Oct. 3, 1933. A. E. G. EHN 1,929,019

APPARATUS FOR PRODUCING SIGNALS

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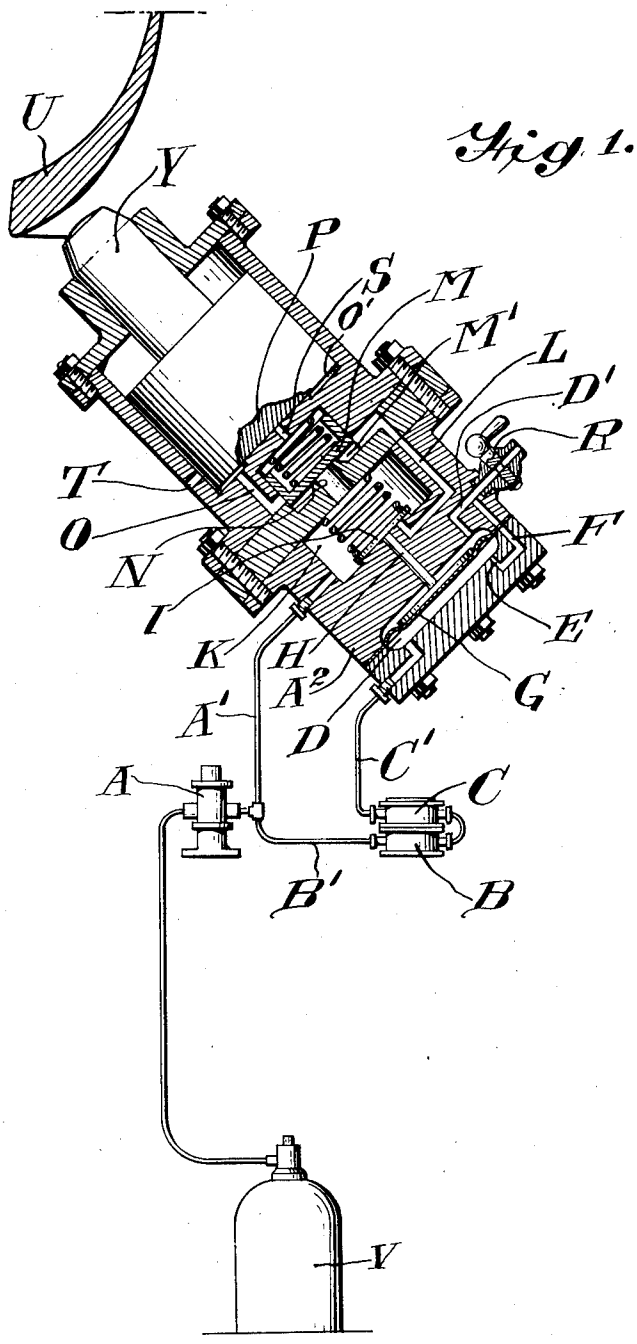

Fig. 1.

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Fig. 2.

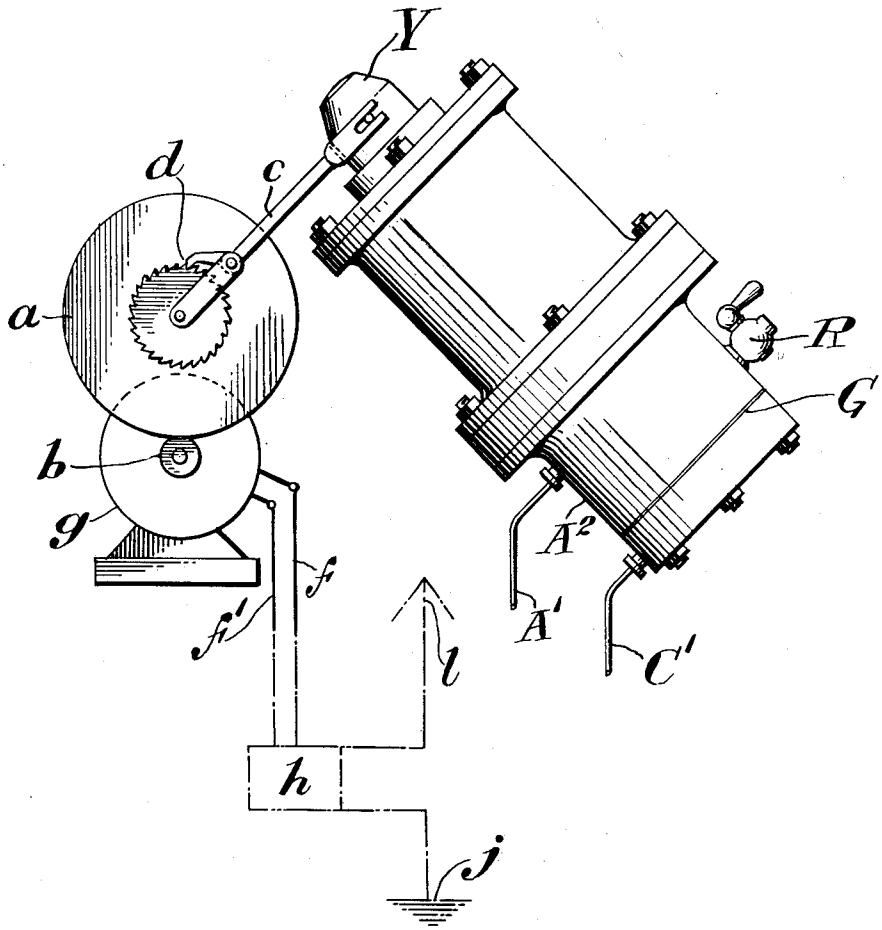

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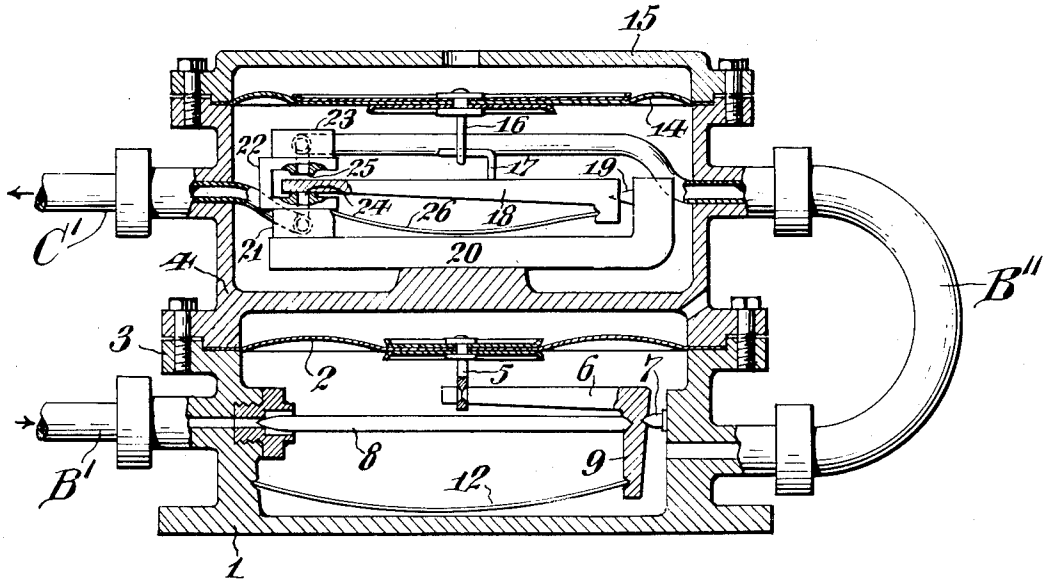
Fig. 3.



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UNITED STATES PATENT OFFICE

1,929,019

APPARATUS FOR PRODUCING SIGNALS

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13 Claims. (Cl. 121—2)

My invention relates to improvements in apparatus for producing signals at certain predetermined intervals of time. Broadly, the invention relates to apparatus in which movement is imparted periodically to a movable member by means of pressure exerted by a fluid, such as gas or the like. The movable member may consist of a piston movable or operable in a cylinder, a diaphragm, or the like. The apparatus embodying the invention may be operated automatically for producing sound signals at predetermined intervals of time and the means for producing the signals may consist of a bell or other like member and a clapper, hammer, or other like instrumentality capable of striking against the bell or the like to produce the sounds desired. The clapper, hammer or other striking instrumentality is connected directly or indirectly with the movable member previously referred to.

As already indicated, the sound signals may be produced at equal or at unequal intervals of time, as may be desired. The said signals may be produced in series of two or more sounds relatively close together and the said series separated from each other by intervals of time longer than those which separate the sounds of the series themselves. In fact, the signals may be produced in such combinations and in such relation to each other as may be desired.

The apparatus also may constitute means for the transmitting of radio signals of any desired character. In this case the movable member is caused to actuate an electric generator for generating electric current impulses which are transmitted to a radio transmitter for producing automatically radio signals. A constant or approximately constant speed may be imparted to the generator by connecting it with the movable member of the apparatus of my invention and by providing it with a fly-wheel or the like. The signals of the radio transmitter may be controlled independently of the impulses of power from the movable member of my invention above referred to or a periodical motion or movement may be imparted to the generator from the said movable member and the radio signals may be controlled directly from or by means of the said movable member.

The invention consists of an apparatus comprising means for insuring reliable action of a member for controlling the passage of a fluid under high pressure to the movable member of the said apparatus for actuating the same to produce the sound signals desired. Such movements may be produced at equal or unequal intervals of time. The said member for controlling the action of the fluid is in turn controlled directly or indirectly by means actuated by a fluid of lower pressure than that for actuating the movable member for producing the sound signals.

In order that the invention may be readily understood and its practical advantages fully appreciated reference should be had to the accompanying drawings wherein I have illustrated one embodiment of the said invention. However, it is to be understood that the invention is susceptible of embodiment in other forms than that shown within the scope of the claims.

In the drawings:

Fig. 1 is a view in vertical section of an apparatus embodying the invention, the said view also showing in elevation means for supplying a fluid under pressure to said apparatus; and

Fig. 2 is a view in elevation of the apparatus shown in Fig. 1, said apparatus being shown as combined with an electric generator and a radio transmitter.

Fig. 3 is a vertical sectional view showing the detailed construction of the combined pressure reducer and flashing device.

In the drawings I have shown at V a tank or receiver containing a suitable fluid, such as gas, under pressure, which is conducted or conveyed through a pipe to a pressure reducing device or apparatus at A. From the latter the gas or other fluid is conveyed through a pipe A^1 to a chamber K of a casing A^2. The top of the chamber K is closed by means of a plate, as shown. A piston cylinder is mounted upon the top of said plate and is secured by screw threaded bolts as shown to the plate and to the said casing A^2.

The gas or other fluid also is conducted from the pressure reducing device A through a pipe B^1 to a pressure reducing device B of known structure by means of which the pressure of the fluid is still further reduced so as to adapt it to the flashing device C which may be constructed in the manner hereinafter described. From the latter the gas is conveyed at intervals through a pipe C^1 to a chamber D provided in the bottom portion of the casing A^2. The chamber D is divided into upper and lower compartments by means of a flexible diaphragm G. The diaphragm G is provided at or near its center with a post H which projects upwardly therefrom through the bottom portion of the casing A^2 and at its upper end is connected with a valve I. A coiled spring located in the chamber K of the casing is seated at one end upon the valve I and tends to hold the latter in closed position upon its seat in the

bottom of the chamber K. A passageway F leads from the lower compartment of the chamber D and communicates at its outer end with a passageway D^1 which leads from the upper compartment of the chamber D. The passageway D^1 leads to the atmosphere and is adapted to be opened and closed by means of a valve R. The said valve may be operated manually to open and close the same or means may be provided for automatically opening and closing the same. For example, the valve R may be operated by connecting it to or with a hygroscopically acting device the character of which varies with a change in atmospheric conditions.

The rate of outflow of the gas or other fluid from the lower compartment of the chamber D is controlled by a restricted opening at E leading from the said compartment to the larger portion of the passageway F.

The cylinder previously referred to is provided with a piston P which is adapted to be actuated outwardly to cause the striker Y connected therewith to strike the sounding member or bell U so as to produce the sound signals desired.

The lower or inner part of the cylinder for the piston P is provided with a recess or chamber within which is located a valve M of cup shape. The bottom of the said valve is adapted to rest upon a valve seat to close the opening N leading from the chamber K. For the purpose of holding or tending to hold the valve M in closed position a coiled spring is located in the said recess or chamber with one end seated upon the upper side of the bottom of the cup-like valve member M with the other end thereof seated against the bottom of the said recess or chamber. The spring normally is under compression and its tendency to expand holds or tends to hold the valve M upon its seat to close the passageway or opening N leading from the chamber K. It will be apparent that gas or other fluid which is delivered from the pipe A^1 to the chamber K acts through the opening N upon the valve M but the spring which tends to hold the latter closed is of a strength such that the force of the gas exerted upon the small area thereof at the top or outer end of the opening N is not sufficient to overcome the pressure of the spring, consequently the valve M will remain in closed position as shown in Fig. 1.

In the meantime, however, gas is being delivered to the lower compartment of the chamber D at greater rate than it is being discharged therefrom through the restricted opening E. In consequence the pressure of the gas or other fluid in the said lower compartment exerted upon the diaphragm G operates through the connection H to open the valve I in opposition to the pressure of the spring which normally holds the latter in closed position. When the said valve I is opened the high pressure gas will pass from the chamber K through the passageway L to an annular chamber M^1 which surrounds the projection the top of which constitutes the seat for the valve M. The combined pressures exerted by the gas in the chamber M^1 and in the passageway or opening N against the valve M are sufficient to overcome the spring for holding the valve M closed and to cause upward or outward movement of the said valve M. Upon the opening of the latter the high pressure gas passes through the channel O into the chamber of the cylinder underneath the piston P. In order that the piston may be effectually and quickly moved by the gas entering the said cylinder underneath the said piston an annular depression or channel O^1 is provided in the bottom of the said cylinder the presence of which permits the gas or other fluid to contact with a relatively large area of the bottom of the piston P which results in immediate and rapid outward movement of the latter to cause the striker Y connected therewith to strike the bell or other sounding device U with a force sufficient to produce the sound desired.

When the piston P is moved outwardly the passageway or channel S is opened, in consequence of which the high pressure gas flows from the cylinder underneath the piston P into the chamber or recess within which the valve M is located. This results in providing equal pressures upon opposite sides of the said valve in consequence of which it is closed by the action thereon of the coiled spring located in the said recess or chamber and one end of which is seated upon the outer or upper side of the said valve. The gas or other fluid escapes through the outlet port T near the bottom of the cylinder and permits the piston P to return to the bottom of the cylinder under the influence of gravity. In the meantime the flow of gas from the flasher device C has been interrupted so as to permit collapse or outward movement of the diaphragm G to thereby permit closing of the valve I whereupon the operation is repeated.

As above indicated, the periodicity of operation of the device is controlled by the flasher apparatus C. In Fig. 3 the interior structure of said device together with the pressure reducing device B is more clearly shown. Referring to this figure of the drawings the numeral 1 indicates a casing, one wall of which comprises a diaphragm 2, which is clamped between a flange 3 of the casing body and a casing body 4. The diaphragm 2 is connected through a link 5 with a lever 6 pivotally mounted on one or more fulcrum points 7 fixed to the casing 1. One end of a bar 8 is inserted against a projection 9 depending from the lever 6, the other end of the bar 8 constituting a valve seating within an inlet opening into the casing 1. Between the wall of the casing and the lower part of the lever projection 9 is inserted a leaf spring 12. B′ indicates the fluid inlet and B″ the fluid outlet.

The strength of the blade spring 12 is adjusted in such a way that the spring counterbalances the fluid pressure on the diaphragm 2 when such pressure corresponds to that required in the conduit B″. Variations of said pressure will cause the diaphragm 2 to ascend or descend so that the blade spring is expanded or depressed and the valve is correspondingly moved towards open or closed position, the pressure in conduit B″ thus being maintained at a decreased and constant level.

In the upper compartment 4 a diaphragm 14 is mounted, which latter is held in place by the cover 15. The diaphragm has connected thereto the eye 16, which is in engagement with the hook 17 of the oscillating valve lever 18, fulcrumed on the pivot pins 19 located at one pole of the magnet on the frame 20. The latter frame is fastened to a projection extending up from the bottom of the casing, and supports at one end a block 21 from which extends the discharge pipe C′. The said block supports a U-shaped pole piece 22 and the latter supports the block 23, with which is connected the inlet pipe B″. A valve seat 24 is formed in one of the legs of the pole piece 22 and connects with a port in the block 21 communicating with the discharge pipe C′. A valve seat 25

in the other leg of the pole piece 22 communicates with a port in the block 23 leading to the inlet pipe B''. A spring 26 extends from the lower face of the lower leg of the pole piece 22 to the junction of the horizontal and vertical arms of the oscillating valve lever 18, and is below the horizontal plane passing through the axes of the pivots 19.

When the gas within the pressure reducing device has reached a predetermined pressure the diaphragm 14 overcomes the pressure of the spring 26 and the magnetic torque of the valve seat 24 on the valve lever 18, which raises and uncovers the valve seat 24. When the valve lever 18 travels farther it comes within the magnetic action of the valve seat 25 which then attracts the valve lever 18 and covers the said valve seat 25. The gas is, in the meantime, escaping through the valve seat 24 to the pipe C'. When the outflow of the gas has caused a reduction of pressure to take place in the casing, the diaphragm 14 moves downward induced by the action of the spring 26 which overcomes the magnetism in valve seat 25 and forces the valve lever 18 away from the said valve seat 25. In the further travel of the valve lever 18 the same comes within the magnetic torque of the valve seat 24 which is then closed. The gas from the supply pipe B'' then flows into the casing until the pressure is sufficient to repeat the action.

If it is desired to interrupt the operation of the apparatus such interruption may be brought about by closing the valve R. When the latter is closed the gas or other fluid escaping from the lower compartment of the chamber D flows through the channel F and the inner portion of the channel L to the upper compartment of the said chamber to establish equal pressures on both sides of the diaphragm G. When this condition is established the valve I is held in closed position by the action of the coiled spring bearing upon the top thereof; also the back pressure of the gas into the flasher C prevents continued operation of the latter. When it is desired to cause resumption of operation of the said apparatus all that is necessary is to open the valve R, whereupon the operation is automatically resumed.

In Fig. 2 I have shown the apparatus above described in combination with an electric generator *g*. For the purpose of actuating the said generator I have provided friction discs *a* and *b* the peripheries of which are in contact with each other as shown. The disc *a* is of large diameter as compared with the disc *b*. The latter disc is mounted upon the shaft of the generator *g*. To effect rotation of the disc *a* to thereby cause actuation of the generator *g* I have provided a lever *c* one end of which is pivoted to the shaft upon which the disc *a* is mounted. The said lever *c* is provided with a pawl which engages the ratchet teeth *d* upon a disc secured to the disc *a*. The other or outer end of the lever *c* is provided with a slot which engages a pin upon the striking member Y of the apparatus embodying my invention. The reciprocating movements of the striker Y cause oscillating movements of the lever *c* about its pivotal axis to actuate the pawl to cause step by step movement of the ratchet wheel and the disc *a* to which the latter is secured.

The current from the generator *g* is conducted through the connecting conductors *f* and f^1 to the radio transmitter *h* which is connected to the antenna *l* and to the ground at *j*.

It will be seen that by my invention I have provided an apparatus comprising fluid controlled and actuating means for producing sound signals as described and also which is adapted for accomplishing many other purposes one of which is depicted in Fig. 2 of the drawings.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. In apparatus of the character described, the combination of a cylinder, a piston movable therein, a casing having a chamber therein and a passageway leading from the chamber to the said cylinder, means for supplying a fluid under pressure to the said chamber, a normally closed valve within the said chamber for controlling the flow of said fluid through the said passageway to the said cylinder, an intermittently fluid pressure actuated member, and a connection between the latter and said valve whereby movement of the said intermittently actuated member under fluid pressure opens said valve, and means for closing said valve.

2. In apparatus of the character described, the combination of a cylinder, a piston movable therein, a casing having a chamber therein and a passageway leading from the chamber to the said cylinder behind said piston, means for supplying a fluid under pressure to the said chamber, a valve in said passageway, which valve is adapted to be opened by the pressure of the said fluid against the same, a valve located in the said chamber for controlling the inlet to the said passageway, an intermittently fluid pressure actuated member, and a connection between the latter and the said last named valve whereby movement of the said intermittently actuated member under fluid pressure causes movement of the said last named valve to permit flow of said fluid through the passageway to the first named valve to cause opening of the latter to thereby enable said fluid to effect movement of the said piston.

3. In apparatus of the character described, the combination of a cylinder, a piston movable therein, a casing having a chamber and having a passageway leading from said chamber to the said cylinder behind said piston, means for supplying a fluid under pressure to the said chamber, a valve for closing the passageway from said chamber to said cylinder, said valve being normally closed and being adapted to be opened by the pressure of said fluid there-against, a valve located in the said chamber and normally closing the inlet to the said passageway, and intermittently movable fluid pressure actuated means having connection with said last named valve for opening the same to permit the passage of fluid under pressure from said chamber to the first named valve to cause opening thereof and to actuate the said piston.

4. In apparatus of the character described, the combination of a casing having a chamber therein, a cylinder mounted on said casing, the latter having a passageway leading from said chamber to the said cylinder behind said piston, means for supplying a fluid under pressure to the said chamber, a valve in the said passageway, said valve being adapted to be moved into open position by the pressure of fluid from the said chamber there-against, means tending to hold the said valve in closed position, a valve mounted within the said chamber for closing the inlet to said passageway, means tending to hold the said last named valve in closed position, an intermittently movable member actuated in one direction by

fluid pressure, a connection between the intermittently movable member and the last named valve whereby movement of the said intermittently movable member under fluid pressure causes movement of the said last named valve into open position for permitting the passage of fluid from the said chamber through the said passageway to the said first named valve.

5. In apparatus of the character described, the combination of a casing, a cylinder mounted on said casing, a piston reciprocatably mounted within said cylinder, the said casing having a chamber therein and a passageway leading from said chamber to the said cylinder, a valve for closing the said passageway, the bottom of the cylinder having a passageway leading from the chamber of said cylinder to the outer side of the said valve, a valve located within the chamber of said casing for closing the inlet to the first named passageway, means tending to hold the last named valve in closed position, an intermittently movable member actuated in one direction by fluid pressure, means for supplying a fluid intermittently and under reduced pressure for causing intermittent movements of the said intermittently movable member in one direction, a connection between the said intermittently movable member and the second named valve for imparting the movement of said intermittently movable member in one direction to said second named valve to cause opening of the same.

6. In an apparatus of the character described, the combination of a casing having a chamber therein, a hollow cylinder having a piston reciprocatably mounted therein, the said casing having a passageway leading from said chamber to the interior of said cylinder, a valve interposed between the said cylinder and the said casing for closing the said passageway, and the said cylinder having a passageway leading from the interior thereof to the outer side of the said valve, a third passageway leading from the chamber of said casing to said valve, a valve located in the chamber of said casing and normally closing the inner end of said third passageway, an intermittently movable member, means for supplying a fluid under pressure intermittently to the said intermittently movable member for causing intermittent movements of the latter, and a rod connecting the said intermittently movable member and the second named valve to cause the latter to partake of the movements of the said intermittently movable member to open and close the said third passageway.

7. In apparatus of the character described, the combination of a movable member adapted to be moved periodically by the action of a high pressure fluid thereon, a casing having a chamber and also having a passageway leading from said chamber to the said periodically movable member, means for supplying a fluid under pressure to the chamber of said casing, a valve in the passageway between said chamber and the said periodically movable member, adapted to be opened by the pressure of fluid against a side thereof, a second passageway leading from said chamber to said valve and having a valve for controlling the inlet thereto from said chamber, the said casing having a second chamber spaced from the first named chamber, a flexible diaphragm dividing the said second named chamber into two compartments, each of said compartments being in communication with the atmosphere by passageways through the said casing, the said passageways meeting at a point distant from their inner ends, means for supplying a fluid under pressure intermittently to one of said compartments to cause vibratory movement of the said diaphragm, and a connection between said diaphragm and the second named valve for actuating the latter to permit fluid under pressure to flow through the second named passageway to the first named valve to open the same and thence to flow to the said periodically movable member to actuate the latter.

8. In apparatus of the character described, the combination of a cylinder, a piston in said cylinder, a fluid chamber, a passageway for fluid connecting said chamber with said cylinder, a valve in said passageway adapted to be opened by fluid pressure upon one side thereof, an equalizing port between said cylinder and the opposite side of said valve, means tending to retain said valve in closed position, a second passageway leading from said fluid chamber to the first mentioned side of said valve, an inlet valve controlling the flow of fluid from said fluid chamber to said passageway, means for intermittently actuating said inlet valve, and means for supplying fluid to said fluid chamber.

9. In apparatus of the character described, the combination of a cylinder, a piston in said cylinder, a fluid chamber having an opening connecting with said cylinder, a valve for said opening adapted to be opened by fluid pressure upon one side thereof, an equalizing port between said cylinder and the opposite side of said valve, a passageway from said fluid chamber to said valve, an inlet valve controlling the flow of fluid from said fluid chamber to said passageway, means for intermittently actuating said inlet valve, means for supplying fluid to said fluid chamber, and means for closing said first named valve when said inlet valve is in closed position.

10. In apparatus of the character described, the combination of a fluid chamber, means for supplying a fluid to said chamber, a passageway for fluid leading from said chamber, a valve controlling the discharge of fluid through said passageway, a diaphragm connected to said valve for opening the same, means for closing said valve, and fluid pressure means for intermittently actuating said diaphragm.

11. In apparatus of the character described, the combination of a fluid chamber, means for supplying a fluid to said chamber, a passageway for fluid leading from said chamber, a valve controlling the discharge of fluid through said passageway, a diaphragm connected to said valve for opening the same, means for closing said valve, and a flashing device for intermittently supplying fluid to said diaphragm.

12. In apparatus of the character described, the combination of a fluid chamber, means for supplying a fluid to said chamber, a passageway for fluid leading from said chamber, a valve controlling the discharge of fluid through said passageway, a diaphragm connected to said valve for opening the same, means for closing said valve, a second chamber divided by said diaphragm into two parts, a flashing device for intermittently supplying fluid to one of said parts, and a passageway connecting said last named part of the chamber with the atmosphere and having a restriction therein.

13. In apparatus of the character described, the combination of a fluid chamber, means for supplying a fluid to said chamber, a passageway for fluid leading from said chamber, a valve controlling the discharge of fluid through said pas-

sageway, a diaphragm connected to said valve for opening the same, means for closing said valve, a second chamber divided by said diaphragm into two parts, a flashing device for intermittently supplying fluid to one of said parts, a passageway connecting said last named part of the chamber with the atmosphere and having a restriction therein, and a passageway connecting the other part of said last named chamber with said second named passageway at a point between the restriction and the exterior of the said second chamber.

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