May 7, 1929. A. BOYNTON 1,712,418

STAGE LIFT FLOWING DEVICE

Filed Nov. 21, 1927

Fig. 1.

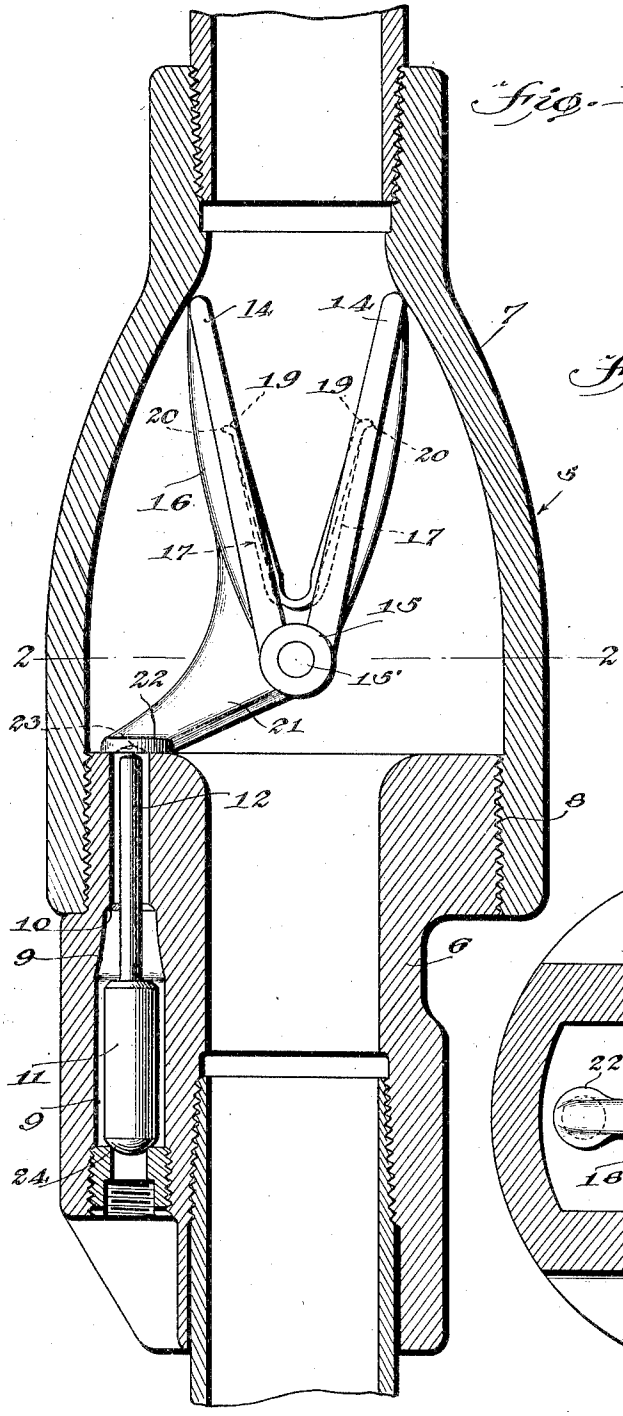


Fig. 3.

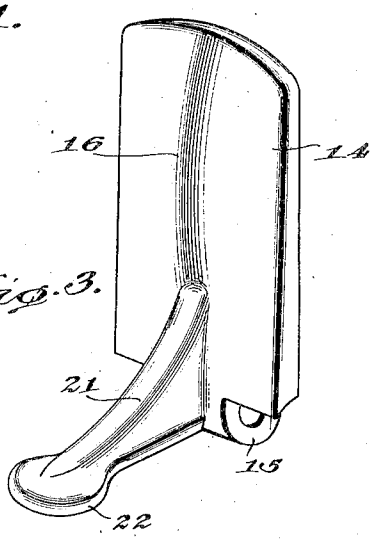
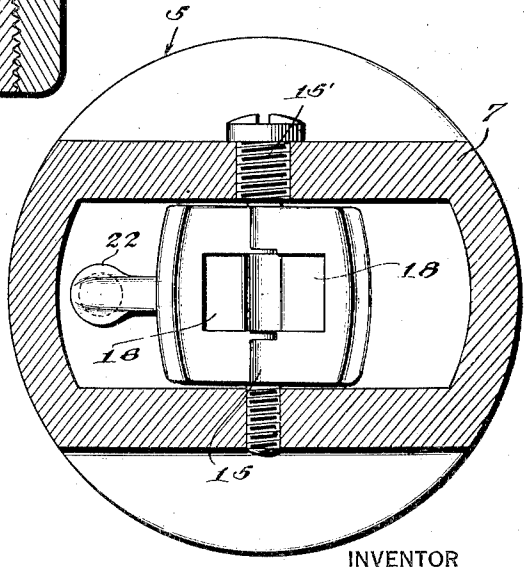


Fig. 2.



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UNITED STATES PATENT OFFICE.

ALEXANDER BOYNTON, OF SAN ANTONIO, TEXAS.

STAGE LIFT FLOWING DEVICE.

Application filed November 21, 1927. Serial No. 234,776.

My invention relates to automatic well flowing devices and more particularly to improvements in certain co-pending applications as follows: Case #13 filed Nov. 15, 1927, Serial #233,499; Case #14 filed Nov. 15, 1927, Serial #233,480; Case #15 filed Nov. 21, 1927, Serial #234,775; Case #16 filed Dec. 1, 1927, Serial #237,051, from each of which it distinguishes by a pair of pivotally supported members which relatively open and close and thereby control the position of a valve element, one of which has an extension for the purpose.

An object of the present invention is to provide a combination differential and velocity fluid pressure control device embodying an opening and closing valve actuating member which is arranged to receive a maximum force from the liquid column and thus assure positive closing of the fluid pressure control valve when the liquid column is moving at proper velocity and reversely operable to depress the valve to open position when such liquid column is moving below proper velocity.

With the preceding and other objects and advantages in mind, the invention consists in the novel combination of elements, constructions and arrangement of parts to be hereinafter specifically referred to, claimed and illustrated in the accompanying drawings, wherein:

Figure 1 is a longitudinal sectional view of the invention;

Figure 2 is a horizontal sectional view taken on line 2—2 of Figure 1; and

Figure 3 is a perspective view of the valve depressing member.

Referring to the drawing of the invention, the valve body 5 is shown to comprise cylindrical castings 6 and 7 threadedly or otherwise coupled as at 8. The casting 6 is provided with a longitudinally extending bore or valve chamber 9 which communicates with the interior of the casting 7 and is formed with a valve seat 10 intermediate the ends upon which a differential and fluid velocity actuated valve element 11 arranged in the valve casing is adapted to seat, the valve element having a longitudinally extending stem 12.

The casting 7 is substantially bell-shaped and mounted therein is a valve depressing member comprising a pair of coacting vanes or plates 14 having interfitting knuckles or hinge barrels 15 at their lower ends which receive a horizontally extending pivot pin 15′ passing transversely through the casting 7 at a point slightly above the upper end of the casting 6 at the longitudinal center thereof.

The outer faces of these vanes or plates are convex or longitudinally curved at as 16, while their inner faces are flat and formed with longitudinally extending grooves 17 to receive the legs of a V-shaped leaf spring 18 interposed between these vanes to urge them in divergent relation. To secure this spring in place the free ends are extended at right angles, as indicated at 19 and engaged in recesses 20 in the vanes at the upper ends of the grooves.

It will be observed that the vanes extend in divergent relation longitudinally of the casting 7 with their free ends abutting the walls of the casting at the small or upper end during periods of no upward fluid movement in the tubing (no differential). Thus the vanes will assume an angular position with relation to the passage of the liquid column passing through the casting 7 during all times when the upward moving fluid column is moving at speeds less than the maximum desired velocity. The vanes will move laterally together where they will lie parallel to each other at the longitudinal center of the casting 7, while the liquid column is moving at maximum desired velocity.

At the lower end and upon the outer face one of these vanes is formed with an angularly disposed extension 21 whose lower end terminates in a circular foot 22 which abuts the upper end of the casting 6 and overlies the stem 12, disengaged therefrom, during periods of no upward liquid movement in the tubing, the foot having a recess 23 in the underface engageable with the upper end of the stem 12, the recess being to prevent forced closing of the valve element upon the lower seat during periods of little or no differential, thereby providing for the admission of a maximum amount of liquid energy during such periods. It will be observed that the greatest by-passing area between plunger and wall 9 exists at this time of little or no differential (little or no velocity).

Operation.

Assuming the liquid column is moving upward at less than the desired velocity, the vanes assume the divergent position illustrated in Figure 1 with the extension in lowered position to depress the valve element

to open position to allow differential pressure to pass into the casting 7 and accelerate the liquid column.

When the liquid column is travelling at the desired velocity it flows against the divergent vanes and moves them together and elevates the circular foot 22 from the stem 12, thereby permitting the valve to close in response to the greater pressure below the plunger 11 than exists within the chamber or casting. Due to the pressure of the liquid column against the vanes they are held in this position until the velocity of the liquid decreases to a point where the force of this velocity is insufficient to overcome the tension of the spring, the latter then functions to return the vanes to divergent positions and engage the extension foot 22, with the plunger valve stem 12 to depress the valve element and thereby admit more liquid energy in order to re-establish or maintain the desired velocity of the upward moving fluid in the tubing.

The plunger or valve element 11 at times of no differential rests upon a seat indicated at 24, this seat comprising the edge of an inlet bore of a bushing fitted in the lower end of the bore or chamber 9. Such times of no differential could, of course, be only when the tubing outlet is closed by a discharge valve closed by the operator when it is not desired to flow the well or during times that there is no pressure in either casing or tubing.

What is claimed is:—

1. In combination a body through which liquid is adapted to pass under the influence of fluid pressure and having a valve controlling the admission of pressure fluid thereto, and a pair of pivotally supported members in the body and operable by the liquid column to govern the opening and closing movement of the valve.

2. In combination a body through which liquid is adapted to pass under the influence of fluid pressure and having a valve controlling the admission of pressure fluid thereto, and a pair of pivotally supported members in the body moved and sustained in a position to permit closing of the valve by the liquid column when travelling at normal velocity and operable to retain the valve in open position upon diminution of velocity of the liquid column.

3. In combination a body through which liquid is adapted to pass under the influence of fluid pressure and having a valve controlling the admission of pressure fluid thereto, and a pair of pivotally supported members in the body and moved towards and away from each other according to the velocity of the liquid column and operable to actuate the valve to open position upon diminishing velocity of the liquid column.

4. In a valve actuating device, a conduit through which a liquid column is adapted to pass under the influence of fluid pressure, a valve for controlling the admission of fluid pressure to the conduit, a pair of normally divergent vanes in the conduit and actuated to parallel relation by the liquid column when moving at normal velocity, and an extension carried by one of the pivoted members and engageable with the valve to retain it in open position when the pivoted members are in divergent relation but is elevated to permit closing of the valve when the pivoted members are in parallel relation.

5. In a valve actuating device, a conduit through which a liquid column is adapted to pass under the influence of fluid pressure, a valve for controlling the admission of fluid pressure to the conduit, and a pair of pivotally supported members in the conduit operable in one direction by the liquid column to permit closing of the valve and in the opposite direction to open the valve and retain it in such position.

6. In a valve actuating device, a conduit through which liquid is adapted to pass under the influence of fluid pressure, a valve controlling the admission of fluid pressure to the conduit, a pair of divergent pivotally supported vanes in the conduit in the path of liquid, a spring interposed between the vanes and tending to urge them away from each other, and an angularly disposed extension normally engaging the valve to retain it in open position, the vanes being actuated towards each other to disengage the extension from the valve to permit closing of the latter when the pressure of the liquid passing through the casing is sufficient to overcome the resistance of the spring.

7. A valve comprising a body having a conduit and a passageway connecting the conduit with the outside of the body, a valve element operable in the passageway to control the flow of pressure fluid, a plurality of members assembled upon a common pivot in the conduit tending to obstruct the conduit but being subject to closing movements by a liquid flow induced by an admission of pressure fluid at the passageway, and an extension carried by one of the members being superimposed upon the valve element and following the movements thereof in a prescribed zone.

Signed at San Antonio, in the county of Bexar and State of Texas, this 26th day of October A. D. 1927.

ALEXANDER BOYNTON.