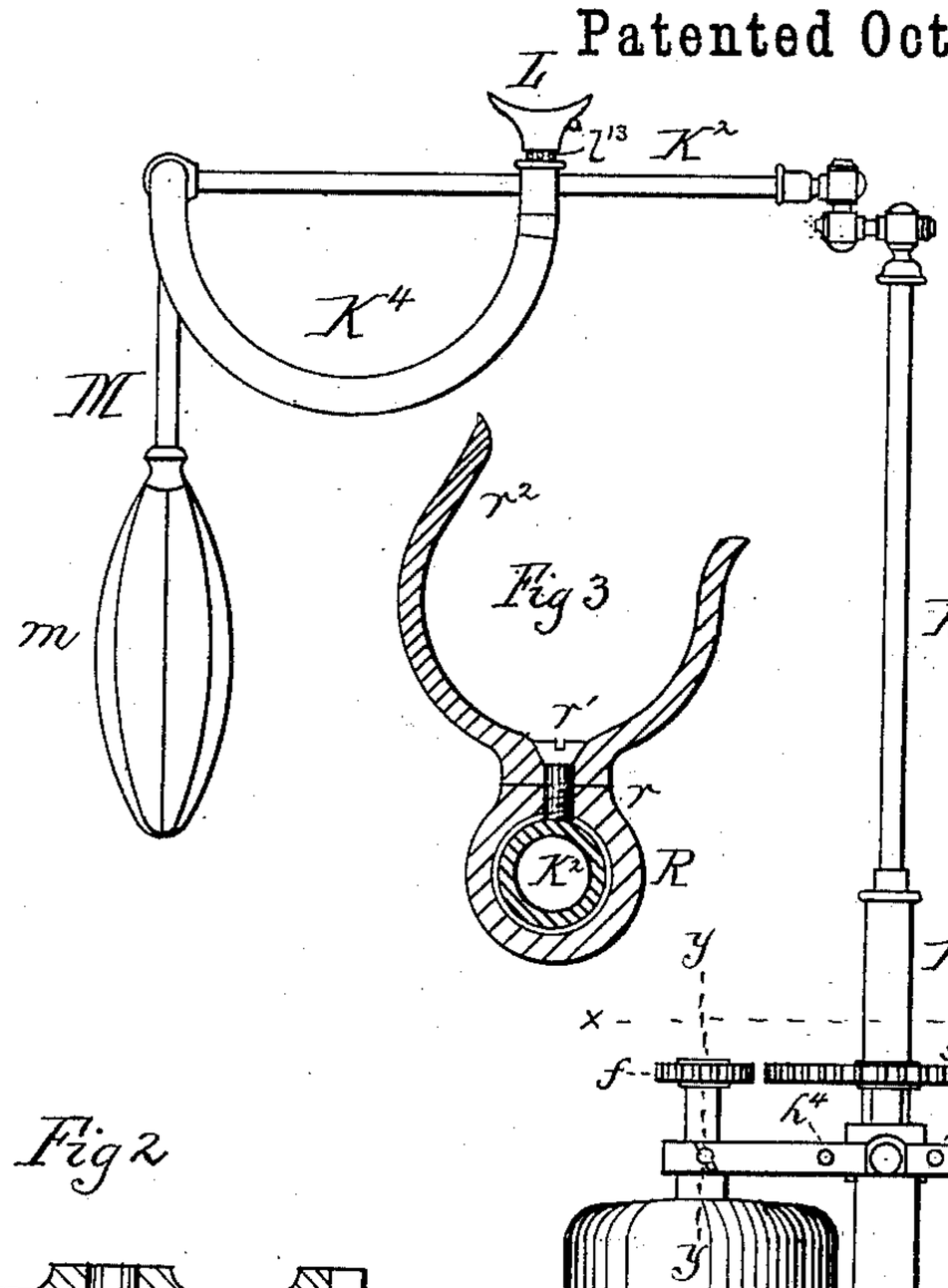
(No Model.) 3 Sheets—Sheet 1.

B. M. WILKERSON.

LIQUID GAS APPARATUS.

No. 328,370. Patented Oct. 13, 1885.



Witnesses
J. Mason Goszler
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Attorneys

(No Model.)

3 Sheets—Sheet 2.

B. M. WILKERSON.

LIQUID GAS APPARATUS.

No. 328,370. Patented Oct. 13, 1885.

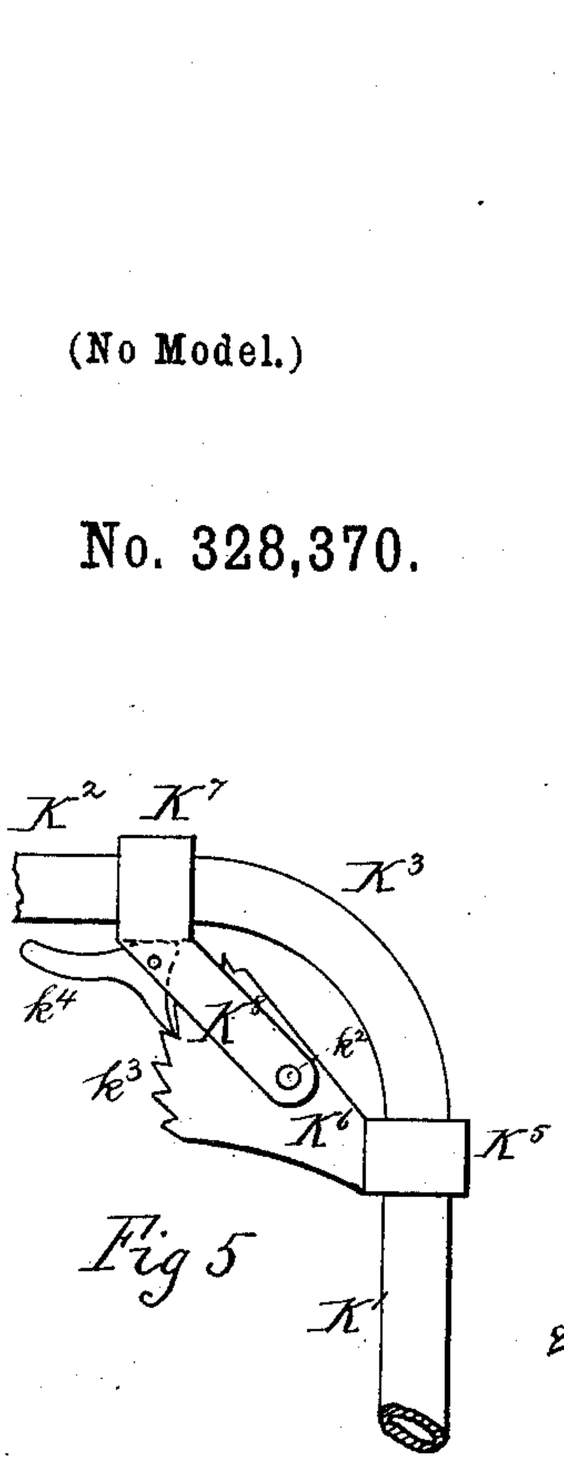
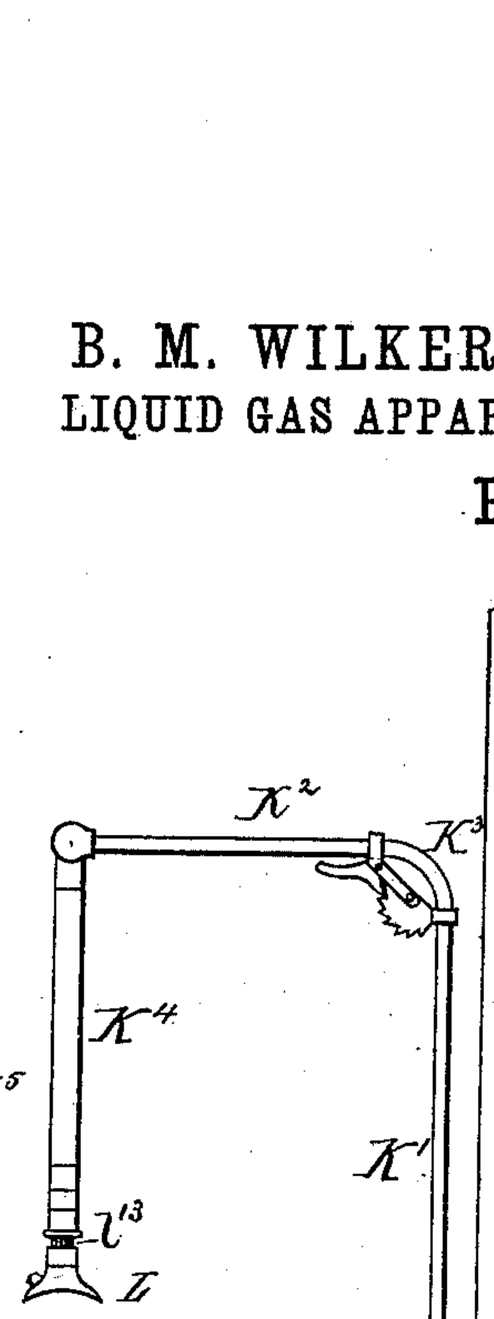
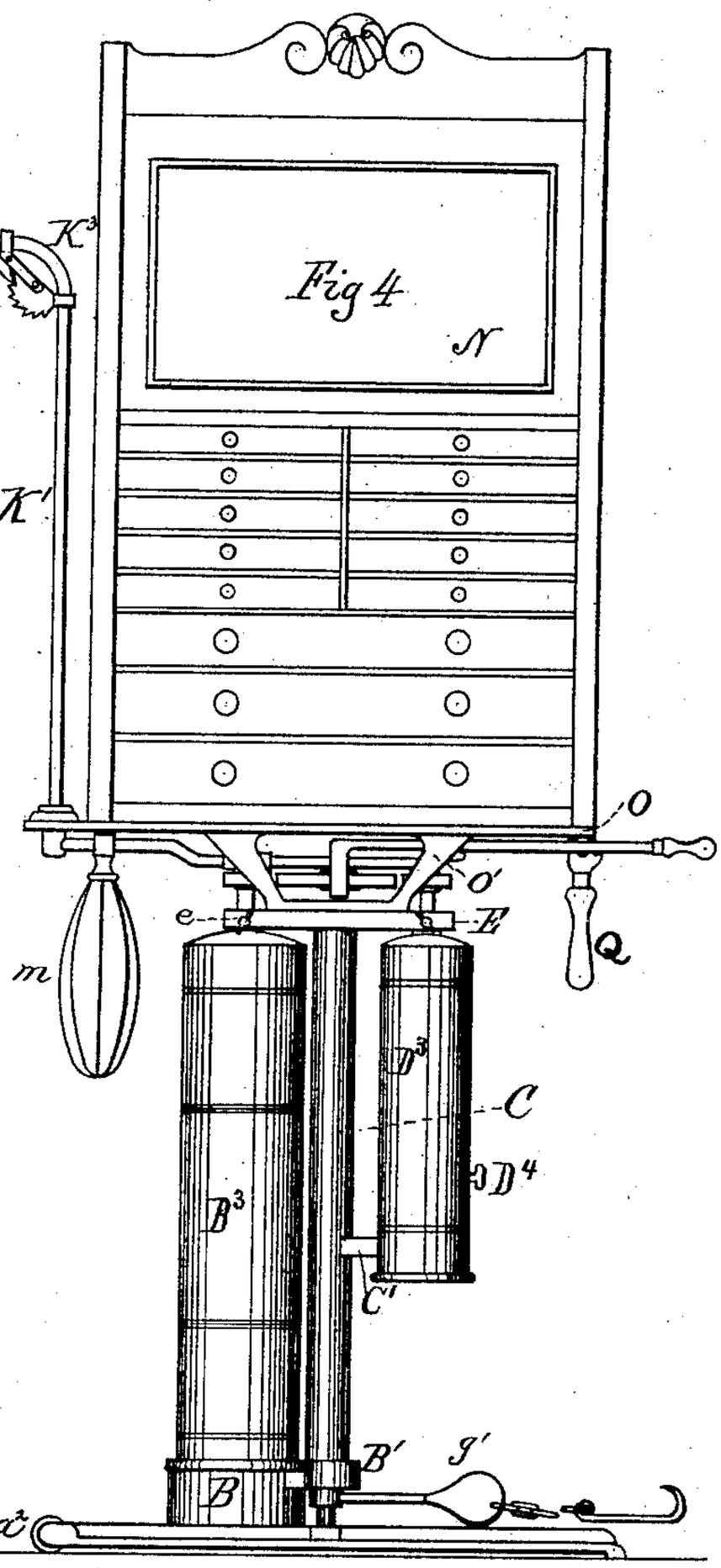


Fig 5





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(No Model.) 3 Sheets—Sheet 3.

B. M. WILKERSON.

LIQUID GAS APPARATUS.

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Fig. 6.

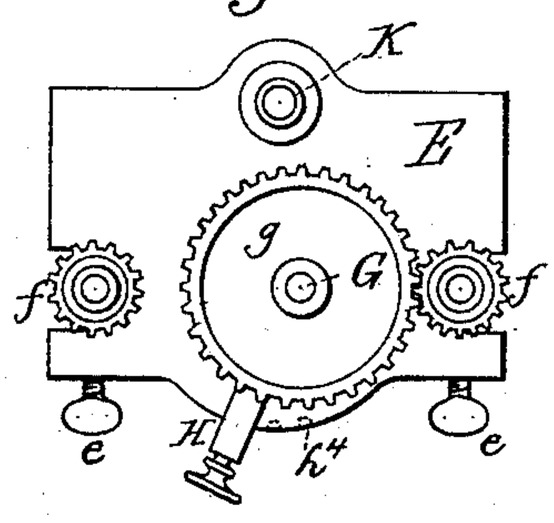


Fig. 7.

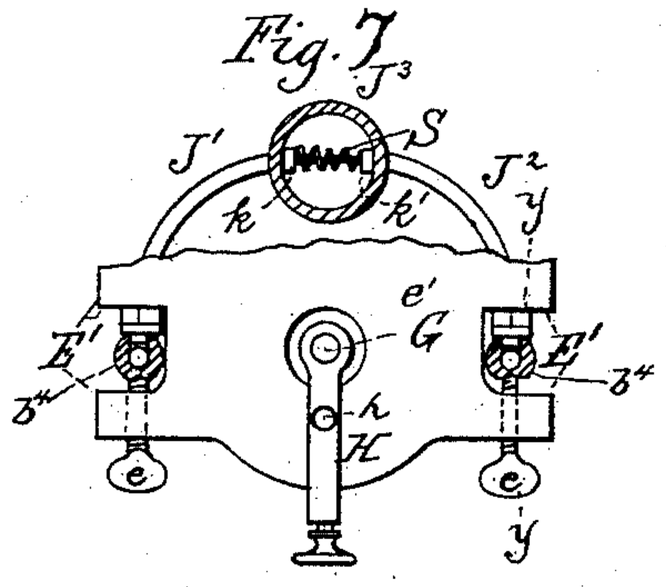


Fig 8.

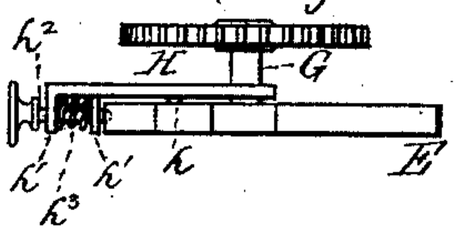


Fig. 9.

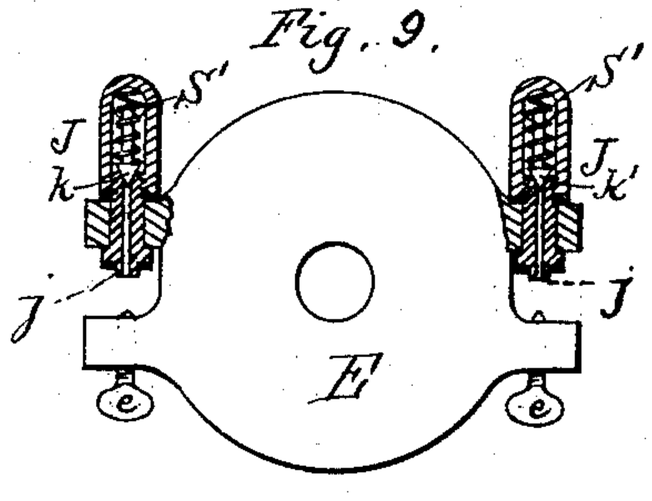


Fig 10.

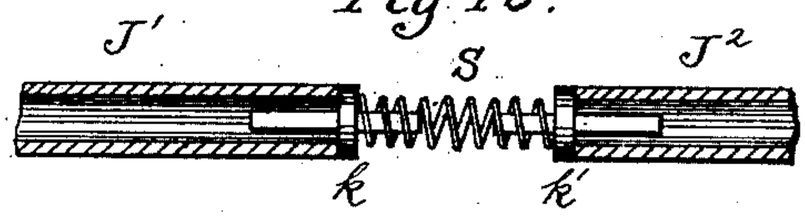


Fig 11.

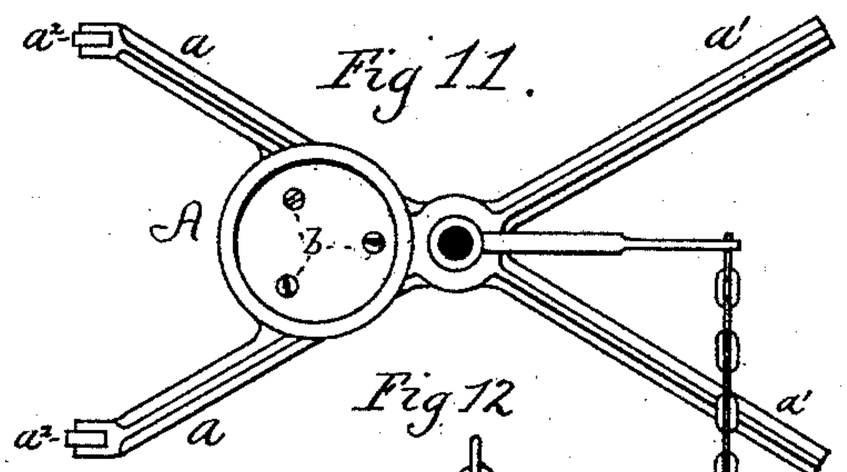
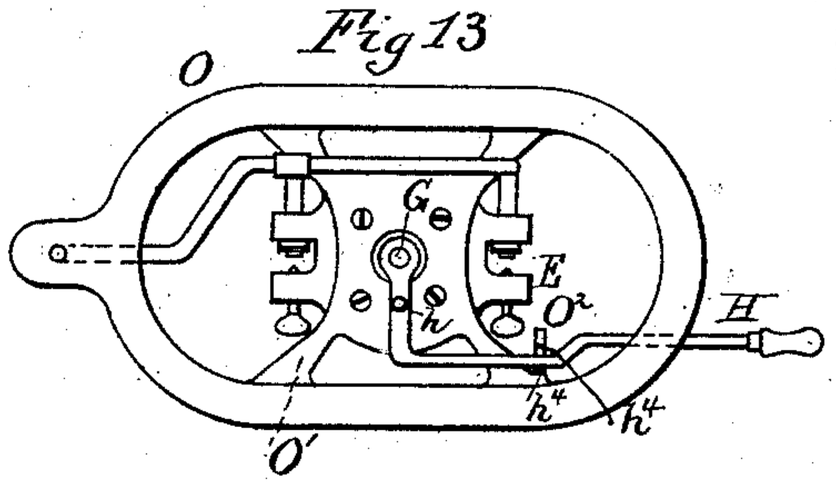


Fig 12

Fig 13



Witnesses
J Mason Goszler
" "
H. Henrie

B. M. Wilkerson Inventor
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Brashears & Williams
Attorneys

UNITED STATES PATENT OFFICE.

BASIL M. WILKERSON, OF BALTIMORE, MARYLAND.

LIQUID-GAS APPARATUS.

SPECIFICATION forming part of Letters Patent No. 328,370, dated October 13, 1885.

Application filed September 5, 1883. Renewed September 23, 1885. Serial No. 177,913. (No model.)

To all whom it may concern:

Be it known that I, BASIL M. WILKERSON, a resident of Baltimore city, Maryland, have invented certain new and useful Improvements in Liquid-Gas Apparatus, of which the following is a specification, reference being had to the accompanying drawings, forming part hereof, in which—

Figure 1 is an elevation of my apparatus complete when used without a cabinet, parts being broken away to show interior construction. Fig. 2 is a sectional view taken vertically on line *y y* of Figs. 1 and 8, showing the construction of the valve and the neck of the bottle and its adjustment to plate E. Fig. 3 is a section of the fork or yoke for suspending the mouth-piece. Fig. 4 is an elevation of my improved apparatus with a cabinet mounted upon it. Fig. 5 is a detail view on an enlarged scale of the joint between the pipes K′ K². Fig. 6 is a cross-section on line *x x* of Fig. 1, showing the manner of arranging the gear-wheels, the parts being differently adjusted and the handle left off. Fig. 7 is a similar view, the gear-wheels being left off and part of plate E being broken away. Fig. 8 is a side view of Fig. 6, pinion *f* and pipe K being left off. Fig. 9 is a partly-sectional view of a modified form of valve to be used instead of the two valves shown in Figs. 7 and 10. Fig. 10 is a sectional detail of the two valves forming the double-valve arrangement shown in Fig. 7. Fig. 11 is a bottom plan view of base. Fig. 12 is a detail thereof. Fig. 13 is a plan view of the cabinet-support with the cabinet removed therefrom.

Like letters of reference mark the same parts in all the figures.

I will first proceed to describe fully the construction and operation of my invention, and afterward specifically set forth the points of novelty in the claims.

Referring to the drawings by letter, A marks the base upon which the whole structure rests, and which is composed of four or any suitable number of radially-extending arms, *a a a′ a′*. The arms *a* are each provided with rollers or wheels *a²*, while the arms *a′* rest upon the floor.

B is a cup, which is mounted on the arms *a a* and the body of the base A, and which is secured by screws *b b b*, passing through the arms *a* and body of the base A, as will be seen by reference to Fig. 11. This cup B is provided with a sleeve, B′, attached to one side of it, which encompasses a central tube, C, and supports said tube, so that it may form the central supporting-pillar of the whole structure.

In the cup B, on a coiled spring, *b′*, (shown in Fig. 1,) rests a bottle, B², made preferably of iron or steel, in which to store the liquefied gas. The spring *b′* is a conical spring, so that when compressed all the coils will lie flat and occupy a vertical space equal to only one coil, and is of about sufficient rigidity to support the bottle and contents, so that the bottle may be raised, for purposes hereinafter specified, with a much less expenditure of power than would otherwise be required.

Part way up on the tube C is mounted, opposite to the cup B, another cup, D, being secured to the tube by a sleeve, D′, similar in structure to the sleeve B′, before mentioned. This cup D serves to support another bottle, D², similar in construction and purpose to the bottle B².

A spring (not shown) similar to the spring *b′* is mounted in the cup D to support the bottle D² in the same manner as the spring *b′* supports the cup B². There is mounted at the top of the tube C and secured rigidly thereto a plate, E, which serves to support the upper ends of the bottles B² D² in a manner hereinafter explained. The bottles B² D² are constructed, as before stated, in a similar manner, and a description of one will do for both.

In the top of the bottle is an opening, *b²*, (see Fig. 2,) through which the gas passes, and the valve for closing said opening will now be described. As before stated, the bottle has an opening, *b²*, in its top for the admission and delivery of the gas. This opening extends through the top and through an extension, *b³*, of the same, (see Fig. 2,) which extension is provided with an exterior thread to engage an interior thread in the neck *b⁴* of the bottle. In this neck is threaded the stem F of the valve, and upon the top of this stem is a pinion, *f*, to turn it when desired. The upper end of the stem F, just below the pinion, is passed through a gland, *b⁸*, which is threaded into the top of the neck *b⁴* of the

bottle. The neck of the bottle is provided with a transverse opening, b^5, to receive the end j of pipe J. The lower end of the valve-stem is surrounded and socketed into a block, b^6, of a hard metal, which block has a point, b^7, extending down into the opening b^2 of the bottle. This opening at its top is widened out into conical shape and forms the valve-seat, being formed of hard metal. Into this seat presses a block, b^9, of soft metal, which is attached to the block b^6, and surrounds the point b^7. When the stem F is turned in, the block of soft metal forming the end of the valve-stem is forced against and into the seat of hard metal, and a close joint is formed, which will securely prevent the escape of the liquefied gas in the bottle; but when the stem is withdrawn the soft-metal stem leaves the seat and permits the escape and vaporizing of the gas, which in its vapor or fluid form passes out through the opening b^5 and pipe J, to be administered by the operator.

The soft-metal stem, constructed as herein described, possesses the advantage that the stem can be readily withdrawn and repaired, or replaced if entirely worn out, as will sometimes be the case, and the seat can be easily reached through the valve-stem opening for grinding, when required. All the parts can be removed, and the construction is much simplified.

The valve, as hereinbefore described, having been secured to the bottle and the bottle being filled and ready to be placed in position in the apparatus, it is placed with its bottom in its cup and resting on its supporting-spring b'.

The neck of the bottle projects upward above the plate E, passing into a notch, E′, of said plate, of which there is one on each side of said plate E, and the end j of the pipe J being in place in the opening b^5 in the neck b^4 of the bottle the joint is made by means of a packing, j^2, and the bottle secured in position by turning up the pointed thumb-screw e, whose point enters a countersunk depression in the neck b^4.

Upon the valve-stem F of each of the bottles B^2 and D^2 is removably mounted a small pinion, f, so that the stem will turn with the pinion.

G is a shaft, stepped in the base A, and extending up through the tube C to a short distance above the plate E, and on its upper end is mounted a gear-wheel, g, the teeth of which are of the same size as those of the pinions f.

The tube C is of sufficient size to allow of a certain amount of play for the shaft G toward and from each of the valve-stems and bottles, so that the gear-wheel g may be made to engage at will with either of the pinions f by certain mechanism, which will now be described.

Pivoted to the plate E at a short distance from the shaft G, over which its outer end engages, is a lever, H, the pivot connecting it with the plate E being marked h. (See Fig. 8.) This lever H is provided with two downward-projecting lugs, h', which are perforated to receive a rod, h^2, which passes through their perforations and is normally held by a spring, h^3, in engagement with notches h^4 in the edge of the plate E. (See Fig. 3.) There are three of these notches h^4, one in the center and one on each side thereof. When the rod h^2 engages the notch h^4 to the left, the opposite end or inner end of the lever H will have carried the shaft G and gear-wheel g to the right and caused its teeth to engage with the gear-wheel f, which is mounted on the valve-stem of the bottle B^2. When it engages the notch on the right, the operation will be reversed, and the pinion on valve-stem of bottle D^2 will engage with gear g. When in engagement with the central notch, the lever H will be held in a central position, holding shaft G so that gear-wheel g will be free from engagement with either of the pinions f.

It is obvious that when the gear-wheel g is in engagement with either one of the pinions f that any rotation of the shaft G will cause an opposite rotation of the valve-stem to which said gear-wheel is secured, and as the pinions are on opposite sides, they will turn in the same direction.

The shaft G has attached to it near its lower end a radially-projecting arm or lever, g', and a spiral spring, g^2, encircles the shaft G, having its one end secured to the said shaft and the other end to some non-rotatable part of the apparatus.

The valves being closed the lever g' will be near one extreme of its movement, and will be held there normally by the spring g^2. To open one of the valves, it is only necessary to push this lever in the opposite direction, which will cause the shaft G, gear-wheel g, and pinion f, with which said gear-wheel is engaged, and its valve-stem to rotate, thus withdrawing the stem from the valve-seat, which will allow the gas to escape from the bottle into the pipe J, and thence to the bag or inhaler, the construction and operation of which will be hereinafter described.

The pipe J is semicircular in shape and composed of two sections, each of substantially a quarter-circle, as at J′ J^2, Fig. 7, and these quarter-circles beginning with the ends J′, as before mentioned, at the neck of the bottles B^2 and D^2, end on opposite sides of a compartment or reservoir, J^3, securely fixed under the rear side of the plate E by means of a pipe, K, extending upward, the communication between the sections of the pipe J and the reservoir J^3 being controlled by valves k k', the construction and operation of which will now be described. These valves are inserted in the ends of the branch pipes J′ J^2, and have stems extending toward each other into the reservoir J^3. A spring, S, surrounds these stems and extends entirely across the reservoir. (See Figs. 7 and 10.) When the gas is admitted into one of the branch pipes from the bottle, it opens the valve at the end

of such branch pipe and enters the reservoir. The opening of this valve is against the force of the spring S, and this spring and the pressure of the gas in the reservoir both tend to close the opposite valve, this absolutely preventing any escape of gas through such valve under any circumstances.

In Fig. 9 I show a modified arrangement in which the valves open into the pipe K, and are, on account of their position with relation to each other, each provided with a spring, marked S′. Their action, however, is automatic, and similar to the double valves above described.

Extending upward from pipe K is a pipe, K′, which is jointed universally to a pipe, K^2, or preferably, as shown in Figs. 4 and 5, as follows, viz: The pipes K′ and K^2 are connected by a flexible tube, K^3, and their adjusting mechanism consists of a sleeve, k^5, swiveled on the pipe K′, and having an arm, K^6, having ratchet k^3, extending at about an angle of forty-five degrees therefrom toward the pipe K^2, a similar sleeve, k^7, secured to pipe K^2, and having two arms or a fork, k^8, extending therefrom at a similar angle and secured to the arm k' by a pivot, k^2, and a pawl, k^4, pivoted in the fork k^8, and engaging with the ratchet k^3, to regulate the angle of adjustment of the two pipes and secure them in adjusted positions.

The teeth of the ratchet have their points toward the pawl, and the weight of the pipe K^2 causes the teeth and pawl to remain normally in engagement with each other and to automatically engage each other when moved in a direction to increase the angle between the pipes K′ K^2; but in order to move these pipes in the opposite direction, to make their angle more acute, the pawl must be disengaged from the teeth by pressure on its outer end, when the adjustment can be made, and upon the release of the pawl the weight of its outer end will cause the point to engage the teeth and secure the pipes in their adjusted position. A spring may be employed to cause the re-engagement of the pawl with the teeth, if desired.

At the outer end of the pipe K^2 a flexible tube, K^4, is connected, to the end of which is secured the mouth-piece L, the construction and operation of which is fully described in another application for United States Letters Patent.

At any point on the pipes between the valves k k' and the mouth-piece L a flexible tube, M, carrying a rubber bag, m, (or a bag of any other suitable material,) may be connected, there being no valves in any of the tubes or pipes or the bag between said valves k k' and the mouth-piece.

In Figs. 4 and 13 I have shown my apparatus constructed so as to be adapted to receive a cabinet, N, which necessitates the mounting above the plate E of a table, O. This table is of cast-iron, and has as its means of support and connection with the plate E one or more arms, O′, four being here shown. I find it desirable in this construction to bend the lever H to the right and engage it in adjusting the gear-wheel g with relation to pinions f in a rack, O^2, attached either to table O or plate E, the weight of lever H retaining it in the notches. The arrangement of the pipes J is also slightly changed, and the pipe K passes up on the side of the apparatus instead of in the rear center, this being preferable when a cabinet is mounted on the apparatus. In the former figure I also show the bottles and tube C incased in ornamental tin or other sheet-metal boxes.

In Figs. 1 and 4 I show the rubber bag mounted by means of its tube on different parts of the pipes—in Fig. 1 at the end of the pipe and near the mouth-piece, and in Fig. 4 under the cabinet and slightly out of the way, but still in sight of the operator.

When the operator desires to administer the gas, the patient is placed in position and the mouth-piece placed over his mouth, the bag having been filled in the following manner: It is well known that the liquefied gas will be vaporized as soon as the pressure or confining power is released, consequently the gas will forcibly escape from the bottle as soon as the valve is opened, and will continue to do so as long as it remains open until it is exhausted. Now, therefore, in order to fill the bag with gas the operator presses his foot against the lever g' and, pushing it around, turns the shaft G, gear g, and pinion f, with which the gear is engaged, thus unscrewing and partially withdrawing the valve-stem and opening the valve. The gas now rushes out into the pipes, and being unable to escape by reason of the automatically closed and locked valve in the mouth-piece it fills the bag, when the lever g' being released it is automatically returned by means of its spring closing the valve. The operator now presses the mouth-piece against the lips of the patient, causing the sections to move on each other, releasing the valve in the mouth-piece, when, by inhaling or inspiration of the patient, the gas is drawn from the bag into the lungs. When it is desired to open the valves without the necessity of being near the apparatus, a cord or chain with a loop or hook at the end is attached to the foot-lever. When sufficient gas has been administered to the patient, the operator withdraws the mouth-piece from the patient's lips, when, by the automatic action of the sections of the mouth-piece, the valve is again automatically closed and locked.

The wheels a^2 are attached to the legs for convenience of transportation from place to place, and to further facilitate this I have attached a handle, Q, (see Fig. 4,) which normally hangs down out of the way, as shown, but may be raised to a horizontal position when grasped by the hand.

I have shown in Fig. 3 an improved device for suspending the mouth-piece when not in use, which consists of a sleeve or ring, R, en-

compassing the pipe K^2 and having a thickened side, *r*, which is perforated and threaded to receive a screw, *r'*, which passes loosely through the center of a U-shaped yoke or fork, r^2, said fork swiveling on said screw and the screw serving the double function of pivot or swivel pin and set-screw, in that it holds the ring R in position when screwed in against the pipe K^2. When the mouth-piece L is not in use, it can be hung in this fork, as shown in Fig. 2.

By my apparatus constructed as herein described I am enabled to accomplish the following important objects:

First. The operator is enabled to administer nitrous-oxide gas (N_2O) to patients for the purpose of anæsthetizing them during dental or surgical operations without cumbering his hands with the gas-valve mechanism, the whole being under full control of his feet, while the hands are left free, and the gas-supply in the bag or reservoir is in full sight. This is of special importance, in view of the well-known fact that the effect of this gas is of very short duration.

There is a great loss of gas in the devices now in use for administering it, due in part to the large size of the bag used, which usually contains an amount which the operator believes sufficient to anæsthetize his patient. This is not always the case, and it is sometimes necessary to refill. To do this with the devices now in use requires that the operator give up the patient temporarily, open the valves, let in more gas, then close the valves before he can proceed. Much gas remains in the bag after many operations which may be a total loss. My construction enables me to use a very small bag or reservoir, and the operator may, while giving full attention to the patient with instruments in hand, fill, refill, or keep the receiver full by a continuous flow until sufficient has been inhaled. This being the case, the inhaler is allowed to drop and is sustained by the pipes. The valve h^4 is instantly automatically closed, and the receiver being small, but small loss can by any possibility occur.

By my gear-shifting device I am enabled, when one bottle is exhausted, to immediately connect with the reserve bottle, and at all times retain an automatically-closed apparatus. In the devices now in use the bottle must be changed when exhausted, and if this occurs during an application of the gas all that has been administered is lost, and a vexatious delay occurs.

A gasometer may be used instead of the bag, if desired.

One special advantage derived from the use of two bottles is that when one is exhausted the other may be instantly drawn upon, and may be retained in use while the empty one is being refilled, thus obviating much difficulty and loss of time.

In Fig. 4 the bottles are incased in ornamental sheaths or cases marked B^3 and D^3, which consist of tubes open at the bottom and closed at the top, except an opening centrally thereof to permit the necks of the bottles to pass through to the supporting and locking devices. The sheath B^3 rests in the cup B, the bottle also resting therein; but the sheath D^3 is supported wholly on the bottle, having no bottom support. In order that the bottle may not drop when the sheath is grasped and the support for the bottle released, the sheath and bottle are secured together by a set-screw, D^4, which is threaded through the sheath D^3 and impinges against the bottle. The sheath and bottle being suspended from the plate E are steadied and held in vertical position by resting against the projection C' from the central tube, C.

I claim—

1. A liquid-gas apparatus having bottles for containing the gas and automatically-closing valves for closing the same, in combination with valve-operating devices provided with foot-pedals or treadles, whereby they may be manipulated by the foot of the operator, substantially as set forth.

2. The combination, in a liquid-gas apparatus, of bottles for containing the gas, each having a valve and valve-controlling mechanism, constructed substantially as described, whereby the gas may be discharged from either bottle at the will of the operator, as set forth.

3. The combination, in a liquid-gas apparatus, of two or more bottles, each having a valve, pipes leading from said valves to a reservoir, gas-bag, or gasometer, and a double valve arrangement, whereby gas can be admitted from only one bottle at a time, as set forth.

4. The combination, in a liquid-gas apparatus, of bottles for containing the gas, valves for dispensing the same, one to each bottle, each having a pinion on its stem, and valve mechanism adapted to be connected with either pinion at will, whereby either may be turned to operate its valve, as set forth.

5. The combination of the bottle B^2, for containing the gas, the central tube, C, the cup B, having sleeve B', encircling the tube C, and the base A, secured to said cup, as and for the purpose set forth.

6. The combination of the central support, C, the cups and sleeves B B' D D', the bottles B^2 D^2, the plate E, and means, substantially as described, for removably securing the bottles to said plate, as set forth.

7. The combination of the plate E, means for attaching the bottle thereto, the tube C, secured to said plate, the cup B, having sleeve B', the shaft G, passing through said tube and carrying valve-operating mechanism, and the foot-lever *g'*, secured to said shaft, for the purpose set forth.

8. The combination, with the bottle B, its valve, and its supporting mechanism, of the lever for operating the valve and the spring connected to the shaft G, whereby the lever is

automatically returned, thereby closing the valve, as set forth.

9. The combination of the base A, the cup B, secured thereto, the central tubular support, C, upheld by the sleeve B′, the shaft G, stepped in the base, and means for securing the tubular support at the top, as set forth.

10. The combination of the base A, having wheels a^2 on one side, the table or cabinet-support O, having drop-handle on the opposite side from the wheels, and the devices connecting the table and base, substantially as set forth.

11. The combination, with the plate E, surmounting the bottles, of the arms O′ and table O, adapted to support the cabinet and inhaler, as set forth.

12. The combination of the base A, tubular support C, carrying bottle-holding cups, the bottles B^2 D^2, plate E, central shaft stepped in base carrying a gear-wheel at the top and an adjusting and automatic returning device at the bottom, as set forth.

13. The combination of the cup B, the bottle B^2, and the spring b' in the cup to partially support the bottle, and means for securing the bottle at the top, as set forth.

14. The combination of the plate E, having notches E′, the bottles having necks b^4, provided with openings b^5, the set-screws e, and the pipe J with ends j, as set forth.

15. The combination, with the plate E and reservoir J^3, of the branch pipes J′ J^2, opening into said reservoir and closed by automatic valves k k', as set forth.

16. The combination of the reservoir J^3, branch pipes J′ J^2, valves k k', having stems, and a single spring encircling said stems and holding the valves normally closed, as set forth.

17. In combination, the valve-stem F, having soft-metal end b^9, and the bottle having conical mouth, as set forth.

18. The combination, with valve-seat, neck b^4, and gland b^8, of the threaded valve-stem F and removable pinion f, as set forth.

19. In combination, the valve-stem F, having conical soft-metal point swiveled thereon, the valve-seat b^9, neck b^4, and pinion f, as set forth.

20. The combination, with the bottles B^2 D^2, having valves with screw-stems F, of the pinions f and the intervening adjustable gear-wheel G, as set forth.

21. The swinging support for the bottle, consisting of plate E with notch E′, the bottle-neck b^4 with opening b^5, the pipe J with end j, projecting through the plate E into opening b^5, and the set-screw e, threaded through said plate and engaging the opposite side of the neck of the bottle, as set forth.

22. In combination with pipe K^2, the sleeve R, fork r^2, and set-screw r', for the purpose set forth.

23. The combination of pipes K′ K^2, flexible tube K^3, and ratchet-adjusting mechanism, constructed and located substantially as described.

24. The combination of the pipes K′ K^2, the flexible tube K^3, the swiveled sleeve and ratchet attached to one of them, and the sleeve rigidly secured to the other and carrying a pawl, the pawl-support being pivoted to the ratchet, as set forth.

25. In a liquid-gas apparatus, the combination of an automatically-closing mouth-piece or inhaler, pipes leading from it to the gas-bottles having automatically-closing valves, and a gas bag or reservoir located on and connected with said pipes, as set forth.

26. The combination, with the valves of a liquid-gas apparatus, of a foot-lever for operating said valves and an extension to said foot-lever extending to a distant point, whereby the lever may be operated from the said point, as and for the purpose set forth.

27. In a liquid-gas apparatus, a pipe connected with and supported upon the apparatus and carrying the inhaler and an adjustable joint, substantially as described, whereby its outer portion may be adjusted to any desired position and secured in said adjustment, as set forth.

28. A liquid-gas apparatus provided with a supported pipe carrying the inhaler and a joint, substantially as described, capable of vertical and lateral adjustment, as set forth.

29. A liquid-gas apparatus provided with a bottle and locking and supporting devices, substantially as described, whereby said bottle is supported and held from turning, as set forth.

30. A liquid-gas apparatus provided with a bottle and devices engaging with the neck of the bottle to support and hold it from turning, as set forth.

31. In a liquid-gas apparatus, a bottle supported wholly at the neck thereof, in combination with the supporting device, serving also to hold it from turning, as set forth.

32. In a liquid-gas apparatus, a sheath having a perforated head for the neck of the bottle to pass through, in combination with a locking device to secure the bottle in the sheath.

33. In a liquid-gas apparatus, a bottle having its ordinary yoke for making the exit-pipe connection to serve to support and lock the bottle from rotation, the parts being combined substantially as described.

In testimony whereof I have hereunto signed my name in the presence of two witnesses.

BASIL M. WILKERSON.

Witnesses:
S. BRASHEARS,
J. MASON GOSZLER.