

C. E. SQUIRES.

FEED PUMP CONTROLLING DEVICE.

APPLICATION FILED MAR. 31, 1904. RENEWED JUNE 12, 1905.

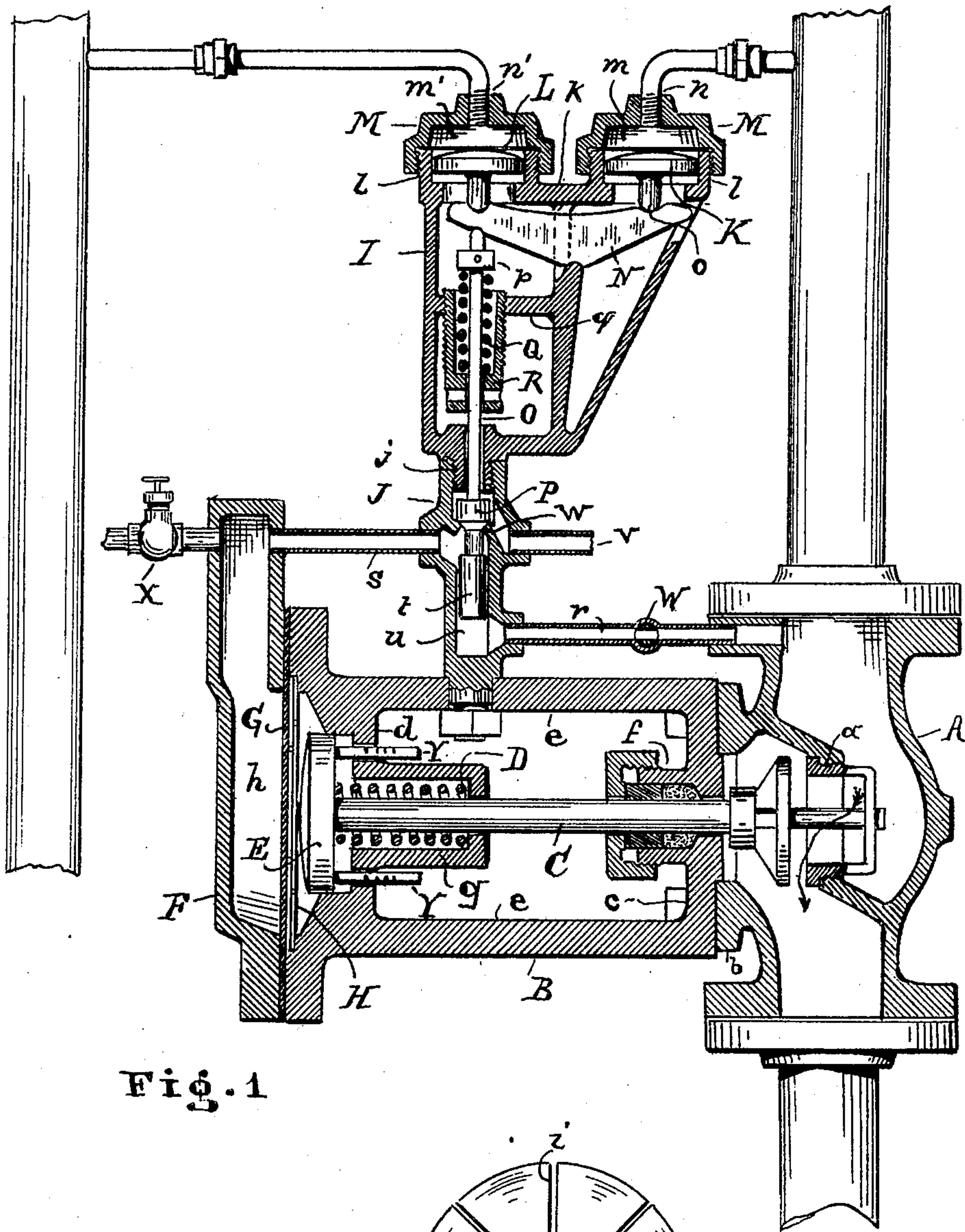


Fig. 1

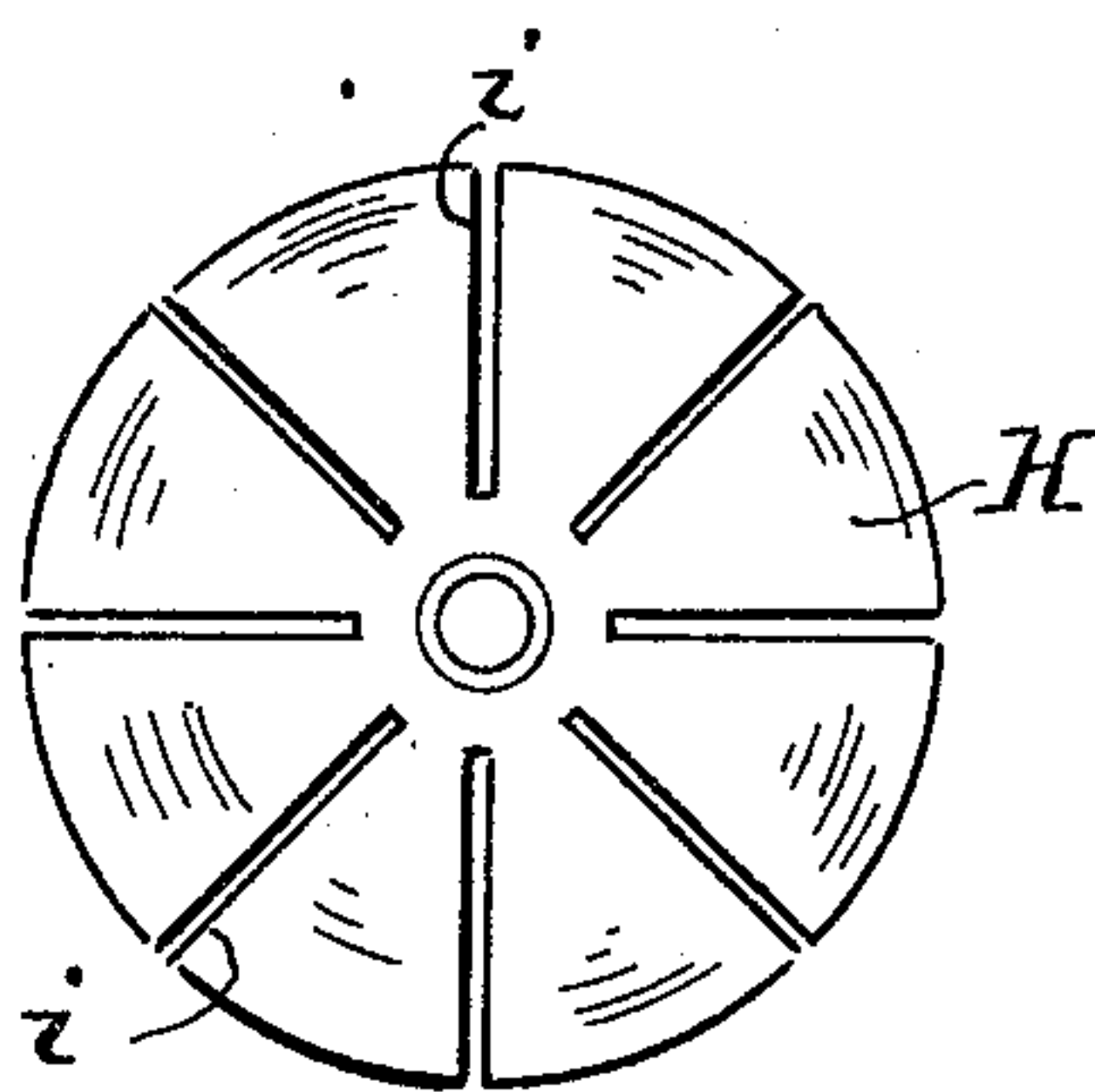


Fig. 2

WITNESSES

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## FEED-PUMP-CONTROLLING DEVICE.

No. 799,500.

Specification of Letters Patent.

Patented Sept. 12, 1905.

Application filed March 31, 1904. Renewed June 12, 1905. Serial No. 264,944.

*To all whom it may concern:*

Be it known that I, CHARLES E. SQUIRES, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Feed-Pump-Controlling Devices, of which the following is a specification.

My invention consists in improved means for controlling the operation of boiler-feed pumps; and the object of my improvement is to so equip steam-pumps of this kind as to render the operation thereof dependent upon the prevailing steam-pressure within the boiler, the equipment being preadjusted so that the pump can and will feed water into the boiler under a certain excess of pressure over the steam-pressure and that the pump may be operated with accelerated speed the moment the steam-pressure should attempt to diminish such excess of water-pressure. I attain this object in a contrivance constructed and arranged substantially as illustrated in the accompanying drawings, in which—

Figure 1 illustrates a vertical central sectional view of said device, and Fig. 2 is a face view of a detail part thereof detached.

Like letters of reference denote like parts in the drawings and specification.

The chief elements employed for obtaining results as above referred to consist of a diaphragm-controlled check-valve, a feed-water and steam-pressure adjustable balancing device, and a blow-off valve, the latter being placed intermediate said check-valve diaphragm and said balancing device.

Of the check-valve A the construction generally may be of the ordinary style. Preferably, however, it is provided with a removable seat of non-corrosive metal, such seat being indicated at *a*. Secured to the flange *b* of said valve is the structure B, which comprises the flange *c*, flange *d*, connecting-bars *e e* for said flanges, a stuffing-box *f* for the valve-stem C, and a cage *g*, which accommodates the placing of spring D and cap E. The flanges *c* and *d* are adapted for bolt connection with valve A and bonnet F, the latter forming a steam-chamber *h*, wherein the steam exerts pressure upon the cap E through the intervention of diaphragm G. Said diaphragm preferably consists of sheet-rubber, and to prevent undue wear of same one or more sheet-metal disks H are interposed between said diaphragm and cap E. A face view of one

of said disks is given in Fig. 2. As shown, said disks are slotted, as at *i i*, simply to render them more flexible and to make them more rapidly and easily respond to the movements of the diaphragm G.

The feed-water and steam-pressure balancing device comprises the frame I, which, as shown, is supported upon and by the casing of the blow-off valve J, as at *j*. Upon the platform *k* of said frame are formed annular externally-screw-threaded projections *l*. Plugs K are slidably arranged inside said cylindrical projections. Metallic flexible disks L cover the face of said cylinders, and screw-threaded caps M serve as a means of securely holding said disks and of forming chambers *m m'* on top thereof. The openings *n n'* leading to said chambers are adapted for pipe connection to convey steam and water to said chambers, respectively, from the steam-pipe feeding the steam-cylinder and from the discharge-pipe of the pump-cylinder of a boiler-feed pump. Directly underneath the platform and in opposing direction to said disks is supported the balance-lever N, the plugs K, with depending pins *o*, establishing operative connection with and between said disks and the said lever.

Extending up through the frame is the stem O. To the lower terminal of said stem is attached the plug P, while the upper terminal is bearing against the under side of lever N. Intermediate these terminals is arranged the balance-adjusting device, whereby the effect of the steam-pressure can be augmented in order to balance a predetermined overpressure in the water-discharge pipe from the pump. As shown, a spring Q is placed upon stem O, which spring bears against the collar *p* and the cup R, the latter having screw-threaded connection with and in the web *q* of frame I. Upon screwing the cup R up or inwardly the spring Q becomes more or less compressed and exerts pressure against the diaphragm in chamber *m'*. The more the spring Q is compressed the easier it is for the steam-pressure to balance the water-pressure.

For obvious reasons it is necessary that there should be an excess of water-pressure in order to assure free feeding of the boiler. Such excess can be obtained and maintained according to the volume of steam which is allowed to pass through valve A. Control of the steam-passage is therefore apparent. This is accomplished by the means above referred



to and the automatic blow-off valve J used in connection therewith. Said blow-off valve is preferably placed between the check-valve A and the bonnet F intermediate the pipes *r* and *s*, steam being conveyed through said pipes by way of said valve A to the chamber *h*, formed by the bonnet and diaphragm G.

The plug P has an extension *t*, which fits loosely in the bore *u* of the casing. Under retarded speed steam can therefore reach the pipe *s*. V is an outlet through which steam is blown off the moment the plug is lifted from its seat *w*. Under normal conditions this plug is continually on the point of blowing off. Thus even while steam is admitted to chamber *h* there will not be sufficient pressure exerted upon diaphragm G to cause a closing of said valve A. For this reason the pump will remain in operation and furnish water to the boiler as long as the steam-pressure does not fall below the predetermined necessary difference in pressures between water and steam. If, for instance, the spring Q is set under such tension that the lever N is enabled to balance an excess of five pounds on the water side, said plug P allows sufficient leakage of steam past its seat so as to retain the diaphragm G in inert condition, in which instance the pump remains supplied with steam, and the boiler is supplied with water under a pressure five pounds higher than the steam-pressure in order to overcome friction in the pipes, &c. In the event of the steam-pressure falling more than five pounds below the water-pressure then the lever would not be able to balance the water-pressure, and the result would be that the plug P is forced into its seat. Steam-pressure would accumulate in chamber *h* and thereupon close the check-valve A and hold it so until the steam-pressure would again rise within the five pounds limit in difference of pressure.

In actual operation fluctuations as above mentioned do seldom occur. The fact is that when this balancing device is once adjusted then the plug will continually remain in the released condition, in which state, however, only just sufficient steam can escape in order to maintain the check-valve open by eliminating the pressure upon the diaphragm G. The steam in passing the lower portion of the plug becomes throttled. Therefore only a diminutive jet of steam can escape while the plug is balanced from off its seat.

The device when once set will always retain the same difference in pressures and work equally as well and reliable under low pressures as with high pressures without requiring readjusting.

In place of the spring Q a weighted lever might be applied without departing from the nature of my invention.

In shutting off the valve or cock W and upon opening of the valve X the device can be put out of service to enable adjustment,

inspection, or repairs without stopping the pump.

The pins Y serve in the nature of indicators to show the extent to which the valve A is held open or whether same is open or closed.

From the foregoing it can readily be seen and understood that the above-described device, aside from a boiler-feed-pump controller, can find general application as a pressure reducing or regulating apparatus for pumps, engines, &c.

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

1. A controlling apparatus for steam-pumps, comprising the combination with the steam-supply and water-discharge pipe thereof of a check-valve, a steam-pressure-controlled diaphragm operatively connected therewith a bonnet forming a chamber with and for said diaphragm, a rigid structure connecting said valve and bonnet, an automatic blow-off valve intercepting the steam-conduit leading to said chamber, and a water and steam pressure balancing device controlling said blow-off valve in the manner as, and for the purpose set forth.

2. With boiler-feed steam-pumps the combination, of a check-valve, controlling the supply of steam to said pump, a diaphragm inclosed in a chamber which is arranged in fixed relation to said valve, a blow-off valve arranged intermediate said chamber and valve and a steam and water pressure balance device regulating the pressure in said chamber by the intervention of said valve, for the purpose set forth.

3. In combination with a feed-pump equipped with a check-valve in its steam-pipe, and an adjustable water-pressure-controlling device, a blow-off valve, a diaphragm acting upon said check-valve and suitable inclosures and connections for and between said diaphragm and said check-valve arranged substantially in the manner as, and for the purpose set forth.

4. The combination with the check-valve A and its stem C of structure B having rigid connection therewith, bonnet F secured to said structure, a non-metallic diaphragm G and slitted metallic disks H held secure between said structure and bonnet in operative connection with said stem and its cap for the purpose set forth.

5. In steam-pumps the combination of a check-valve, structures forming a steam-chamber outside said valve, a diaphragm and a cap situated within said structures and means extending externally of said structure to indicate the position of said valve.

6. A controlling device for steam-driven pumps comprising pressure-controlled means arranged in open relation with the steam-pipe and liquid-discharge side of such pumps and in connection with a blow-off valve, a check-



valve in the steam-pipe, a diaphragm arranged to control said check-valve and suitable communication arranged between the blow-off-valve casing, the diaphragm inclosure and the steam-pipe for the purpose of maintaining a predetermined pressure in the liquid-discharge side of such pumps.

7. A controlling device for steam-driven pumps comprising pressure-controlled means arranged in communication with the steam-pipe and liquid-discharge side of such pumps,

a blow-off valve actuated thereby, a check-valve in said steam-pipe, and a contrivance arranged and equipped to establish an automatic control over said check-valve under full or diminished steam-pressure as and for the purpose set forth.

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