(No Model.)

W. C. ROSSNEY.

GAS REGULATOR.

No. 344,990. Patented July 6, 1886.

Fig. 1.

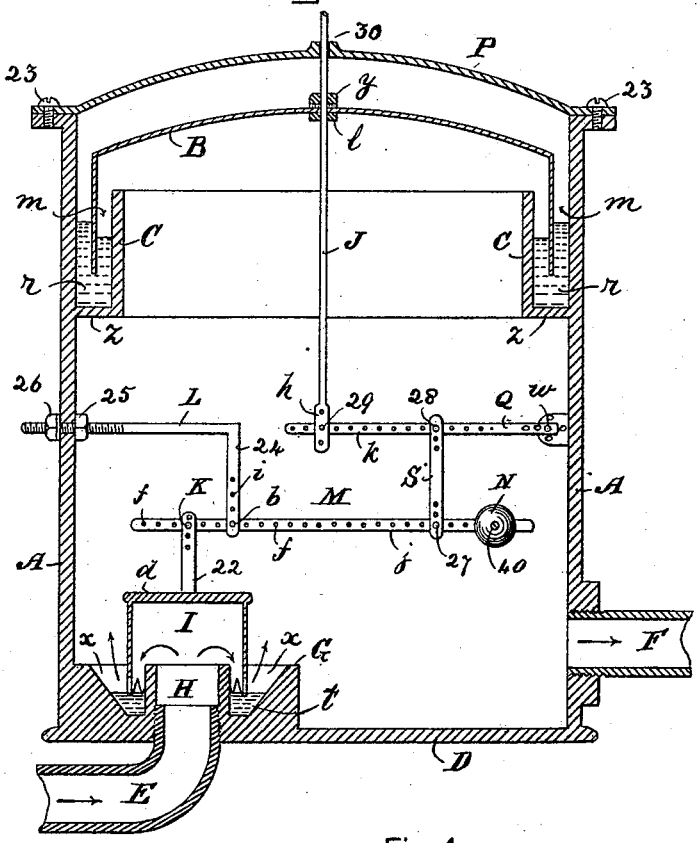


Fig. 4.

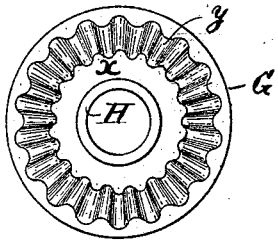


Fig. 2.

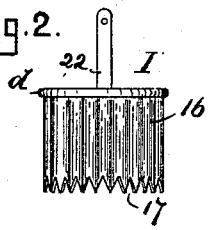


Fig. 3.

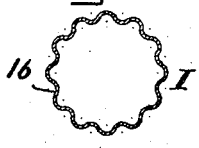
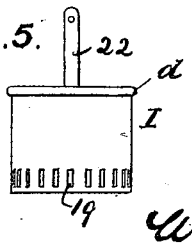


Fig. 5.



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GAS-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 344,990, dated July 6, 1886.

Application filed February 13, 1886. Serial No. 191,834. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM C. ROSSNEY, of Hyde Park, in the county of Norfolk, State of Massachusetts, have invented a certain new and useful Improvement in Gas-Regulators, of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which said invention appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical section of my improved gas-regulator, some of the parts being shown in elevation; Fig. 2, a side elevation of the cup-valve detached; Fig. 3, a horizontal section of the cup-valve taken through the center of its body; Fig. 4, a top plan view of the hub or valve-seat, and Fig. 5 a side elevation, showing a modification of the cup-valve.

Like letters of reference indicate corresponding parts in the different figures of the drawings.

My invention relates to that class of gas-regulators which are operated automatically by the pressure of the gas; and it consists in a novel construction and combination of parts, as hereinafter more fully set forth and claimed, by which a more effective device of this character is produced than is now in ordinary use.

It is well known that in nearly all gas-regulators having valves which are opened and closed by the pressure of the gas in such a manner as to automatically control the supply delivered to the burners much difficulty is experienced from the valves becoming clogged or stuck by gas-tar, or by the carbonaceous deposits from the gas, while others are so constructed as to be less sensitive and certain in their operations than is necessary to produce the best results.

My invention is designed to obviate these and other objections, which are hereinafter pointed out; and to that end I make use of means which will be readily understood by all conversant with such matters from the following explanation:

In the drawings, A represents the body, B the gas-holder, C the cylinder, and D the base, of the regulator, these parts being preferably composed of cast-iron. The body A is cylindrical in form, but may be made in any other suitable shape, and should be about six inches in diameter and eight in height in a regulator for use with an induction-pipe one inch in diameter. A cover, P, is secured to the top of the body A by the screws 23; but instead of being secured in this manner it may be provided with an annular downwardly-projecting flange for keeping it in position; or it may be secured in any other suitable manner, the cover being also preferably composed of cast-iron. Projecting horizontally and inwardly from the walls of the body A there is an annular flange, *z*, on which is erected a cylinder, C, concentric with said body and open at either end, the body A, flange *z*, and cylinder C being cast integral, or in one piece; but when not so formed they are connected by gas-tight joints. The base D is also cast integral with the body A, of which it forms a part; but it may be made separately, if preferred, and be united to the body proper by screws or other suitable means, whereby a gas-tight joint is produced and the parts held in proper position. Within the body A, and preferably disposed on the base D, there is a vertically-arranged cylindrical hub or projection, G, which may be cast integral with said base; but when not so cast it is united thereto or to the induction-pipe E in such a manner as to form a gas-tight joint therewith. An annular reservoir or chamber, *x*, open at its top, is formed in said hub, which hub is also provided with a vertical opening or passage, H, extending centrally through it from top to bottom. A downwardly-closing cup-valve, I, has its lower portion disposed in the chamber *x*, said valve being provided with a stem, 22, which is adjustably jointed or connected by the pin K to a main counterbalancing-lever, M. This lever is furnished with a moving counter-balance or weight, N, and the weight provided with a screw, 40, for securing it in any desired position on said lever. Projecting inwardly and horizontally from the wall of the body A, above the hub G, there is a bar or fulcrum, L, having at its inner end a downwardly-projecting arm, 24, provided with a series of holes, *i*. The outer

end of said bar is screw-threaded and passes through a hole in the wall of the body A, being properly packed and secured in position by the lock-nuts 25 and 26, by which nuts and screw-thread the bar is also rendered adjustable laterally of said body. The lever M is provided at one of its ends with a series of holes *f*, and at its opposite end with a series of holes, *j*, and is pivoted or jointed, by means of a pin or fulcrum proper, *b*, in the arm 24 of the bar L, between the weight N and joint or pin K, being made vertically adjustable on said arm by the pin *b* and holes *i*, and laterally adjustable thereon by the pin *b* and holes *f*. An auxiliary lever, Q, having its outer end jointed by the pin *w* to the wall of the body A, or to a projection thereon, is arranged horizontally within said body opposite the bar L, and preferably on the same plane therewith, said lever being both laterally and vertically adjustable. The lever Q is provided with a series of holes, *k*, and is connected with the lever M by a short vertically-arranged rigid bar or link, S, said bar being detachably and adjustably pivoted or jointed at its lower end to the lever M by the pin 27, and connected in like manner to the lever Q by the pin 28. A vertically-arranged rod, J, having its lower end adjustably jointed or pivoted to the inner end of the rod Q by the pin 29, is firmly connected by means of the lock-nuts *y'* with the gas-holder B, at or near its center, said rod being preferably secured in the top of the holder in such a manner as to be readily adjusted vertically therein, and yet so packed as to form a gas-tight joint therewith. The rod is elongated at its upper end and passes loosely through the cover P, as shown at 30, thus permitting the air to enter the chamber above the holder B, and the long arm of the lever M to be depressed by pushing said rod down, and the valve I opened to permit a free flow of gas through the regulator, if at any time the same should be required, and vice versa. The induction-pipe E opens upwardly through the base D, beneath the hub G, into the passage H, the joint between said pipe and base, and also between said pipe and the hub, being gas-tight. An eduction-pipe, F, opening outwardly through the body A, is disposed below the flange *z*, the joint between said pipe and the body being also gas-tight. The latter pipe may, however, lead outwardly through the base D, if preferred, instead of through the body, as shown. An annular chamber, *m*, is formed between the cylinder C and walls of the body A, the top of said chamber being open. A quantity of some suitable liquid, *r*, preferably quicksilver or mercury, is placed in the chamber *m* for packing the holder B, the lower edge of said holder being immersed in said liquid when the holder is in use. The chamber *x* in the hub G flares, or is dish-shaped, its outer walls being inclined at an angle, preferably of about forty-five degrees, thereby making said chamber wider at the top than it is at the bottom, as shown in Fig. 1. Its outer walls are also grooved or corrugated, as shown at *y* in Fig. 4. The body of the cup valve I is vertically grooved or corrugated, as shown at 16 in Figs. 2 and 3, and its lower edge is serrated, or provided with teeth 17, as best seen in Fig. 2. A quantity of some suitable liquid, *t*, preferably quicksilver or mercury, is placed in the chamber *x* of the hub G, to form a liquid seat for the valve I, the lower ends of the teeth 17 being immersed in the liquid when the gas is passing through the regulator. When the regulator is used in a position where it is not perfectly stationary, or when it is disturbed by the jarring of the building in which it is placed—as, for instance, in a factory where heavy machinery is running—the liquid *t* is liable to be slightly disturbed, or caused to flow from one side to the other of the chamber *x*, thereby causing the gas to be delivered intermittently to the burners, or the lights to "flicker." To prevent the liquid *t* from circulating in the chamber *x* when the regulator is jarred or disturbed, as described, the corrugations *y* in the outer walls of said chamber and the corrugations 16 in the body of the cup-valve I are employed, the liquid falling into the grooves or corrugations and thereby being prevented from flowing or circulating as freely as it would were the outer walls of the chamber and body of the valve plain or smooth. I do not, however, confine myself to using the corrugations *y*, as instead of the corrugations one or more projections of any suitable form may be disposed on either wall of the chamber *x*, and extending from top to bottom thereof, for accomplishing the same result. The inner wall of the chamber may also be corrugated, instead of the outer, if preferred, or both may be corrugated. Neither do I confine myself to corrugating the body of the cup-valve I, as instead of the corrugations one or more projections of any suitable form may be disposed on the outer or inner side of the valve, and extending from top to bottom thereof, for performing the same function. A fulcrum bar or standard for supporting the lever M may be erected on the base D, if desired, and used in place of the bar L. The liquid *t* and the hub G, provided with a chamber for said liquid, constitute a liquid valve-seat for the valve I. The pin *w* serves as a fulcrum for the lever Q, but any other suitable fulcrum may be employed. The gas-tar and other carbonaceous deposits from the gas, which tend to collect on the lower edge or teeth, 17, of the valve I, will be washed or detached from said valve by the liquid or quicksilver *t* as the valve rises and falls, and be blown by the inflowing gas against the outer walls of the chamber *x*, to which they will adhere, and thus be prevented from interfering with the proper working of the valve. It is somewhat important, therefore, that there should be sufficient space between the valve and the outer walls of the chamber *x*, at the surface of the liquid *t*, in order to prevent the tar and deposits, when once detached from the

valve, from returning and readhering to it, and hence the outer walls of the chamber *x* are flared or inclined, as shown and described, whereby the requisite space is afforded around the valve I at the surface of the liquid and the use of the liquid economized, a less quantity being required than would be necessary if the chamber were of uniform width throughout. The jarring or disturbance of the regulator when in use, as described, is also liable to cause the cup-valve I to oscillate or swing slightly on the pin K, and thereby disturb the even flow of the gas or cause the lights to flicker. To obviate this difficulty the parts are so constructed and arranged that the extreme lower portion of the valve is kept immersed beneath the surface of the liquid *t* when the regulator is in use, and an opening or openings for the passage of the gas through the valve is formed therein above the level of said liquid, thereby preventing the valve from swinging or oscillating when the regulator is jarred or disturbed, said opening or openings being adapted to be closed by the liquid when the valve is sufficiently depressed.

In the valve shown in Figs. 1 and 2 the spaces between the teeth 17 constitute the openings for the passage of the gas through the valve, the points of said teeth being immersed in the quicksilver or liquid *t*, to prevent the valve from swinging or oscillating; but instead of serrating the valve or constructing it with teeth it may, if preferred, be made with slots or openings 19 for the passage of the gas, as shown in Fig. 5, its lower edge being immersed in the liquid *t* in substantially the same manner as when the teeth are employed. One or more of the slots 19 may be used, as required, and they may also be elongated to open downwardly through the lower edge of the valve, if desired. I do not, however, confine myself to serrating the lower edge of the valve or to providing it with openings for the passage of the gas, the gas passing beneath the extreme lower edge of the valve in entering the regulator when the openings are omitted. Neither do I confine myself, when it is serrated, to serrating the entire lower edge of the valve, as one or more Λ-shaped openings may be formed therein, although I deem it preferable that its lower edge should be entirely serrated. Neither do I confine myself to making the spaces between the teeth strictly Λ-shaped, as this form may be varied without departing entirely from the spirit of my invention, nor to making the teeth 17 V-shaped or pointed, as the form of the teeth may also be varied, if desired. I however deem a cup-valve which is serrated or provided in its lower portion with one or more Λ-shaped openings for the passage of the gas, the smaller part or apex being uppermost, as shown in Figs. 1 and 2, superior to one which is provided with one or more openings having parallel or approximately parallel sides, substantially as shown in Fig. 5, for the reason that the width or area of the Λ-shaped opening decreases rapidly from its base to its apex, and hence the valve requires to be but slightly depressed to greatly reduce the volume of the inflowing gas, and vice versa; or, in other words, the flow of the gas through a Λ-shaped opening in the valve, when the opening is arranged as described, will be in inverse ratio to the rise or fall of the valve, as the case may be, whereas when the opening is of uniform width the quantity of gas passing through it will correspond with the distance the valve rises or falls.

The auxiliary lever Q and connecting bar or link S may be dispensed with and the rod J jointed directly to the lever M, if desired. I however deem it preferable to use them, as they enable the valve to be more delicately adjusted than is possible when the rod J is connected directly to the lever M, and also prevent the lower end of said rod from being sprung or moved laterally to such an extent as it is liable to be moved when the lever Q is not employed. It will be obvious that by moving the bar S toward the fulcrum *w* of the lever Q the distance which the valve I will be raised or lowered by the gas-holder B will be decreased, and that by moving it in the opposite direction, or toward the rod J, it will be increased.

The weight or counter-balance N may be placed between the bar S and arm 24, if desired, or it may be placed on the auxiliary lever Q, instead of the lever M, if preferred. The weight may also be omitted. The top *d* of the valve I is thickened to give it weight, and thus enable the valve to counterbalance to a certain extent the movable parts on the opposite side of the fulcrum-pin *b*.

In the use of my improvement the gas is let into the regulator through the pipe E, passing thence upwardly through the opening H into the valve I, thence downwardly through the opening or openings in the lower part of the valve, or beneath the valve, as the case may be, into the chamber *x*, thence into the body A and gas-holder B, and thence through the pipe F to the burners. When the gas is passing through the regulator, as described, if the pressure is increased—as, for instance, by shutting off a portion of the burners—the gas-holder B will be raised accordingly, thereby drawing up the rod J, elevating the long arms of the levers Q M, depressing the valve I, and decreasing the volume of gas delivered to the pipe F or to the burners in a manner which will be readily obvious without a more explicit description. Of course when the pressure within the regulator is decreased—as, for instance, by lighting up an additional number of burners—the gas-holder B will fall, the long arms of the levers Q M be depressed, the valve I raised, and the volume of gas passing through the regulator increased.

It will be obvious that the valve I, being provided with a liquid seat, cannot be clogged with gas-tar to such an extent as to prevent it from working properly, for the reason that the tar cannot adhere to the quicksilver *t*, and

should it adhere to the teeth 17, or lower edge of the valve, and thereby partially close up the opening or openings through which the gas passes, it would merely decrease the pressure within the gas-holder B and cause said holder to fall and open the valve accordingly.

Having thus explained my invention, what I claim is—

1. In a gas-regulator, the combination of the following instrumentalities, to wit: a body, a liquid valve-seat, a cup-valve adapted to be seated therein, a main counterbalancing-lever connected to said valve, a fulcrum for said lever, an auxiliary counterbalancing-lever, a fulcrum for said auxiliary lever, a bar or link connecting said levers between their fulcrums, a liquid-seated gas-holder, and a rod connecting the auxiliary lever to the gas-holder, said liquid valve-seat, valve, levers, fulcrums, bar, and gas-holder being disposed within said body, substantially as described.

2. In a gas-regulator, the combination of the following instrumentalities, to wit: a body, a liquid valve-seat, a cup-valve adapted to be seated therein, a main counterbalancing-lever connected to said valve, a fulcrum for said lever, an auxiliary lever, a fulcrum for said auxiliary lever, a bar or link connecting said levers between their fulcrums, a liquid-seated gas-holder, and a rod connecting said gas-holder and auxiliary lever, said valve being provided with an opening or openings through its side for the gas, said opening or openings being adapted to be closed by the liquid in which the valve is seated when the valve is depressed, and said valve-seat, valve, levers, fulcrums, bar, and gas-holder disposed within said body, substantially as described.

3. In a gas-regulator, an annular liquid valve-seat, in combination with an inverted cup-valve adapted to be seated therein, and operative mechanism for said valve, the body of said valve being provided with lateral projections extending from top to bottom thereof.

4. In a gas-regulator, an annular liquid valve-seat, in combination with an inverted cup-valve adapted to be seated therein, and operative mechanism for said valve, the body of said valve being corrugated.

5. In a gas-regulator, an annular liquid valve-seat, in combination with an inverted cup-valve adapted to be seated therein, and operative mechanism for said valve, said seat being provided with lateral projections extending from top to bottom thereof.

6. In a gas-regulator, an annular liquid valve-seat, in combination with an inverted cup-valve adapted to be seated therein, and operative mechanism for said valve, said seat being corrugated.

7. In a gas-regulator, an annular liquid valve-seat, in combination with an inverted cup-valve adapted to be seated therein, and operative mechanism for said valve, the outer wall of said seat being corrugated.

8. In a gas-regulator, an annular liquid valve-seat, in combination with an inverted cup-valve adapted to be seated therein, and operative mechanism for said valve, said seat and the body of said valve being corrugated.

9. In a gas-regulator, the pivoted levers M Q, connected by the bar S, in combination with the rod J, liquid-seated gas-holder B, a cup-valve, and a liquid seat for said valve, said lever Q being adjustable vertically, substantially as described.

10. In a gas-regulator, the pivoted levers M Q, connected by the bar S, in combination with a cup-valve, a liquid seat for said valve, the rod J, and liquid-seated gas-holder B, said lever M being adjustable vertically, substantially as set forth.

11. In a gas-regulator, the pivoted levers M Q, connected by the bar S, in combination with a cup-valve, a liquid seat for said valve, the rod J, and liquid-seated gas-holder B, said lever Q being adjustable laterally, substantially as described.

12. In a gas-regulator, the pivoted levers M Q, connected by the bar S, in combination with a cup-valve, a liquid seat for said valve, the rod J, and liquid-seated gas-holder B, said lever M being adjustable laterally, substantially as set forth.

13. In a gas-regulator, the pivoted levers M Q, connected by the bar S, in combination with a cup-valve, a liquid seat for said valve, the rod J, and liquid-seated gas-holder B, said bar being adjustable on one or both of said levers, substantially as described.

14. In a gas-regulator, a body, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a counterbalancing weighted lever connected to said cup-valve, a liquid-seated gas-holder, and a rod connecting said gas-holder with said lever, in combination with an L-shaped arm, in one end of which said lever is fulcrumed, the other end of said arm being screw-threaded and extending through the side of the body, and nuts on the interior and exterior of said body, for adjustably securing said arm in place.

15. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a counterbalancing weighted lever connected to said cup-valve, and a rod connecting said gas-holder with said lever, in combination with a fulcrum for the lever, said lever being adjustable vertically in its fulcrum.

16. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers.

17. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said

cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, the fulcrum of said main lever being adjustable vertically.

18. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, the fulcrum of said main lever being adjustable laterally.

19. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, the fulcrum of said main lever being adjustable vertically and laterally.

20. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, the fulcrum of said auxiliary lever being adjustable laterally.

21. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, the fulcrum of said auxiliary lever being adjustable vertically.

22. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, the fulcrum of said auxiliary lever being adjustable vertically and laterally.

23. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said link being laterally adjustable at its point of connection with said main lever.

24. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said link being vertically adjustable at its point of connection with said main lever.

25. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said link being laterally and vertically adjustable at its point of connection with said main lever.

26. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said link being laterally adjustable at its point of connection with said auxiliary lever.

27. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said link being vertically adjustable at its point of connection with said auxiliary lever.

28. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said link being laterally and vertically adjustable at its point of connection with said auxiliary lever.

29. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said link being laterally adjustable at its point of connection with each lever.

30. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said link being vertically adjustable at its point of connection with each lever.

31. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder,

and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said link being laterally and vertically adjustable at its point of connection with each lever.

32. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said levers being laterally adjustable in their fulcrums.

33. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said levers being vertically adjustable in their fulcrums.

34. In a gas-regulator, an annular liquid valve-seat, an inverted cup-valve adapted to be seated therein, a liquid-seated gas-holder, and a rod connected thereto, in combination with a main lever of the first class connected to said cup-valve, an auxiliary lever of the second class connected to said rod, and a link connecting said levers, said levers being vertically and laterally adjustable in their fulcrums.

35. In a gas-regulator, the combination of a body, a liquid valve-seat, a cup-valve adapted to be seated therein, a counterbalancing-lever whose short arm is connected to said cup-valve, a fulcrum for said lever, a liquid-seated gas-holder, and a rod or device for connecting the long arm of said lever and said holder, said valve-seat, valve, lever, fulcrum, and gas-holder being disposed within said body, substantially as described.

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Witnesses:
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