A. L. CIHAK.

GAS APPARATUS.

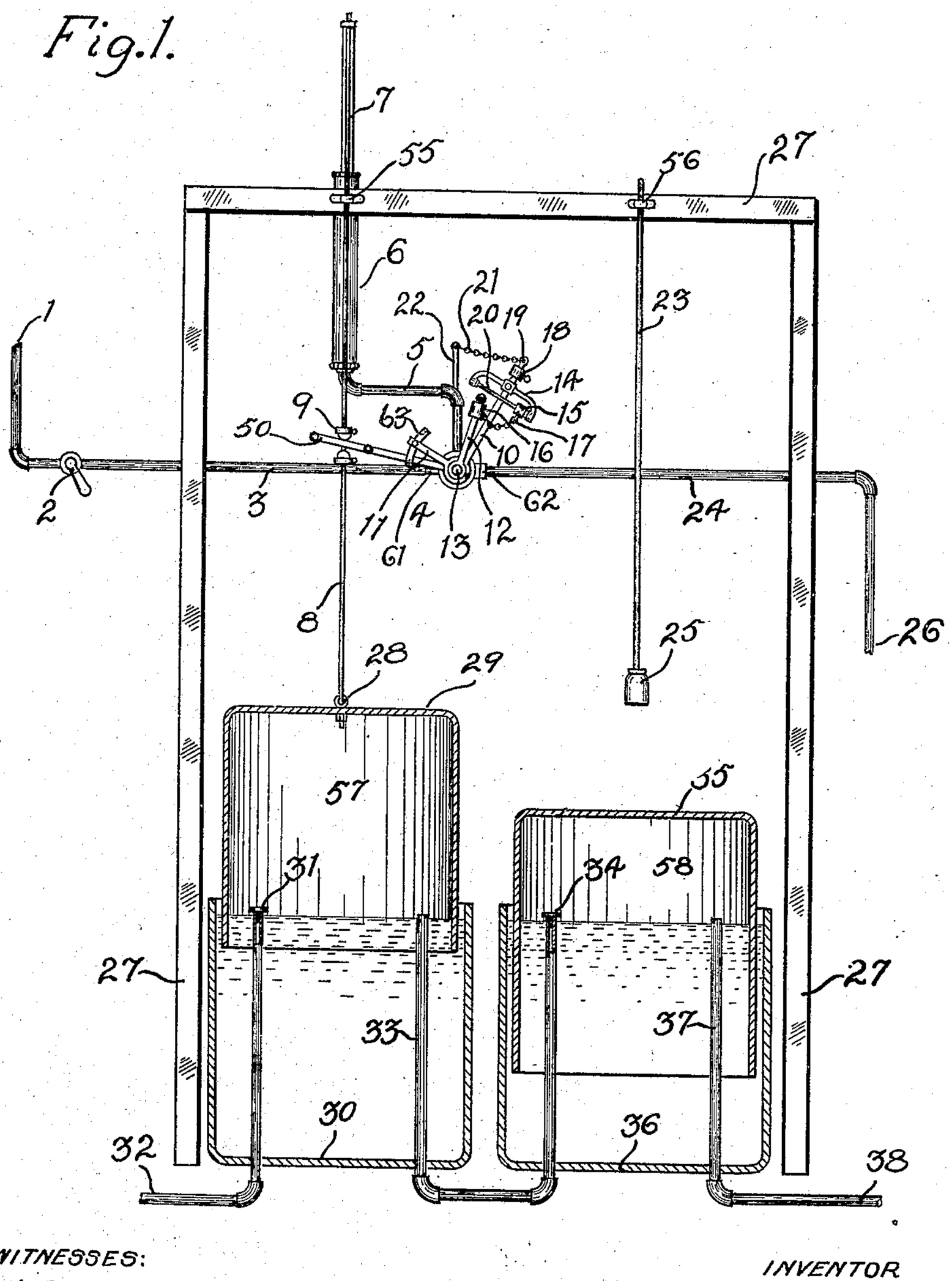
APPLICATION FILED FEB. 28, 1908.

911,572.

Patented Feb. 9, 1909.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

H. B. Burr.

Ila Haydank.

INVENTOR

Anthony L. Cihak

BY G. G. Kennedy.

ATTORNEY.

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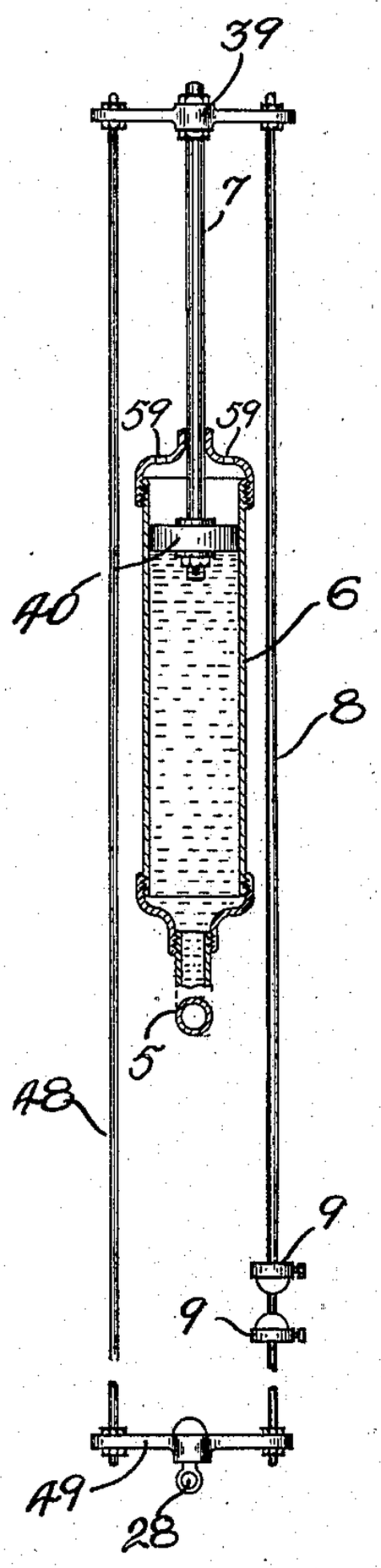
2 SHEETS—SHEET 2.

Fig. 3.



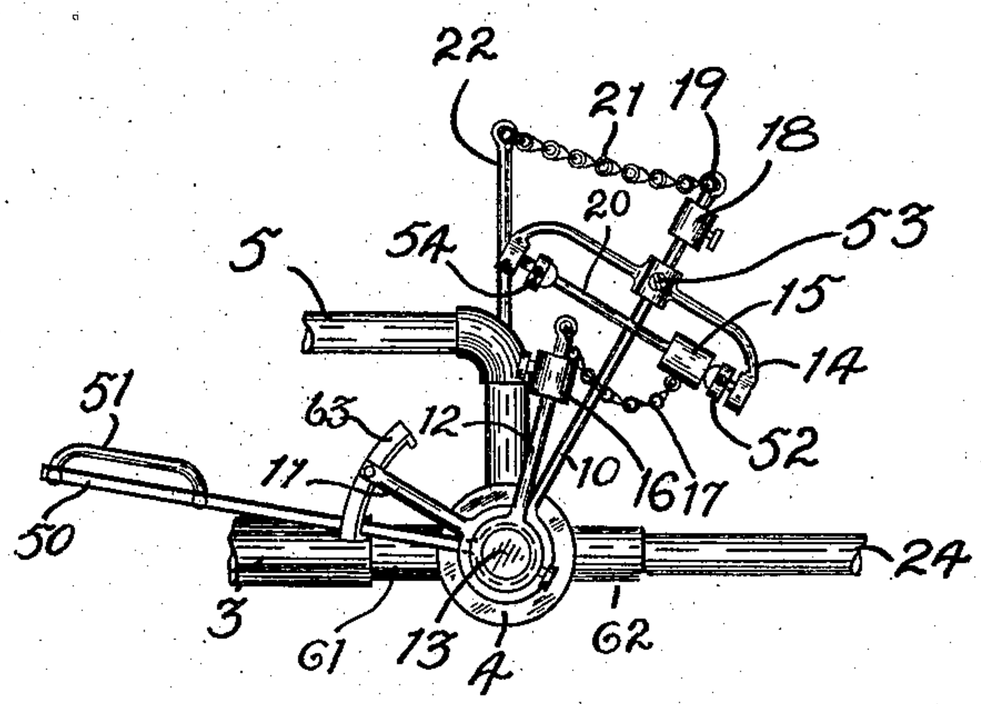


Fig. 4.

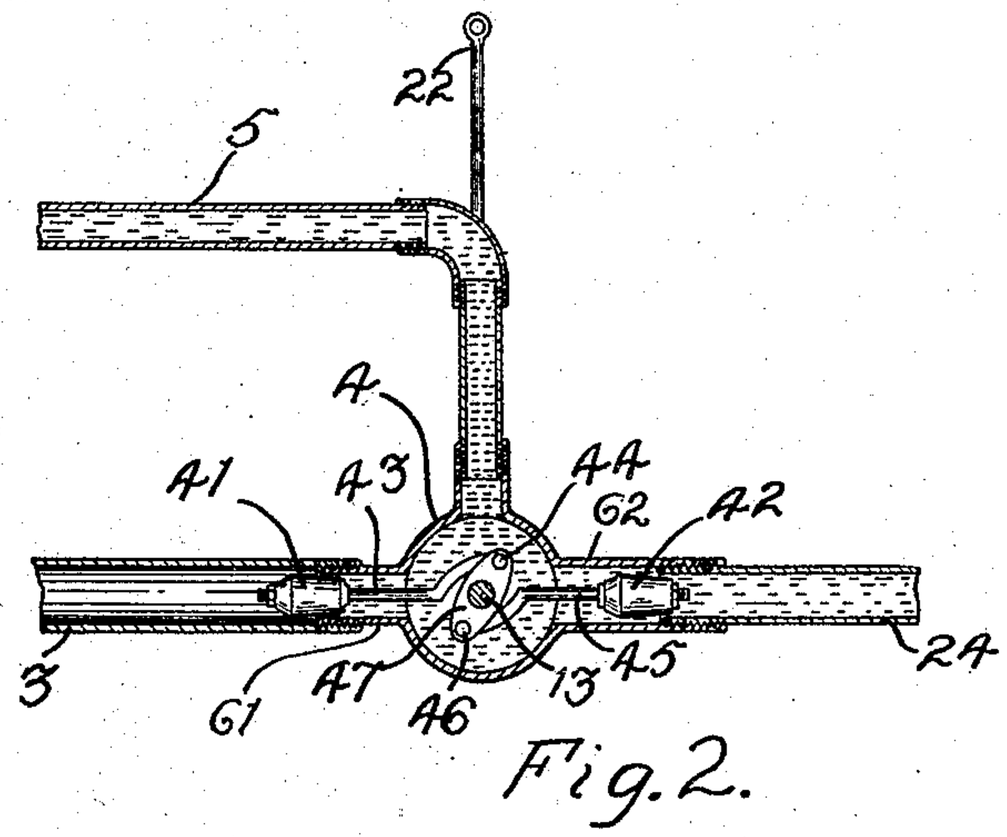


Fig. 2.

WITNESSES:

H. B. Burr.

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INVENTOR

Anthony L. Cihak.

BY

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ATTORNEY.

UNITED STATES PATENT OFFICE.

ANTHONY L. CIHAK, OF WATERLOO, IOWA.

GAS APPARATUS.

No. 911,572. Specification of Letters Patent. Patented Feb. 9, 1909.

Application filed February 28, 1908. Serial No. 418,237.

To all whom it may concern:

Be it known that I, ANTHONY L. CIHAK, a citizen of the United States of America, and a resident of Waterloo, Blackhawk county, Iowa, have invented certain new and useful Improvements in Gas Apparatus, of which the following is a specification.

My invention relates to improvements in gas apparatus, and the object of my improvement is to provide new and useful automatic regulating devices for governing the supply and pressure of the air supplied by the machine to the carbureter. This object I have accomplished by the mechanism which is hereinafter described and claimed, and which is fully illustrated in the accompanying drawings, in which:

Figure 1 is a front elevation of an air-pump for forcing a supply of air under pressure to the carbureter, with my improved regulating devices embodied therein. Fig. 2 is an enlarged axial section of the valve-chambers with their communicating pipes and the inclosed valve mechanism. Fig. 3 is an enlarged detail elevation, partly in section, of the water-pump and its connections. Fig. 4 is an enlarged detail of the said improved automatic governing apparatus.

Similar numbers refer to similar parts throughout the several views.

My improved governing device is an integral part of the mechanism of a gas apparatus for the control of the air pressure in the carbureter. The pipes 37—38 communicate between a carbureter (not shown) and the interior of an inverted bell 35, the latter being immersed in water contained in a receptacle 36, whereby an air-space is formed in the bell over the water-seal, by air issuing from the open upper end of a pipe 34. The vertical pipe 34 passes down through the bottom of the receptacle 36, where it is connected with a short horizontal pipe, and the latter with a riser 33 extending into the second receptacle 30, with its open upper end above the water-level of a water-seal therein. Another riser pipe 31 passes through the bottom of the receptacle 30, with its upper end above the water-level, its outer end connected to a horizontal pipe 32, which is an air-inlet for the vertically-movable bell 57 the latter having its lower end inserted in the water in the receptacle 30. The upper ends of each of the pipes 31 and 34 are supplied with valves which open and close respectively accordingly as the movable bell 57 rises and falls under the impulse thereby given to the air under both said bells.

The frame 27 supports the mechanism of a water-pump, whose cylinder 6 contains a solid piston 40 secured on the lower end of a piston-rod 7, the latter working through the upper cylinder-head 59, with its upper end secured in a cross-piece 39. From either end of said cross-piece depend fixed rods 8 and 48 whose lower ends are secured to the ends of another cross-piece 49, which has a central depending eye-bolt 28 secured to the center of the top of the bell 57.

A rod 23 whose upper end is slidable through an eye-bolt 56 secured to the frame 27, has a weight 25 on its lower end adapted to contact with the upper end of the bell 35, to exercise a downward pressure on the latter, and which tends to regulate the motion of said bell by preventing any sudden or jerky movements thereof which otherwise might be caused by reason of the air impulses derived from the mechanical action of the bell 57.

Two collars 9, spaced apart, are adjustably seated about the lower part of the rod 8 by means of set-screws, and their inner ends are provided with hemispherical rubber caps, said collars forming stops for the end of the lever 50, the latter being slidably secured about said rod between said stops by means of a yoke 51. The rods 8 and 48 move through the eye-bolts 55 on the frame 27.

The numeral 1 designates a pipe in communication with any suitable source of water-head, and is coupled to a horizontal pipe 3 containing a cut-off valve 2. The latter pipe is in communication with the valve-chamber 4. A pipe 5 affords communication between said valve-chamber and the pump-cylinder 6, while the pipes 24—26 afford an egress to exhaust water escaping from the valve-chamber.

The valve-chamber 4 has lateral tubes 61 and 62 projecting in opposite directions, of which 61 is exteriorly threaded to enter the pipe 3, while the tube 62 is interiorly threaded to receive the end of the pipe 24. By this arrangement the valve 41 which is of conical form, moves in the line of water pressure against the end of the tube 61 as its seat, while the exhaust-valve 42 is located within the tube 62 and moves in the line of

water pressure against the end of the pipe 24 as its seat. By this arrangement no extra force is required, save the water pressure, to keep either valve closed or open. When the lever 12 gets beyond the vertical on either side the water pressure alone serves to throw it the balance of the way. Very little friction thus results on the valves 41—42 in their to-and-fro movements. The two valves are therefore both so placed that when closed the water-head acts with them instead of against them, thus more effectively sealing the openings at their seats.

The numeral 13 designates a rock-shaft seated in bearings in said valve-chamber and projecting therefrom, and rock-arms 47 being secured thereto within said chamber. A valve-stem 43 has its bent inner end pivoted at 44 to one of said rock-arms, while the valve-stem 45 of the other valve 42 has its bent inner end 46 pivotally connected to the end of the other rock-arm 47. When the shaft 13 is rocked in one direction, by this means the valve 41 is retracted from its seat permitting the entry of water under head from the pipe 3 to the chamber 4, while the exhaust-valve is at the same time firmly pressed against its seat. A reverse rocking of said shaft causes a reversal of the above action, by closing the inlet-valve 41 against its seat, and opening the exhaust-valve 42, allowing egress to the pipe 24 of the water in the chamber 4 and below the piston in the cylinder 6. The automatic controller for said rock-shaft 13 is shown in Figs. 1 and 4. The lever 50, whose outer end embraces the rod 8 between its fixed collars 9, has its inner end pivoted on the rock-shaft 13 outside of the valve-chamber 4.

The numerals 10 and 11 designate the two arms of a bell-crank lever which is also pivoted on said rock-shaft 13. The lowermost short member of said lever has secured transversely thereto at its ends at a medial point a cross-bar 63 whose ends are bent rearwardly at right-angles and adapted to be contacted by the pivoted arm 50 respectively when the latter is shifted either up or down, by the upward or downward movement of its connected rod 8. The longer upper member 10 of said bell-crank lever has at its upper end a slidable cylindrical weight 18 adjustably secured thereon by a set-screw. Just below said weight a cross-bar 14 is slidably and adjustably secured to said member 10 by a set-screw 53. A straight cross-bar 20 has its ends mounted in seats in the downturned ends of the cross-bar 14, and slidable collars 54 and 52 are adjustably secured on it near its ends by means of set-screws. A cylindrical weight 15 is adapted to slide upon the cross-bar 20, and to said weight is connected one end of a short chain 17 whose other end is connected to the outer end of a lever-arm 12 which is secured to the outer end of the rock-shaft 13. A slidable weight 16 is adjustably secured upon the arm 12 by means of a set-screw.

A fixed vertical upright 22 extends upward from the valve-chamber 4, and a short chain 21 is connected between it and the eye 19 on the upper end of the bell-crank member 10. This upright 22 is made slightly resilient, which diminishes the shock due to the falling of the weighted member 10 of said bell-crank lever.

In Figs. 2 and 4, the parts of the automatic regulator are shown in their positions assumed when the inlet valve 41 is nearly or quite closed and the exhaust-valve 42 is nearly or quite fully opened away from its seat. The piston 40 is descending in the pump-cylinder 6, and the water is exhausting from under it through the valve-chamber 4 and the exhaust-pipes 24 and 26. The lever-arm 50 has begun its descent concurrently with the downward movement of the pump rod 8, and engaging the detent on the lower end of the cross-bar 63 has started the bell-crank lever in movement so that its upper member 10 moves to the left. When the member 10 has attained the vertical position, the valves still remaining in the positions just described, and continues its movement to the left of the vertical, the weight 15 slides along the bar 20 to the left till it is stopped by the hemispherical cap on the left collar 54. As the weight 15 shifts its position suddenly, its movement is communicated by means of the chain 17 to the fixed lever-arm 12, which thus quickly shifts the rock-shaft 13 to the left, closing the exhaust-valve at the moment when the piston 40 has arrived at the bottom of the pump-cylinder 6, and opening the inlet valve 41. The inrushing water then drives up the piston reversing the direction of movement of the rod 8, its connected lever 50, and the latter engaging the detent on the upper end of the cross-bar 63 reverses the bell-crank lever so as to start the member 10 to the right. At the moment when the piston has reached the top of the cylinder the weight 15 slides to the right along the cross-bar 20 which is now inclined to the right, and draws with it the arm 12, instantaneously shifting the valves to close the inlet- and open the exhaust-valve. The whole device thus works automatically, and pumps air into the reservoir bell 35, whence it is drawn to supply a carbureter through the pipe 37—38. The weight 18 may be adjusted on the member 10 as desired to change the leverage pressure, as the weight 16 on the arm 12 may be adjusted for the same reason. The cross-bar 14 may also be adjusted along the member 10, to vary the length of throw of the arm 12. This adjustment of the throw of the arm 12 is useful for the following purpose. The conical-valve heads 41 and 42 are

ordinarily constructed of rubber or similar yielding material, in order to insure a close fit between themselves and their seats. The wear on their contact-surfaces is taken up so as to keep the said fit perfect by this adjustment of the cross-bar 14 on the arm 10. The chain connected between the upright 22 and the member 10 limits the movement of said member in either direction, and takes off the shock of the sudden fall of the weight 15 from the other parts. The arm 12 may also be adjusted in its position on the rock-shaft, so as to set the valves in the proper positions to insure their fitting their seats. The weight 16 on the arm 12 is made sufficiently massive to hold the valves 41 and 42 securely in place against their seats, compensating for slackness in the bearings which may be occasioned by wear.

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

1. In a gas apparatus, in combination, an air-pump whose piston is operatively connected with the piston of a water-pump, the latter adapted to be actuated in one direction by water admitted under head by way of a valve-chamber, a valve-chamber supplied with an exhaust-pipe, and with an inlet-pipe in communication with some source of water under pressure, an inlet-valve in said inlet-pipe adapted to seat itself moving against its seat in the same direction as the water moving therethrough, an exhaust-valve in said valve-chamber adapted to seat itself against its seat in the same direction as the inlet-valve, a rock-shaft seated in said valve-chamber with one end projecting outwardly therefrom, oppositely-directed arms secured to said rock-shaft within said valve-chamber, valve-stems on said valves, each pivotally connected to one of the arms on said rock-shaft, a lever secured to said rock-shaft on the outside of the valve-chamber, a weight secured to the outer portion of said rock-shaft lever, and linking means operatively connected between said lever and the piston-rod of said water-pump adapted to rock said shaft to close or open said inlet-valve and concurrently open or close said exhaust-valve instantaneously when said piston has arrived at one or the other limit of its stroke.

2. In a gas apparatus, in combination, an air-pump whose piston is operatively connected with the piston of a water-pump, the latter adapted to be actuated in one direction by water admitted under head by way of a valve-chamber, a valve-chamber supplied with an exhaust-pipe, and with an inlet-pipe in communication with some source of water under pressure, inlet- and exhaust-valves for said valve-chamber adapted to govern the communication to said inlet- and exhaust-pipes, a rock-shaft in said valve-chamber having one end projecting outwardly therefrom, oppositely-directed arms secured to said rock-shaft within said chamber, a valve-stem on each valve each pivotally-connected to one of said arms, a lever secured to the outward portion of said rock-shaft, a bell-crank lever pivoted on said rock-shaft, a cross-piece secured to the upper member of said bell-crank lever, a slidable weight on said cross-piece, a link-connection between said slidable weight and said rock-shaft lever, and operative connections between the lower member of said bell-crank lever and the piston-rod of said water-pump adapted to rock said bell-crank lever to alternately close or open said inlet-valve and concurrently open or close said exhaust-valve instantaneously when said piston has arrived at one or the other limits of its stroke.

3. In a gas apparatus, in combination, an air-pump whose piston is operatively connected with the piston of a water-pump, the latter adapted to be actuated in one direction by water admitted under head by way of a valve-chamber, a valve-chamber supplied with an exhaust-pipe, and with an inlet-pipe in communication with some source of water under pressure, inlet- and exhaust-valves for said valve-chamber adapted to govern the communication to said inlet- and exhaust-pipes, a rock-shaft in said valve-chamber having one end projecting outwardly therefrom, oppositely-directed arms secured to said rock-shaft within said chamber, a valve-stem on each valve each pivotally-connected to one of said arms, a lever secured to the outer portion of said rock-shaft, a bell-crank lever pivoted on said rock-shaft, a cross-piece secured to the upper member of said bell-crank-lever, a slidable weight on said cross-piece, a link-connection between said slidable weight and said rock-shaft lever, a lever having one end pivoted on said rock-shaft, linking-means between the outer end of said lever and the piston-rod of said water-pump, and a cross-piece on the lower member of said bell-crank lever having a detent on each end adapted to be contacted by said last-mentioned lever alternately when the latter is making either its up or down stroke, to throw the bell-crank lever and cause its sliding weight to instantaneously rock the fixed rock-shaft lever in either direction.

4. In a gas apparatus, in combination, an air-pump whose piston is operatively connected with the piston of a water-pump, the latter adapted to be actuated in one direction by water admitted under head by way of a valve-chamber, a valve-chamber supplied with an exhaust-pipe, and with an inlet-pipe in communication with some source of water under pressure, inlet- and exhaust-valves for said valve-chamber adapted to

govern the communication to said inlet- and exhaust-pipes, a rock-shaft in said valve-chamber having one end projecting outwardly therefrom, oppositely-directed arms secured to said rock-shaft within said chamber, a valve-stem on each valve each pivotally-connected to one of said arms, a lever secured to the outer portion of said rock-shaft, an adjustable weight on said rock-shaft lever, a bell-crank lever pivoted on said rock-shaft, an adjustable weight on said bell-crank lever's upper member, an adjustable cross-piece slidable on said upper member, a fixed upright, a chain-connection between said fixed upright and the upper member of said bell-crank lever, a cross-bar having its ends seated in the downturned ends of said cross-piece on said upper member and spaced away therefrom parallel thereto, a slidable weight on said cross-bar, adjustable buffer-collars on each end of said cross-bar, a link-connection between said slidable weight and said rock-shaft lever, a lever having one end pivoted on said rock-shaft, a parallel rod fixedly secured to the piston-rod of said water-pump outside of its cylinder, adjustable collars spaced apart on said parallel rod, means for pivotally connecting the outer end of said last-mentioned pivoted lever to said parallel rod between said collars, and a cross-piece on the lower member of said bell-crank lever having a detent at each end adapted to be contacted by said last-mentioned lever alternately when the latter is making either its up or down stroke, to throw the bell-crank lever, and cause its sliding weight to instantaneously rock said rock-shaft to actuate said inlet- and exhaust-valves.

5. In a gas apparatus, in combination, an air-pump whose piston is operatively connected with the piston of a water-pump, the latter adapted to be actuated in one direction by water admitted under head by way of a valve-chamber, a valve-chamber supplied with an exhaust-outlet and with an inlet in communication with water under head, a rock-shaft in said valve-chamber and projecting outwardly therefrom, valves, connecting-means between said rock-shaft and said valves adapted to cause them to be seated alternately to close the inlet or outlet of said chamber when said shaft is rocked to and from, a crank-arm projecting from the outer portion of said rock-shaft, a weight on the outer end of said crank-arm, and means connected between said crank-arm and the piston-rod of said water-pump adapted to rock said shaft to and from when the piston of said pump arrives at the end of its stroke.

6. In a gas apparatus, in combination, a valve-chamber having an inlet for a fluid under pressure, and an outlet, a rock-shaft in said chamber extending outwardly therefrom, valves operatively connected with said rock-shaft and adapted to close said outlet and said inlet alternately when said shaft is rocked back and forth, a crank-arm on said rock-shaft, a lever fulcrumed on said rock-shaft, a weight on the end of said lever, linking-means between said lever and said crank-arm, a water-pump having a piston-rod projecting, said water-pump being in communication with said valve-chamber, and operative connections between said piston-rod and said weighted lever on the rock-shaft, adapted to actuate said lever to cause it to suddenly throw over said crank-arm at either limit of its stroke.

7. In a gas apparatus, in combination, a valve-chamber having an inlet for water under pressure and an outlet, a rock-shaft in said chamber extending outwardly therefrom, valves operatively connected with said rock-shaft and adapted to close said outlet and said inlet alternately when said shaft is rocked back and forth, a crank-arm on said rock-shaft, a lever fulcrumed on said rock-shaft, a weight on the end of said lever, linking-means between said lever and said crank-arm, a resilient connection between the said lever and some fixed object, a water-pump having a piston-rod projecting, said water-pump being in communication with said valve-chamber, and operative connections betwen said piston-rod and said weighted lever on the rock-shaft, adapted to actuate said lever to cause it to suddenly throw over said crank-arm at either limit of its stroke.

Signed at Waterloo, Iowa, this 17th day of Feb. 1908.

ANTHONY L. CIHAK.

Witnesses:
G. C. KENNEDY,
O. D. YOUNG.