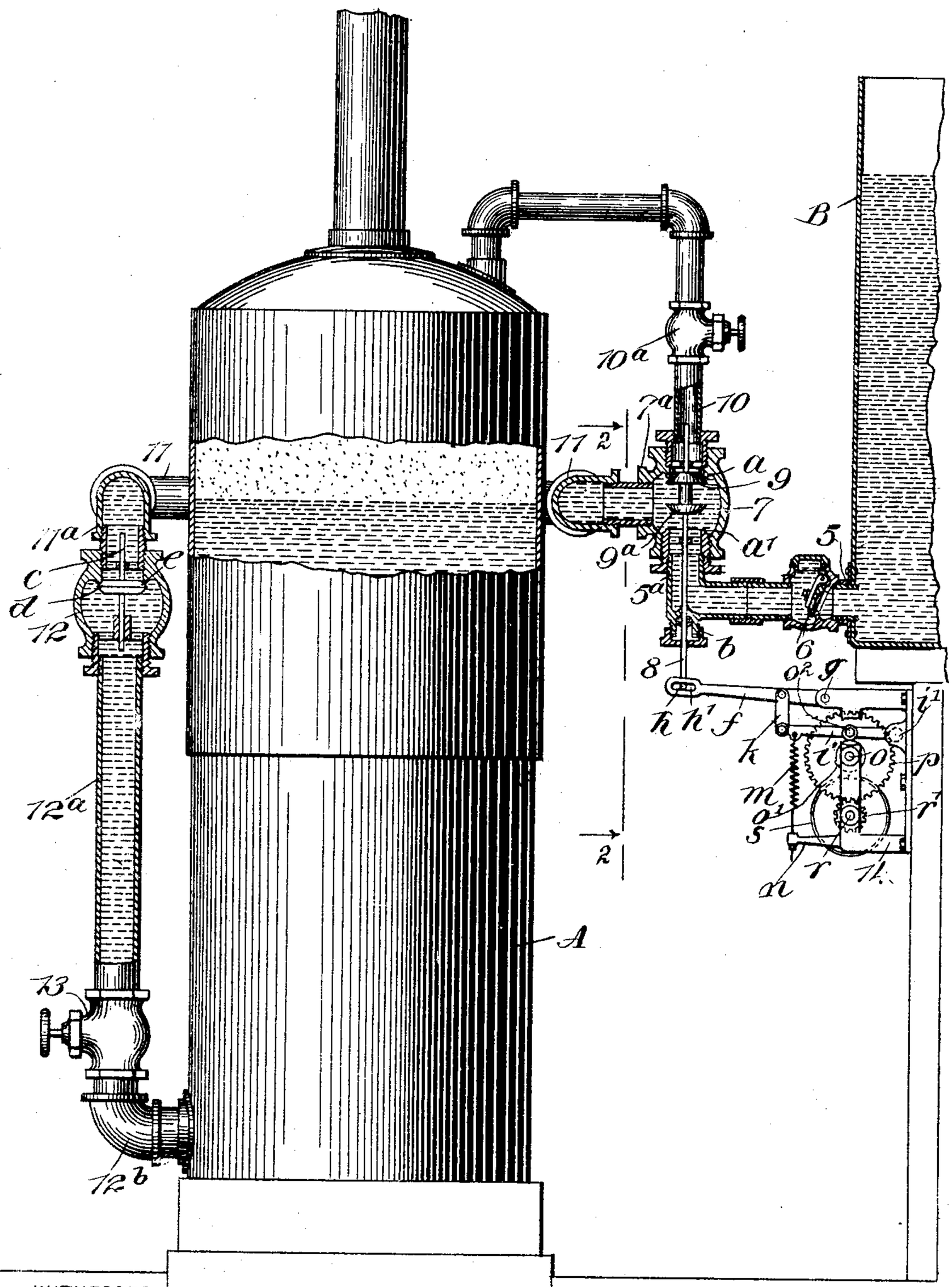
No. 764,988. PATENTED JULY 12, 1904.

E. L. DEL CASTILLO.

AUTOMATICALLY REGULATED FEEDER FOR STEAM BOILERS.

APPLICATION FILED OCT. 21, 1903.

NO MODEL. 2 SHEETS—SHEET 1.



WITNESSES:

C. B. Mattingly

Wm. P. Patton

FIG. 1. Enrique Loinaz del Castillo

INVENTOR

BY Munn & Co

ATTORNEYS

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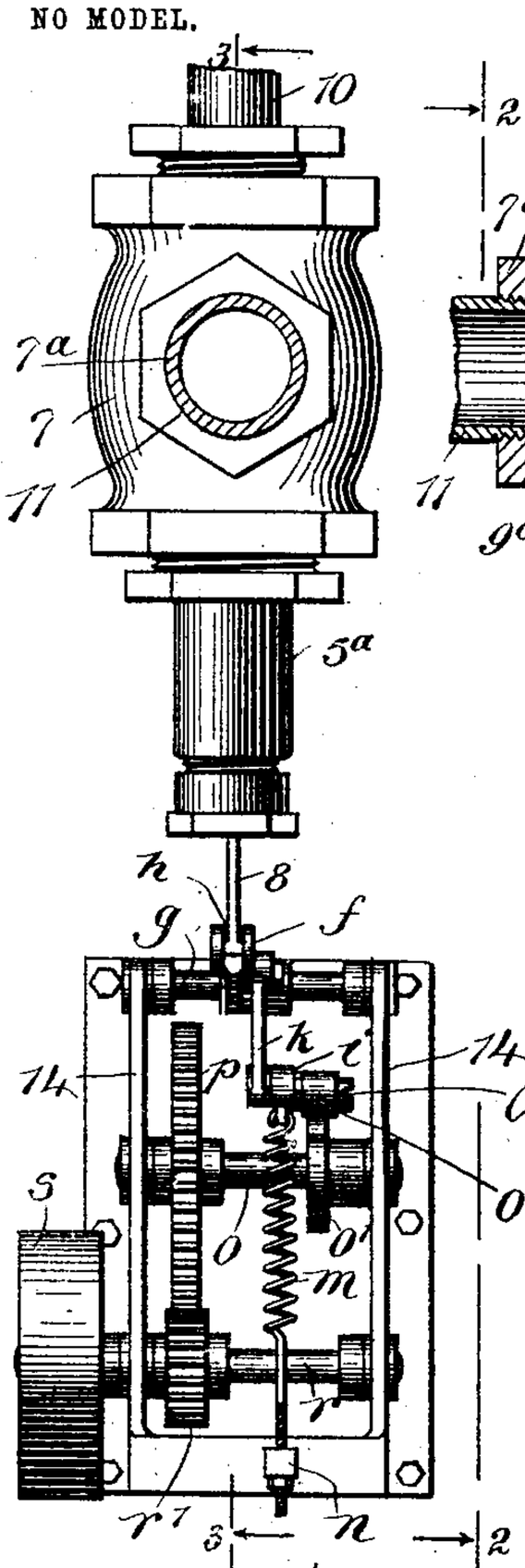

Fig. 2

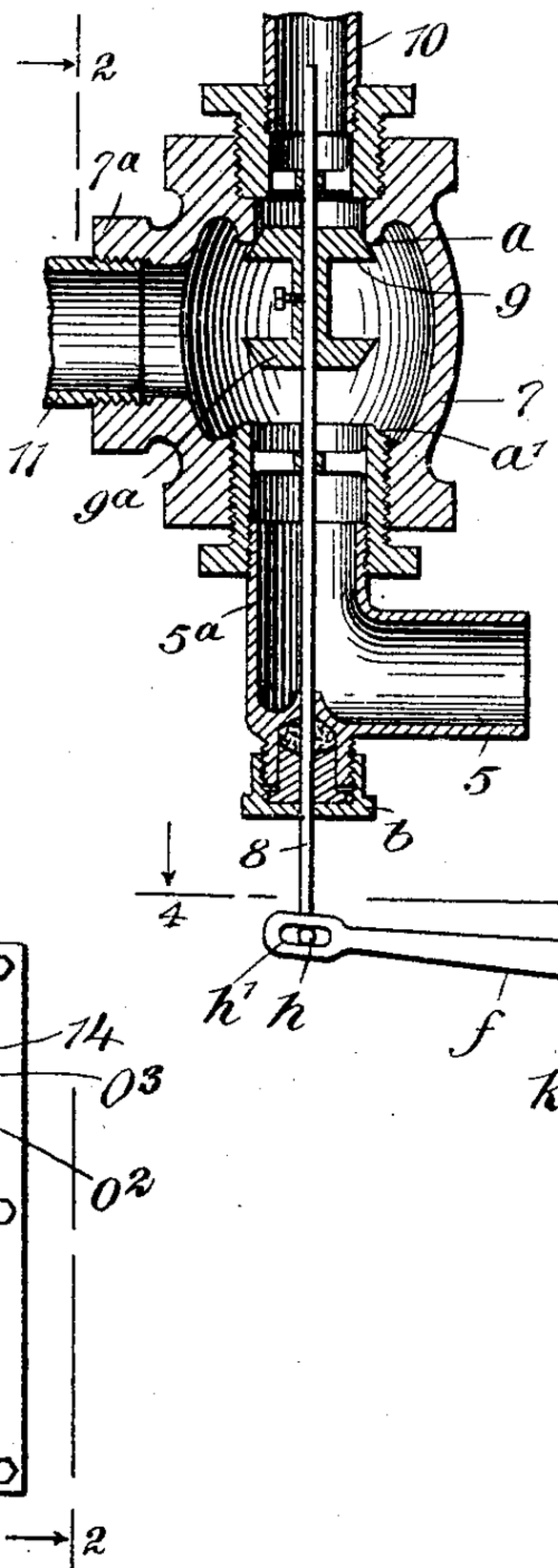

Fig. 3

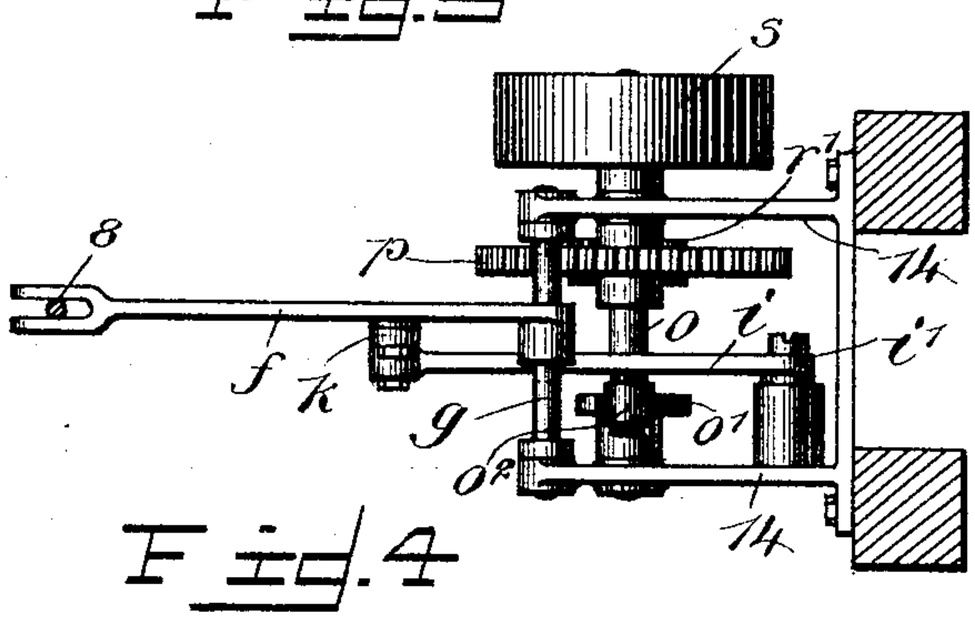

Fig. 4

WITNESSES:

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BY

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No. 764,988. Patented July 12, 1904.

UNITED STATES PATENT OFFICE.

ENRIQUE LOINAZ DEL CASTILLO, OF HAVANA, CUBA.

AUTOMATICALLY-REGULATED FEEDER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 764,988, dated July 12, 1904.

Application filed October 21, 1903. Serial No. 177,857. (No model.)

To all whom it may concern:

Be it known that I, ENRIQUE LOINAZ DEL CASTILLO, a citizen of the Republic of Cuba, and a resident of Havana, Cuba, have invented a new and Improved Automatically-Regulated Water-Feeder for Steam-Boilers, of which the following is a full, clear, and exact description.

This invention has for its object to provide novel features of construction and combinations of parts for a water-feeding apparatus that positively and exactly controls the introduction of water into a steam-boiler so as to maintain the level of water therein at a predetermined height automatically.

The invention consists in the novel construction and arrangement of parts, as is hereinafter described, and indicated in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of a steam-boiler broken away at the water-line therein and a sectional side view of the improved water-feed regulator applied thereto. Fig. 2 is an enlarged partly-sectional view taken substantially on the lines 2 2 in Figs. 1 and 3. Fig. 3 is a partly-sectional side view of the apparatus substantially on the line 3 3 in Fig. 2, and Fig. 4 is a partly-sectional plan view substantially on the line 4 4 in Fig. 3.

In the drawings that represent the construction and application of the invention, A indicates a steam-boiler of the high-pressure vertical type, and B a water-supply tank from which water is to be fed into the boiler and regulated in the quantity supplied thereto by means of the novel mechanism that constitutes the invention and which consists of the following details:

An outlet branch pipe 5 is secured upon the lower portion of the tank side wall and covers an opening therein, so as to receive water under pressure from the tank B, and in said outlet branch pipe a check-valve 6 is introduced which prevents back pressure, though this valve is not an indispensable feature of the invention.

A valve-casing 7 is connected with the outer end of the branch pipe by an engagement of one end thereof with the upper end of an upturned end portion 5^a of the branch pipe 5. The upright casing 7 is provided with two similar valve-seats *a a'*, that are respectively located at the upper and lower ends of said valve-casing. A valve-rod 8 is held centrally in the casing 7 and extends down through a suitable packing-box *b* on the lower side of the branch pipe at its upturned portion 5^a, the lower portion of the valve-rod extending from the packing-box a sufficient distance to permit a coupled engagement of the extremity with an actuating device that will be hereinafter described.

Upon the valve-rod 8, within the valve-casing 7, two united disk valves 9 9^a are mounted and secured, which are suitably spaced apart and are arranged for engagement with a respective valve-seat *a a'*, that will be effected when the valve-rod is reciprocated a degree limited by the alternate closure of the valves upon said valve-seats and by the throw of an actuating-cam that will be hereinafter described.

Connected with the upper end of the valve-casing 7 is the lower end of a steam-supply pipe 10, which extends to tap the upper portion of the steam-boiler A, and in the steam-supply pipe a valve 10^a is introduced for control or arrest of steam that passes from the boiler into the valve-casing 7 when the apparatus is to be stopped or removed. Between the ends of the valve-casing 7 an outlet branch 7^a is formed, which is connected to one end of the tubular water-conduit 11, which is attached horizontally to the boiler at the desired water-level and may extend around or partly around the shell of the boiler A in contact therewith to receive heat which pervades the boiler-shell when in service. At the remaining end of the water-conduit 11 a depending elbow 11^a is formed or secured, which is connected with the upper end of a valve-casing 12.

Upon a valve-stem *c*, that is held to reciprocate longitudinally and centrally in the valve-casing 12, a disk check-valve *d* is mounted and adapted to seat upon the annular valve-seat *e*, formed within the casing at a point

near the upper support for the valve-stem, the valve being normally held closed by steam-pressure on the water contained in the boiler. From the lower end of the valve-casing 12 a feed-water pipe 12^a extends toward the center of the bottom of the boiler and is therewith connected for the introduction of feed-water by means of the lateral extension 12^b of said feed-pipe, and in the latter a stop-valve 13 is preferably introduced for arresting the influx of water when it is desired to stop or to remove the apparatus.

Upon a suitable support that is near to and beneath the outlet branch pipe 6 preferably an open bracket-frame 14 is affixed, and, as shown, a rock-arm *f*, that is extended from the rock-shaft *g*, which is held to rock by a journaled engagement of its ends with the upper spaced members of the bracket-frame, is by its extended end loosely connected to the lower end of the valve-rod 8, said end being furnished with a T-head *h*, that works in a slot *h'*, formed laterally and longitudinally in the extended end portion of the rock-arm *f*.

An auxiliary arm *i* is pivoted by one end *i'* on the frame 14 and extends beneath the rock-arm *f*, with which it is loosely connected by a link *k*, and from the auxiliary arm *i* a retracting-spring *m* extends toward a limb *n* on the bracket-frame to which the lower end of the spring is secured, so that the tension of the spring is exerted to depress the auxiliary arm. On a counter-shaft *o*, that is journaled at its ends transversely upon the bracket-frame 14 below the auxiliary arm *i*, a cam-block *o'* is secured, that is engaged at its working edge with the periphery of a roller o^2, which is loosely mounted upon a journal-stud o^3, that projects laterally from the auxiliary arm *i*.

A spur-gear *p* is mounted upon and secured to the transverse counter-shaft *o* and meshes with a pinion *r'*, that is secured upon the driven shaft *r*, held to rotate on the frame 14 below the counter-shaft *o*. The driven shaft *r* extends at one side of the bracket-frame 14, and a pulley *s* is mounted upon and secured to this extended end of the shaft for engagement therewith of a driving-belt (not shown) that is to be connected to an engine or to any suitable means for transmitting rotary motion to the driven shaft *r*.

Operation: Before applying heat to the boiler water is introduced into it by merely raising the rock-arm *f*. As the water-tank B is elevated above the water-line to be maintained in the boiler A, it will be evident that if the stop-valve 13 is opened and the rock-arms *f* and *i* are raised, thereby adjusting the cam-block *o'*, as shown in Fig. 1, the lower valve 9^a is raised from the valve-seat *a'* and a continuous passage is afforded for water to flow from the tank B into the boiler A, thus permitting the boiler to be supplied with water to a proper height therein by gravity, it being understood that the usual means for indicating the height of water, such as a glass water-gage, has been provided, this detail being omitted from the drawings.

When in motion, assuming that steam has been generated in the boiler A by the application of heat thereto, the pressure of steam upon the water in the boiler will close the check-valve *d* upon its seat *e*, and thus arrest the flow of water into the boiler by gravity. To compensate for the evaporation of water for generation of steam in the boiler and to maintain into it a constant water-level, a quantity of water equal to that evaporated is fed therein through the pipe 11 by gravity, and said feed of water is automatically controlled by the improved apparatus, as follows: Motion being communicated to the cam-block *o'* by rotation of the pulley *s*, this will alternately seat and unseat the valves 9 9^a by lowering and raising the valve-rod 8. When by the downward movement of said rod the valve 9 is removed from the seat *a*, steam coming through the valve 9, that now will be opened, will enter the valve-casing 7 and also pass through the water-conduit 11 into the valve-casing 12. The pressure of steam thus produced on the upper surface of the disk valve *d* will at least equal that of the pressure of water on the lower surface of said valve-disk, and this will force the valve *d* to drop by its gravity, thus opening a passage for water from the conduit 11 to enter the boiler at the lower end 12^b of the feed-pipe 12^a. The next movement upward of the valve-rod 8, as shown in Fig. 1, will change the position of the valves 9 and 9^a, so as to unseat the latter and seat the former, and the feed of water into the boiler will instantly cease, due to the pressure existing inside the boiler causing the closure of the disk check-valve *d*. At the same time pressure disappearing at the pipe-conduit 11 by its being now incommunicated to the boiler through closure of valves 9 and *d* the water from the tank will flow by gravity into said conduit 11 until it is refilled, thus providing a quantity of water in the horizontal conduit 11 equal to that which said conduit has immediately before supplied to the boiler during the preceding downward movement of the valve-rod 8. The next movement downward of the valve-rod 8 transmitted by the rotary motion of shaft *o* and cam *o'* is already described. By it the valve 9 will be unseated, allowing the passage of steam from the boiler into the conduit 11, while valve 9^a coming down upon its seat cuts off communication of said conduit to the tank or pipe supply of water. Thus the steam coming through valve 9 into conduit 11 forces down and opens valve *d*, which was closed by the pressure existing in the boiler, and through it the latter is fed from conduit 11 till both boiler and conduit have the same level of water. Thus it is seen that a rotary motion being applied to a cam

o' the valve-rod 8 is caused to move periodically up and down thereby, connecting in the upward movement the conduit 11, through valve 9^a, to the tank or pipe supply of water to be filled by gravity, and then in the next downward movement of the rod the already-filled conduit 11 is communicated with the boiler through the steam-valve 9 and the water-valve 9^a to supply by gravity to the boiler the amount of water evaporated. The intervals of these periodical vertical movements of the valve-rod 8 may be fixed from no less than half a minute to one minute or time most suitable to special use. It is obvious that these periodical movements that change the positions of valves 9 and 9^a will without any regulating interference control the introduction of water into the boiler in a positive, continuous, and automatic manner.

The amount of water to be supplied to the boiler will influence the general dimensions of the apparatus to be installed; but no regulation will be needed afterward for the speed of the rotary movement of cam *o'* whether a large or a small amount of water is consumed. The reason of this great advantage is that the feeding-conduit 11 being a horizontal chamber located at the desired height of water-level will naturally cease flowing into the boiler as soon as water reaches the same level on both, whether their intermittent communication continues or not. Thus there is no possibility of the water in the boiler against the laws of gravity passing over the height of conduit 11, which is located at the desired height of level, and it will come under said level just the bare measure of the water evaporated during the interval of movement of the valve-rod—for instance, one-half a minute—while it cuts off communication with the boiler of conduit 11 to establish it with the tank or pipe supply to be refilled by the income of the same amount of water that the boiler was previously fed from said conduit. The water before reaching the boiler will be heated by the liquid always existing in conduit 11, besides said conduit being adapted, preferably, as a belt-pipe to the boiler, and thus maintained heated.

The check-valve 6 is not indispensable; but its presence is preferred to prevent any slight escape of steam during the motion of valves 9 and 9^a. The mechanism for producing the periodical vertical movement of the valve-rod 8 could be changed to an eccentric wheel or other suitable system; but the one employed in this description is preferred.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a water feeding and controlling apparatus for a steam-boiler, the combination with a boiler, and a water-supply, of a water-feeding conduit connected at its ends to the water-supply and to the boiler, a check-valve in the water-feeding conduit, a steam-supply pipe, a valve-casing between the water-feeding conduit and said steam-supply pipe, a valve-rod adapted to reciprocate in said valve-casing, two spaced valves mounted on the valve-rod and respectively controlling the entrance of steam and water into said valve-casing, and means to reciprocate the valve-rod and valves.

2. In a water feeding and controlling apparatus for a steam-boiler, the combination with a boiler, a water-supply, a water-feeding conduit connected by one end to the water-supply and at the other end to the lower portion of the boiler, and a check-valve in the conduit, above its discharging end, of a steam-supply pipe, a valve-casing connected at one end to the steam-supply pipe and at the other end to the water-conduit, a valve-rod working in and extended at one end outside of the valve-casing, two spaced valves on the rod, adapted respectively to close and open the entrance for steam and water into the casing, and means connected with the extended end of the valve-rod, for its reciprocation at a predetermined speed.

3. In a water feeding and controlling apparatus for a steam-boiler, the combination with a boiler, and a water-supply tank, of a water-feeding conduit disposed horizontally at the side of the boiler, a valve-casing laterally mounted on one end of the water-feeding conduit, a steam-supply pipe extended from the steam-space in the boiler to engage the upper end of the valve-casing, a valve-rod held to reciprocate vertically in said valve-casing, the lower end of said rod having a loose engagement with a rock-arm, means for positively rocking said arm, two valves spaced apart on the valve-rod and adapted by reciprocation of the rod to alternately open and close the inlets for steam and water into the valve-casing, a check-valve at the opposite end of the water-feeding conduit, and a water-feeding pipe extended from said check-valve and tapping the lower portion of the water-space in the boiler.

4. In an apparatus of the character described, the combination of a water-feeding conduit, a valve-casing having a lateral outlet that receives an end of the conduit, a steam-supply pipe tapping one end of the valve-casing, a water-supply pipe secured in the other end of said casing, a valve-rod held to reciprocate longitudinally of the valve-casing, two spaced valves on said rod, adapted for alternately opening and closing the inlets for water and steam into the ends of the valve-casing, and a power-actuated device, adapted to reciprocate the valve-rod.

5. In a device of the character described, comprising in part a steam-controlling valve, a water-controlling valve, and a valve-rod whereon said valves are mounted to open and close alternately, the valve-actuating mechanism, consisting of a supported frame, a main rock-arm rockably mounted on the frame and pivoted by one end upon the pendent end of

the valve-rod, an auxiliary rock-arm, pivoted by one end on the frame and at the other end upon one end of a link that at its opposite end is pivoted upon the main rock-arm, a retractable spring extended between the auxiliary rock-arm and a projection from the frame, a cam carried by a shaft journaled on the frame, said cam having contact with the auxiliary arm, to rock it against stress of the spring, speed-controlling gearing carried by shafts journaled on the frame and adapted to transmit motion to the cam, and means to rotate the gearing.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ENRIQUE LOINAZ DEL CASTILLO.

Witnesses:

WM. P. PATTON,

JNO. M. RITTER.