No. 821,184. PATENTED MAY 22, 1906.

A. J. OAKES.

TIME CONTROLLED VALVE ACTUATING MECHANISM.

APPLICATION FILED FEB. 13, 1905.

3 SHEETS—SHEET 1.

Fig. 1.

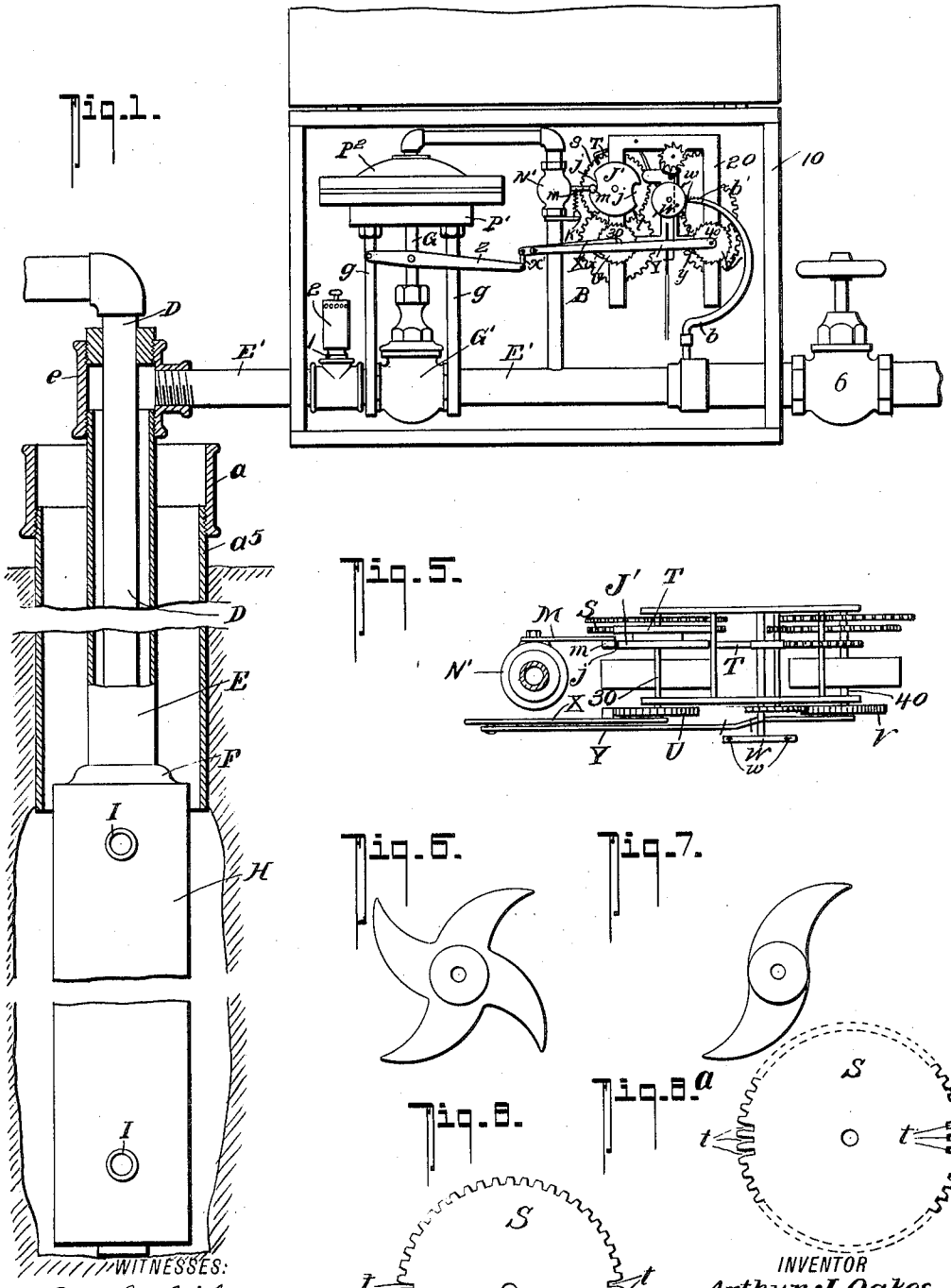

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

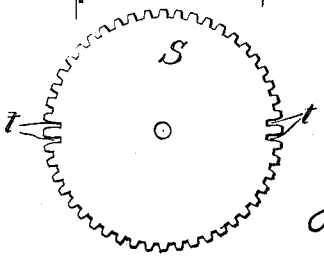

Fig. 8a.

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3 SHEETS—SHEET 2.

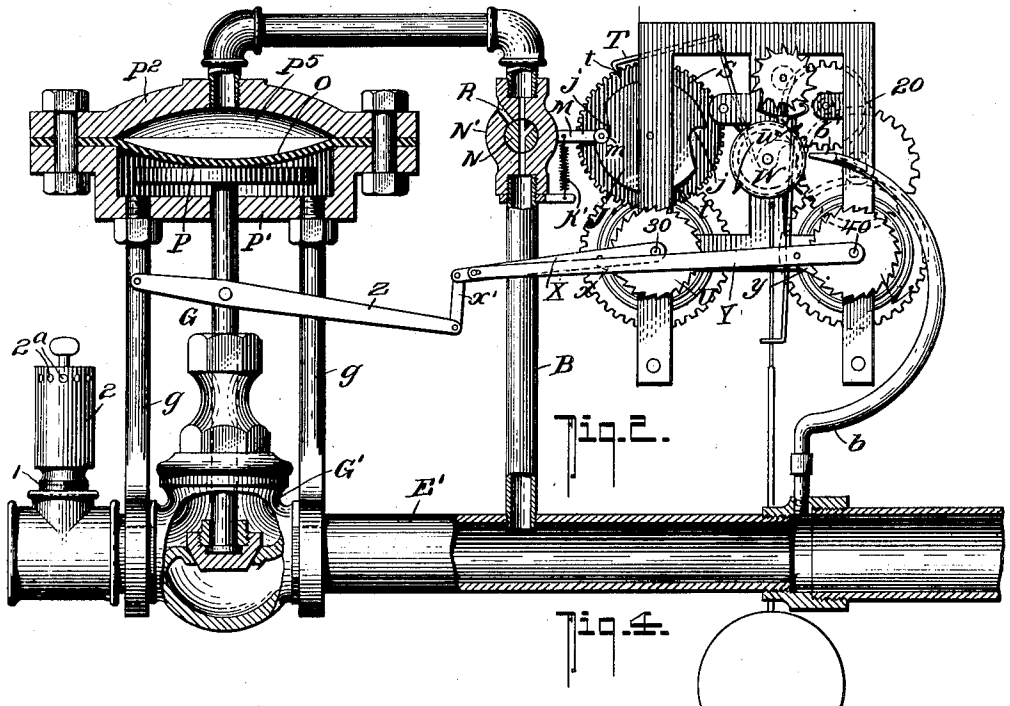
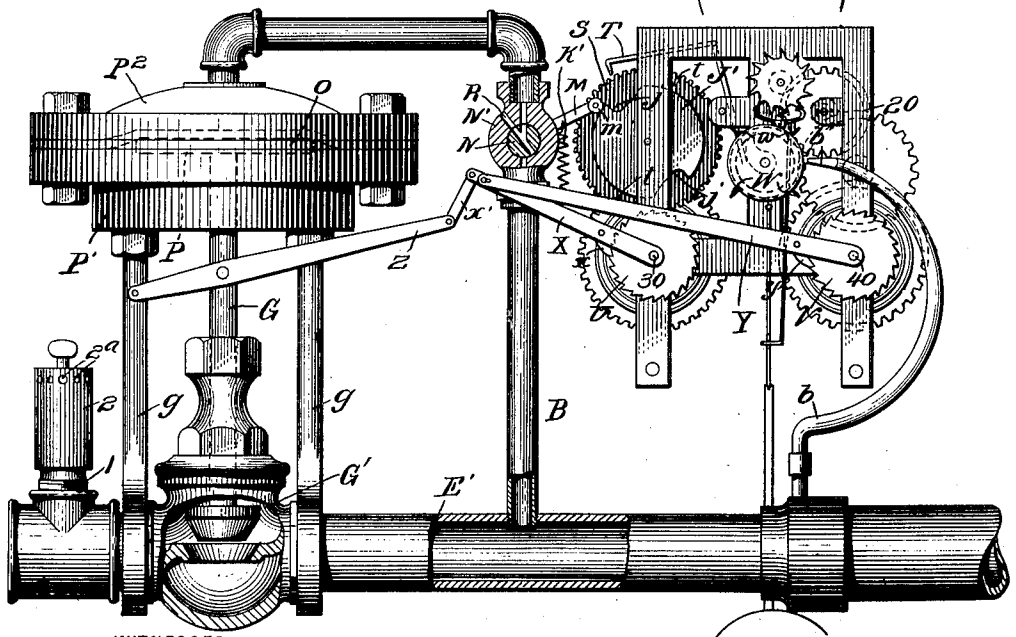


Fig. 2.

Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 9.

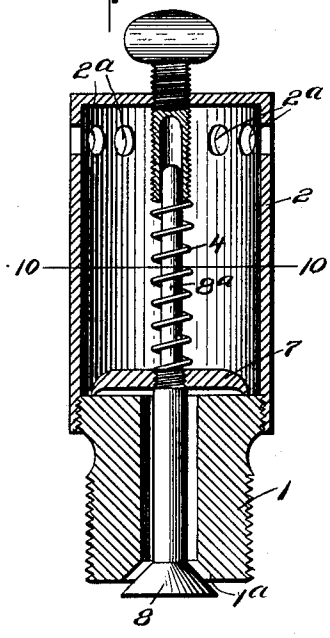


Fig. 3.

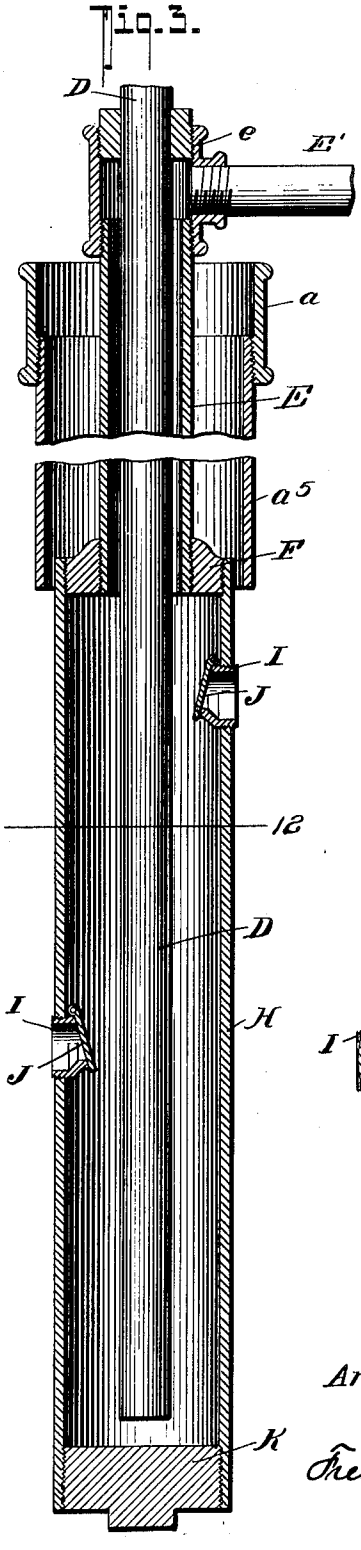


Fig. 11.

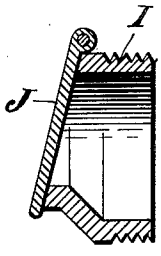


Fig. 10.

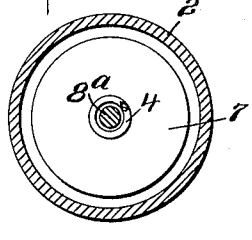
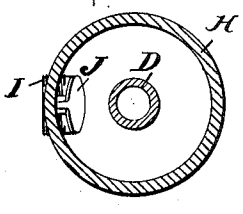


Fig. 12.



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UNITED STATES PATENT OFFICE.

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TIME-CONTROLLED VALVE-ACTUATING MECHANISM.

No. 821,184. Specification of Letters Patent. Patented May 22, 1906.

Application filed February 13, 1905. Serial No. 245,482.

To all whom it may concern:

Be it known that I, ARTHUR J. OAKES, residing at Chanute, in the county of Neosho and State of Kansas, have invented a new and Improved Time-Controlling Valve-Actuating Mechanism, of which the following is a specification.

My invention, which generally seeks to provide a new and improved means for automatically discharging pressure of air, steam, gases, and other fluids at predetermined times, more especially has for its purpose to produce a simple, inexpensive, and positively-operating means for flowing oil-wells by discharging into the well at predetermined times air or other fluids under pressure; and my said invention in its generic nature comprehends a means for discharging an air line or feed containing fluid under compression and mechanism for intermittently opening the said air-line or fluid-feed to discharge against the fluid within the well and which automatically closes off the said fluid-discharge to the well at predetermined intervals.

In its more complete nature my invention embodies a means for leading a fluid-pressure into the well against the fluid therein at predetermined intervals which comprises a valved feed-pipe coöperatively joined with the well-tube, a clock mechanism, a supplemental air-pressure-controlled means for opening the valve in the feed-pipe energized by direct communication with the feed-pipe, and a means for cutting out the supplemental air-pressure line controlled by the said clock mechanism.

My invention also has for its object to provide in a compressed-fluid-discharging means embodying the general features before stated a means for keeping up the clock-mechanism-actuating spring to a substantially uniform tension controlled by the shifting of the valve device in the main-line pipe and devices for readily setting the clock mechanism to actuate the valve in the supplemental air-line on one, two, or three hour intervals or on the fraction of or multiples of such periods.

In its more subordinate features my invention consists in certain details of construction and novel combination and arrangement of parts, all of which will be hereinafter fully explained, pointed out in the appended claims, and illustrated in the accompanying drawings, in which—

Figure 1 is a view illustrating the general operation and application of my invention. Fig. 2 is a side elevation, parts being in section, of the automatically-actuated means for controlling the pressure-discharge and its flow to the oil-well. Fig. 3 is an enlarged view, in vertical section, of the base portion of the well with its outflow or discharging pipe and the air line or tube that surrounds it. Fig. 4 is a side elevation of the clock mechanism and illustrates the position of the same when the air back of the diaphragm that holds the main valve down is exhausting and the air-line is open direct to the well. Fig. 5 is a detail plan view of the notched wheel, the cam-wheel, and the valve-lever actuated thereby. Figs. 6 and 7 are detail views of modifications of the tripping-cams on the hour-post of the clock mechanism hereinafter referred to. Figs. 8 and 8^a are modifications of the striker-wheel S hereinafter explained. Fig. 9 is a vertical section of the relief-valve. Fig. 10 is a horizontal section thereof on the line 10 10 of Fig. 9. Fig. 11 is a detail section, on an enlarged scale, of one of the valve devices J; and Fig. 12 is a horizontal section on the line 12 12 of Fig. 3.

While the construction of parts disclosed in the accompanying drawings show a simple and preferred arrangement of my invention, I desire it understood that the said disclosure is intended to illustrate the generic principle of my invention, as the mechanism illustrated may be varied or modified without departing from the broad ideas of my invention that come within the scope of the hereinafter-specified claims.

In Fig. 1 I have shown the controlling mechanism mounted within a housing 10, located near the well; but in practice said housing may be located at any convenient point. The casing-head *a* is on the upper end of the upper casing-tube a^5, that extends down into the well.

H designates the bottom casing, which is closed by the plug K at the lower end and has one or more inlets I, having back-flap valves J and provided at the upper end with a bushing F, to which the lower end of the discharge-pipe E from the air-line connects. The upper end of the pipe E connects with a T-coupling *e*, with which the main air-line pipe E′ connects and through which the off-take or oil-discharge pipe D passes and which extends down through the pipe E into the casing H to a point near the bottom thereof, as shown.

G′ designates a globe-valve located in the main air-line pipe E′, and *g g* designate standards mounted on the opposite ends of the valve-casing, which extend vertically from the pipe E′. On the upper end of the standards *g g* is mounted a horizontal casing composed of the base member P′ and the dome-shaped cap P^2, detachably secured to the base P′ by the bolts and nuts, as shown. The stem G of the valve G′ extends centrally up through the base member P and carries a disk *p*, that engages the diaphragm O, which divides the casing-chamber, it being held secure by the clamped flanges of the casing members, as shown.

Within the air-line pipe at a point between the valve G and the well is located a relief-valve which comprises the tubular plug 1, screwed into the pipe E′ and having a valve-seat 1^a, the tubular shell 2, screwed onto the plug 1 and having air-outlets 2^a 2^a, the valve 8, that coacts with the seat 1^a and whose stem 8^a goes up into the shell and enters the pendent hollow adjusting-screw in the top of the shell for regulating the tension of the spring 4, that forces the valve 8 from its seat and which rests upon the disk 7, secured to the valve-stem, as clearly shown in Fig. 9, the purpose of which will presently appear.

B designates a supplemental air-line pipe that connects with the main air-line pipe E′ and which discharges through the dome-shaped cap P^2 against the diaphragm O, and in the said pipe B is mounted a valve-casing N′, having an exhaust-port R. A two-way valve-core N is mounted in the casing, which under one adjustment (see Figs. 2 and 4) opens up a direct communication between the main and the supplemental air-line pipes, and thus allows for air under high pressure entering the casing P^5 against the diaphragm, whereby to cause the valve G to move down against its seat, and thus normally close off the main air-line pipe E′ from the well. When adjusted to its other position effected at predetermined times, (in the manner hereinafter fully described,) the valve-core closes off the main air-line pipe from the casing P^5 and allows the air against the diaphragm O to bleed off through the exhaust-port R in the valve-casing N′, and by reason of the pressure now being off the top of the valve G the air-pressure in the main line forces up the said valve G, and thus permits the air-pressure to discharge down into the well against the fluid, which is then caused to flow freely out of the pipe D to the collecting-tank. At this point I deem it proper to again say that any suitable time-controlled means for shifting the valve N at the desired intervals may be utilized.

In the drawings I have shown a special form of clock mechanism which I find effectively serves the intended purposes and is readily modified to actuate the valve at any desired intervals. The means shown comprise a clock-mechanism-supporting frame 20, supported in any approved manner adjacent the valve-casing N′. The train of gearing includes a cam-wheel J′, having two diametrically opposite notches *j j*, and the said cam-wheel is mounted to turn with the striking-wheel S, which is in motion during the time the air is discharging into the well and is cut off from diaphragm O, and the motion is arrested by the drop-pawl T engaging one of the deep notches *t t*, at which time one of the notches *j j* in the cam-wheel will be in line with the arm M, secured to the stem of valve N, which has a right-angled roller-bearing head *m*, that drops down into the cam-wheel J′, arrests the motion thereof, and at the same time shifts the valve N to bring the main and supplemental air-lines back into communication, and thus shift the valve G to cut off the air-line from the well.

When the air-pressure is cut off from the well, the tension of spring 4 on the relief-valve is sufficient to open the said valve after enough of the air-main pressure in well has escaped through the oil-line D to allow the spring 4 to shift the valve 8. When main-line pressure passes to the well, the said main-line pressure acts on the disk 7 and lifts the valve 8 against the seat. The pressure being on the valve-head keeps the relief closed.

The striking or tripping action of the clock mechanism may be readily varied. For instance, should it be desired to flow the well every fifteen minutes instead of putting a single cam on the hour-post of the clock-movement, as shown in Figs. 2 and 4, a quadruple-cam device like that shown in Fig. 6 may be used, and in case it is desired to "flow" at every half-hour the hour-post can be equipped with a double cam, as shown in Fig. 7.

To reduce the flow once in every two hours, a single cam on the hour-post is used and an additional deep notch is made on both sides of the striking-wheel, as shown in Fig. 8, and for every three hours a third notch is made, as shown in Fig. 8^a, and so on, further changes in time of flowing being controlled by proper adjustments of the striker-wheel.

b designates an expansion-tube such as is commonly used in pressure-gages, which connects with the main-line pipe E′ and extends vertically therefrom, said connection being by means of coupling-nipple, as shown. The upper end of the expansion-tube *b* coacts with a tripper-wheel W, having radiating prongs *w*, when the pressure in the main line is not sufficient to flow the well. On end of tube *b* is mounted an adjustable finger *b′*, which is arranged to engage the prongs *w*, which stops wheel W on the hour-post, and thus cuts out the cam device thereon from tripping the striking attachment of the clock-movement,

while the time portion of the clock-movement remains in action.

U and V designate ratchet-wheels mounted on the winding-posts that carry the main-spring, and X and Y indicate levers that are pivotally connected at one end to the posts 30 and 40, respectively, and each of which carries a spring-pawl *x* and *y*, that engage their corresponding ratchet-wheels. The lever X has a pendent link *x'*, that pivotally connects with the free end of a lever Z, pivotally connected at its rear end to one of the standards *g* and is also pivotally joined to the stem of valve G, as shown. The lever Y is pivotally connected at its outer end to the outer end of lever X by a slot-and-stud fastening, as shown.

By providing a lever-and-ratchet means arranged as shown and described the downward movement of the valve G is utilized for winding up the clock-spring, since the downward pressure on the valve is powerful enough to effect the desired movement of the levers X and Y. To provide for compensating a "gain" on either winding-post, whereby the spring will become too tight, the levers X and Y are made of spring-steel, so that in case of excess pressure therein they will either one or both flex or bend.

From the foregoing, taken in connection with the accompanying drawings, it is believed the manner in which my oil-well-flowing means operates and its advantages will be readily apparent.

It will be noticed the action is automatic. The shifting of the valve in the air-line is controlled by the air in the main line, while the times when said air is permitted to shift the main or cut-off valve is controlled by a clock mechanism arranged to be set to actuate at predetermined intervals. It will be also understood that while I have shown my invention as applied for use on a single oil-well it can be readily adapted for flowing any number of wells in the field, since pressure on all lines would be the same. The times that air would be discharged into the wells would be the same for all wells; but a "small" producer, it is obvious, would not require as much air for flowing it as would a "large" producer. To provide for proper air-pressure to each well, a supplemental globe-valve 6 is placed on the main air-line pipe, as shown in Fig. 1, to govern the volume of air to be discharged into the well, according to its requirement. The period of discharge for flowing in practice is from twenty to thirty seconds, according to tension kept on the clock-striking-means-actuating spring.

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

1. In an apparatus of the character described, a main air-line that discharges into the well, a main valve in said line automatically closed to cut off the main line from the well by the normal pressure in the main line, a second valve coöperatively joined with the main line for controlling the pressure-feed against the main valve said second valve having an exhaust-port and a two-way core, and an automatically-actuated means for shifting the said core at predetermined times to cut off the main-line pressure against the main valve for the purposes described.

2. In an apparatus of the character described, the combination with the main pipe-line for discharging a fluid under pressure into a well, a valved casing in said pipe-line; an air-chamber, a stem on the valve that works in said air-chamber, and a diaphragm within the said chamber that engages the valve-stem; of a supplemental pipe-line that joins with the main pipe-line and discharges into the aforesaid air-chamber against the diaphragm therein, a two-way valve in said supplemental pipe-line adapted under one adjustment to connect the diaphragm-chamber with the main-line pipe and under another adjustment to bleed off the air-pressure in said chamber against the diaphragm whereby to permit the fluid-pressure in the main-line pipe to shift the main valve to its open position and an automatically-actuated means for shifting the said two-way valve at predetermined times, as set forth.

3. In an apparatus as described, the combination with the air-line and a valve therein normally held open, and a clock-actuated means for controlling the said valve to move it to its closed position at predetermined intervals, of a means for automatically rewinding the clock-spring actuated by the shifting of the cut-off valve, as set forth.

4. In an apparatus of the character described, the combination with the main pipe-line arranged to discharge fluid under pressure into a well, a main valve in said pipe that normally closes off the discharge through said pipe to the well, said valve having a projecting shank, a flexible diaphragm connected to the upper end of the stem, a supplement air-line from the main pipe-line that discharges against the diaphragm to move the main valve to its closing position, a two-way valve in said supplemental line adapted under one adjustment to open up communication between the main-line feed and the diaphragm-chamber, and under another adjustment to cut out the main line from said diaphragm-chamber and to open said chamber to atmosphere and means for automatically shifting the said two-way valve at predetermined times for the purposes specified.

5. In an apparatus of the character described, in combination with a casing supported in the well closed at the bottom and having valved intakes, of a pipe-line that conveys fluid-pressure, that discharges into

the top of the casing in the well, an oil-discharge pipe that extends into said casing, a valve in the pipe-line normally held open by the pressure in the air-line and automatically-actuating means for leading the main-line pressure against the said valve for closing said valve, said means being operable at predetermined times for the purposes specified.

6. In a well-flowing apparatus of the character stated, the combination with the pipe-line that conveys fluid-pressure into the well, and the cut-off valve therein, held open by the pressure in the pipe-line, of a supplemental air-line the pressure of which serves to close the cut-off valve, a two-way valve in said supplemental line, and a clock mechanism for controlling and shifting the two-way valve to close off the supplemental air-line from the main air-line whereby to release the back pressure on the cut-off valve in the main line, as stated.

7. In an apparatus of the character described, the combination with the air-line, the valve in said line, clock-actuated means for shifting the said valve to its closed position at predetermined periods, said means including the pronged wheel W, of the pressure-tube *b* connected to the main line and having its free end arranged to coöperate with the wheel W, for the purposes described.

8. In an apparatus of the character described, the combination with the main pipe-line the globe-valve connected therewith and normally held open by pressure in said pipe-line; of the casing P^5, the diaphragm O connected with the stem of the globe-valve, the supplemental air-line that connects with the main pipe-line and discharges into the casing P^5 against diaphragm O, the two-way valve in the supplemental line, normally held to open the air from the main line against diaphragm O, and a clock mechanism for shifting the two-way valve at predetermined times to close off the air to the casing, as set forth.

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Witnesses:
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