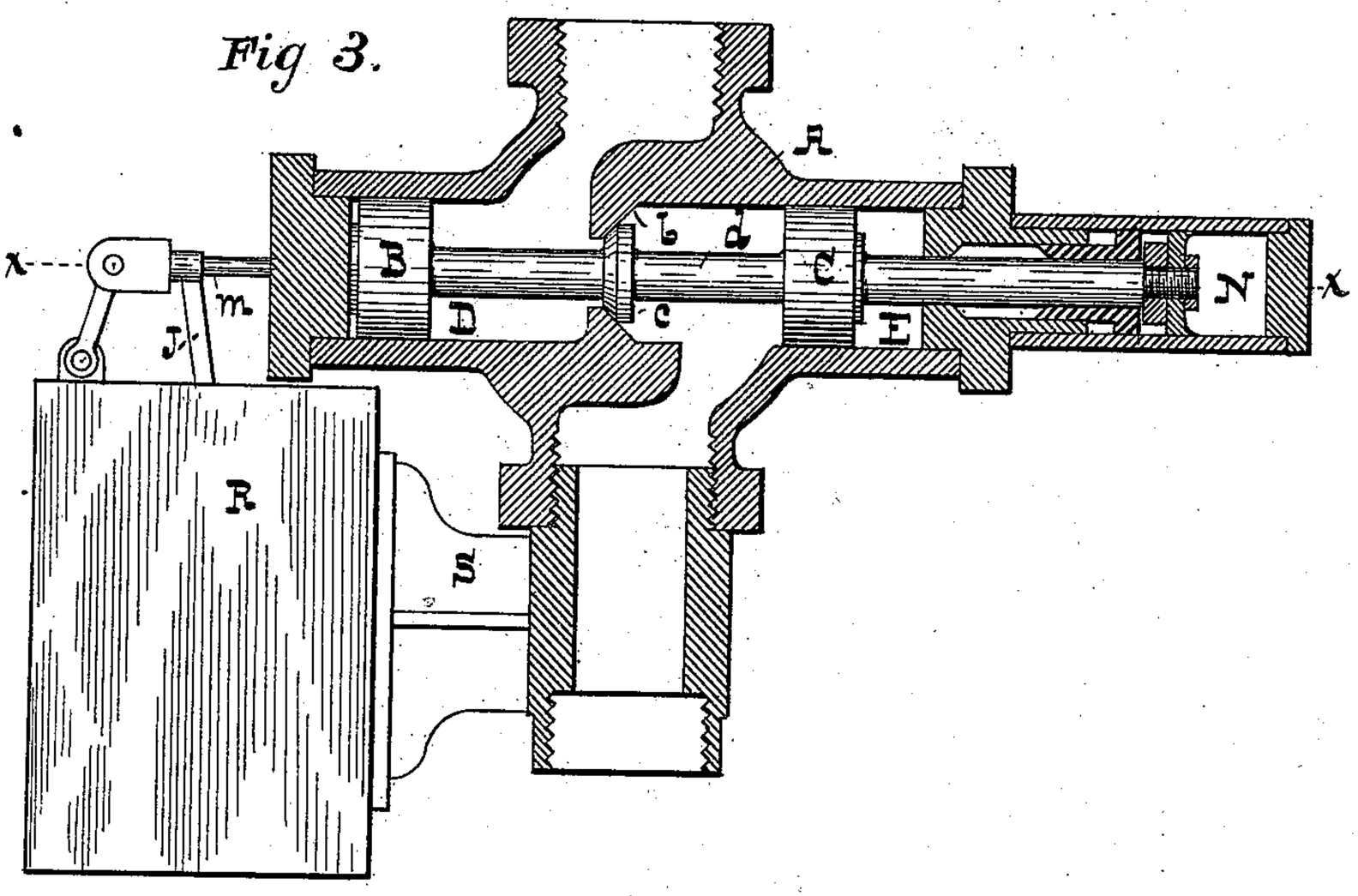
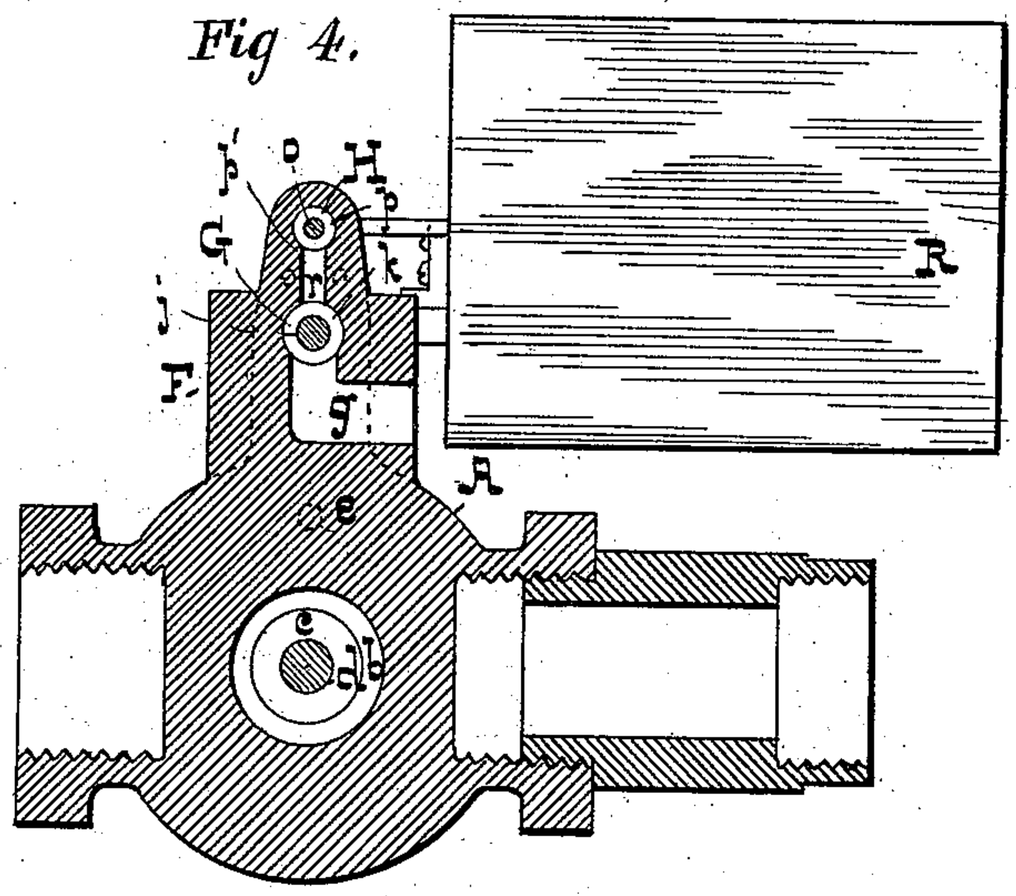


Fig 4.



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UNITED STATES PATENT OFFICE.

NATHAN E. NASH AND GEORGE A. EDDY, OF CLEVELAND, OHIO, ASSIGNORS TO THE NATIONAL ELECTRIC VALVE COMPANY, OF SAME PLACE.

WATER-REGULATOR FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 504,234, dated August 29, 1893.

Application filed August 13, 1891. Serial No. 402,553. (No model.)

To all whom it may concern:

Be it known that we, NATHAN E. NASH and GEORGE A. EDDY, both of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain Improvements in Water-Regulators for Steam-Boilers, of which the following is a specification.

This invention relates to improved mechanism which is placed in the steam pipe of the steam pump which feeds the boiler, whereby steam is admitted to the steam pump as the water in the boiler falls below a certain point, and is turned off as the water in the boiler attains its original height.

The devices which are applied directly to the boiler and are influenced by the change in level of the water therein to set in operation the mechanism hereinbefore alluded to, form no part of the present invention but are illustrated in the drawings, and partially described herein.

In the description of the said invention which follows, reference is made to the accompanying drawings forming a part hereof, and in which—

Figure 1 is a view of a part of a boiler, together with a sectional top view of the apparatus which forms the subject of the present invention, and a side elevation, partly in section, of the devices which are employed in connection with the boiler to co-operate with the same to effect the result desired. Fig. 2 is a section of Fig. 3 taken on the dotted line *x—x*. Fig. 3 is a section of Fig. 2 taken on the dotted line *y—y*. Fig. 4 is a section of Fig. 2 taken on the dotted line *z—z*. Fig. 5 is a vertical section of the valve operating devices; and Figs. 6 and 7 are details of the invention.

Similar letters of reference indicate similar parts in all the figures.

Referring to the drawings, A is the shell of the controlling valve, which is placed in the steam pipe of the water-feeding steam pump.

The valve seat is denoted by *b*, and the valve by *c*, see Figs. 2, 3, and 4. The valve *c* is on a stem *d* which carries two pistons, B and C, one on each side of the valve, and these pistons which are of uniform size or diameter, are adapted to slide in cylindrical chambers, D and E, which lead from and are in communication with the central chamber in which the valve is situated. By this construction it will be seen than any force of steam acting on the outer faces of the said pistons does not influence the valve, *c*, to open or close; or in other words the valve *c*, is balanced, and consequently no force is required to open or close it other than that to overcome the friction of the pistons.

F is the main valve chest, and the ports which lead from the same to the cylindrical chambers, D and E, exteriorly of the pistons, are denoted by *e* and *f*. Steam enters the chest F through the passage *g*, and is exhausted through the openings, *h* and *i*.

The piston valve, G, which is adapted to slide in the chest, F, consists of a stem, *j*, on which are formed collars, *k*, which constitute pistons and fit the chest steam tight. The construction of this piston valve is well known and forms no part of the present invention. The office of this piston valve is to open and close the main valve *c* through the medium of the pistons, B and C, and it is provided with a rod, *m*, connected by means of a pin with a lever adapted to operate a switch which places in circuit, and cuts out certain magnets for actuating a primary piston valve, H, which controls the movement of the valve, G, as will hereinafter fully appear. The primary piston valve, H, is formed on a stem *o* having collars, *p*, arranged in a similar manner to those on the stem *j* of the valve, G.

The ports which lead from the valve chest I, of the piston valve, H, to the valve chest F of the valve G, are denoted by *p′* and *q*, and the steam port *r* to supply this primary chest leads from the chest F.

The exhaust ports *s* and *t* are shown in dotted lines in Figs. 2 and 4 and also the openings *u* and *v* leading to the outer air.

The steam ports *p′* and *q*, and the exhaust ports *s* and *t* are situated side by side as shown in Fig. 2.

By reference to Fig. 2 it will be seen that the exhaust ports *p′* and *q* enter the valve chest F at points some distance from its ends. Consequently the exhaust steam in the chest F is cut off before the valve has reached its

full stroke, thereby forming a cushion which prevents the valve G from forcibly striking the heads of its chest.

The rod *w* of the valve H is connected by a suitable joint to a lever J having a cross arm K at its lower end to which the armatures L and M are attached, as will hereinafter fully appear.

The end of the valve stem *d*, of the main steam valve, *c*, enters a chamber N and is provided thereat with a piston, preferably of leather, and in the wall of the chamber, N, is a passage which extends from one end of the said chamber to the other. In the center of this passage is a cock or valve P, whereby the effective size of the passage may be regulated.

The chamber N, is filled with oil or glycerine through the filling aperture Q, and the contained oil, in the operation of the valve *c*, is forced from one end of the chamber N to the other, thus reducing the speed of the valve, *c*, which speed may be altered by adjusting the cock P.

R is a box secured to a bracket S on the side of the valve shell A.

T and U are pairs of magnets dependent from a plate V which is sustained by rods, *a'*, from the bottom *b'* of the box, R.

The lever J before alluded to, passes through the top, *c*, of the box, R, and is fulcrumed at *d'* to a lug, *e'* formed as a part of, or attached to, the bottom *b'* of the box, R. The arrangement of these parts together with that of the cross lever K and the armatures L and M is shown particularly in Fig. 5. The lever *n* which actuates the switch before alluded to is also well shown in this figure. The lever, *n*, passes through a slot in the top of the box R, and its short arm rests between two collars *f'* on the stem *g'* of the switch. The remaining part of this switch consists of a cylinder *h'* of some non-conducting material such as hard rubber, having in its center a groove filled with a metallic band *j'*. By this construction the metallic band *j'* is insulated from the stem *g'*. The stem *g'* of the switch passes through the supporting blocks *i'* which project from the plate V, see Figs. 5 and 6.

W is a bracket rising from the plate V to which the spring conductors *k'*, *m'* and *n'* are attached and insulated therefrom.

The leading wires *o'* and *p''* from the magnets T, lead respectively to the binding post *q'*, and the spring conductor *k'*, while the corresponding wires, *s'* and *r'* of the magnets, U, lead to the binding post *t'* and the spring conductor *n'*, respectively. The spring conductor *m'* is in the electric circuit and connected to the binding post *u'* to which the wire leading to the electric battery shown in Fig. 1 is also connected.

When the switch is in the position shown in Fig. 1, the pair of magnets, T, are in the circuit, and when the said circuit is closed by a suitable device at the boiler operated by the fall of water in the same below the desired level, the said magnets attract the armature L, and the lever J being carried to the right, (see Fig. 5) the primary steam valve H is moved so as to effect the movement of the valve, G to the left, and the opening of the valve, *c*, which admits steam to the steam pump and water is fed to the boiler. This feed continues until the proper level is attained when the actuating device or thermostat at the boiler reverses the operation and steam is cut off from the steam pump.

The device which we preferably apply to the boiler to actuate the mechanism hereinbefore described by closing the electric circuit, is shown in Figs. 1 and 7. Referring to these figures, A', is a hollow column divided by a central partition B', which extends to near the top, into two compartments. This column is tapped into a fitting which is screwed into the gage cock holder C' attached to the boiler a part of which is shown in Fig. 1 and designated D'. E' is a bent arm or lever, fulcrumed to a rod F' the lower end of which is fastened to a plate G' extending from the foot of the column A'. This bent lever rests on a pin or screw, H' which passes through a slotted lug, I', on the top of the column A'. A spring J' serves to influence the long arm of the lever toward the column A' and takes up all loose motion. The plate G' is slotted, and in this slot is situated a sliding carriage, K', which is insulated from the plate G'. This carriage is open in the center and from each end enters a screw. These screws are denoted by L' and M', and the latter which is intended to be adjusted, is fitted with a lock nut N'. The movement of the carriage is retarded by a spring O', shown in Fig. 7. At the upper end of the column A' is a try cock whereby water or steam may be blown off to clean the interior of the column, when necessary. At the same end is also a bracket P' to which three binding posts, Q', R', and S', are attached. Wires T', U', and V', lead respectively to the screw L', the lower end of the bent lever, E' which is furnished with an insulated contact point, and the screw M'. From the binding posts the same wires lead respectively to the binding posts *q'*, *u'*, and *t'*, see Fig. 1. The thermostatic column A' is of a variable length. When it is filled with water from the boiler which is cooler than the steam, it is shorter than when it is filled with steam in communication with that in the boiler; and in the change, from one length to another, the bent lever E' is moved and the insulated contact points of the same brought into communication with either the screw, L' or M', and the circuit closed, until the magnets actuated thereby are moved, when the circuit is again broken. The object in having the carriage movable in the slotted plate G' is to allow of the operation of the instrument at different temperatures, or at different steam pressures. When the pressure is changed the end of the bent lever moves the carriage, but this movement does not interfere with the operation of the

insulated contact point of the lever which brings the magnets T or U into the circuit, as will be readily understood. Supposing the thermostatic column to be filled with water, the column is at its shortest length, and the point of the bent lever is in contact with the screw L′. This places the magnets, U, in the circuit and thereby effects the closing of the valve, *c*, but as this valve is closed, and the steam pump thrown out of operation, the switch is moved which cuts out the said magnets and they are then in an open circuit.

From the description it will be seen that the battery is never in use except at the moment of opening or closing the valve *c*. At all other times it is in an open circuit.

We claim as our invention—

1. In an electric water regulating apparatus for boilers, the steam controlling valve of the feed pump having a cylindrical chamber at each side of the said valve and in communication with the central chamber in which the said valve is situated, combined with a piston in each chamber, the said pistons being connected with the stem of the said valve, a valve to admit steam alternately to the outer faces of the two pistons, and magnets which are charged by the rise and fall of the water in the boiler through the medium of a suitable thermostat, arranged to actuate the said controlling valve, substantially as, and for the purpose specified.

2. In an electric water regulating apparatus for steam boilers, the steam controlling valve of the feed pump having a cylindrical chamber at each side of the said valve and in communication with the central chamber in which the said valve is situated, combined with pistons on the stem of the said valve, one at each side thereof, a steam chest having a valve therein which controls the admission and escape of steam to and from the said pistons, and a second valve chest containing a valve to control the movement of steam to and from the first chest, and suitable magnets adapted to operate the last named valve as the change in water level in the boiler takes place, substantially as, and for the purpose specified.

3. In an electric water regulating apparatus, for steam boilers, the steam valve which regulates the admission of steam to the steam feed pump controlled by means of a primary and a secondary steam valve, the former in connection with actuating magnets and the latter adapted to operate a switch whereby the actuating magnets are cut out of the electric circuit, substantially as, and for the purpose specified.

4. In an electric water regulating apparatus for boilers, a valve to control the admission of steam to a steam feed pump, having on its stem two pistons of the same diameter, one at each side of the valve, the said pistons being in cylinders leading from the chamber in which the controlling valve is situated, a valve chest with ports in communication with the said cylinders having a balanced piston valve, a valve chest in communication with the first having a smaller balanced piston valve, magnets connected to the stem of the smaller piston valve, and a switch connected to the stem of the larger piston valve, whereby as the magnets are charged with electricity the two piston valves are moved and the steam valve opened or closed and the switch changed in position so as to cut out the said magnets, substantially as, and for the purpose specified.

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Witnesses:
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