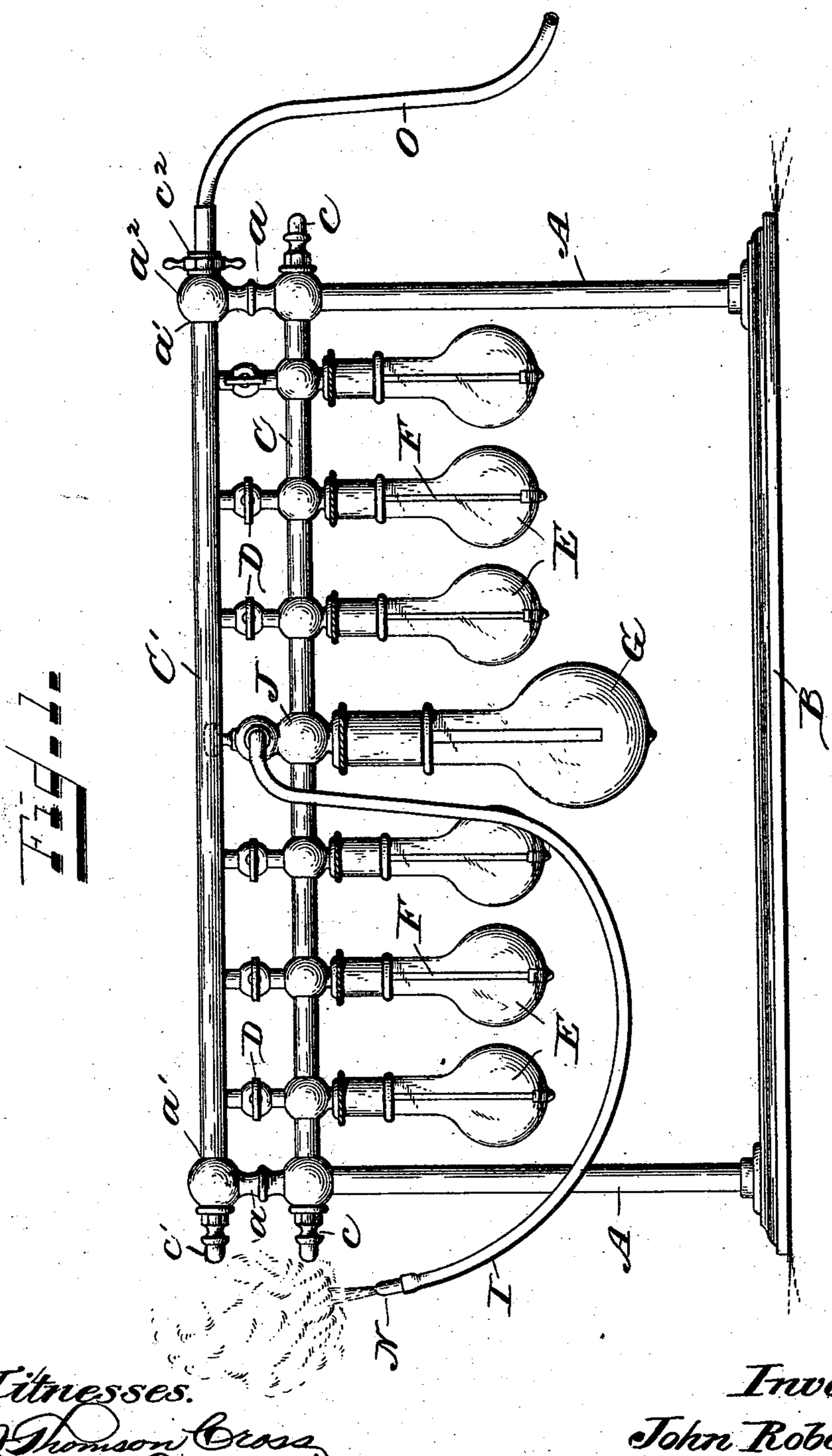
(No Model.) 2 Sheets—Sheet 1.

J. ROBERTSON.

ATOMIZER.

No. 549,822. Patented Nov. 12, 1895.



Witnesses.
J. Thomson Cross
Wilber L. Root.

Inventor:
John Robertson,
by James F. Ramsey
his Attorney.

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Fig. 2.

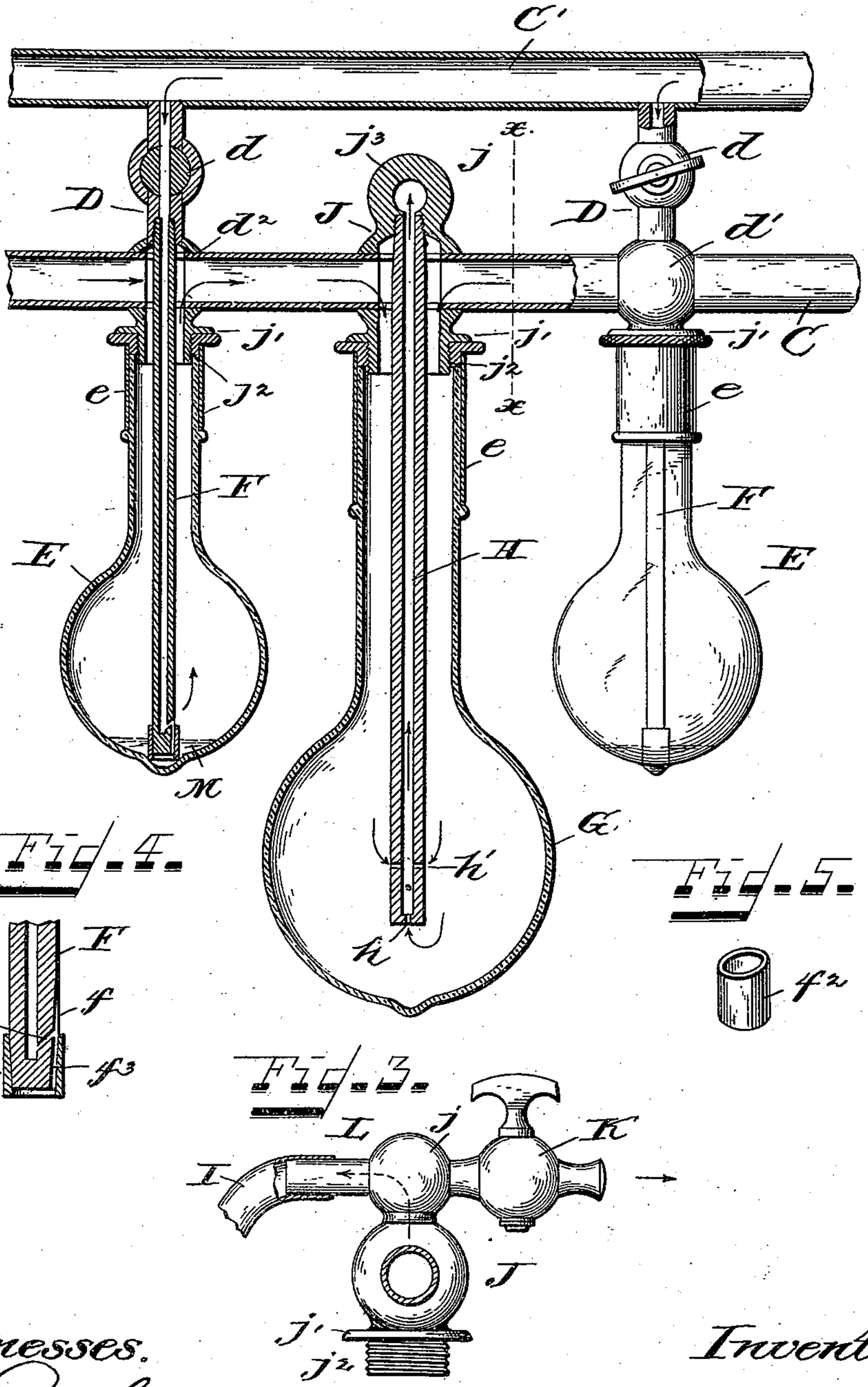

Fig. 4.

Fig. 5.

Fig. 3.

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UNITED STATES PATENT OFFICE.

JOHN ROBERTSON, OF CINCINNATI, OHIO.

ATOMIZER.

SPECIFICATION forming part of Letters Patent No. 549,822, dated November 12, 1895.

Application filed December 17, 1894. Serial No. 532,059. (No model.)

To all whom it may concern:

Be it known that I, JOHN ROBERTSON, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Atomizer; and I declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to a new apparatus for atomizing, mixing, and administering liquid medicines.

The object of my invention is to provide an apparatus for the rapid reduction of liquid medicines in one or more atomizing-flasks to their most available and efficacious form for administration by channels other than the digestive organs; for combining the reduced products with facility and convenience in a mixing-flask in a thorough manner, without impairing their medicinal virtues, by precipitation or chemical decomposition, although the medicines used may be insoluble in each other or chemically incompatible in the liquid state; for furnishing a convenient means of administering the reduced and combined products in such a manner as to reach the disease in the most direct channel with great facility and economy of time and medicine, and also in combining and applying a variety of different kinds of remedies in an atomized state and in any desired proportion to meet the requirements of varying cases.

My invention consists in certain features of construction and in the combination and arrangement of parts and the method employed in atomizing, mixing, and applying medicines, as hereinafter described, and pointed out in the claims.

In the drawings, Figure 1 is a front elevation of the apparatus. Fig. 2 is an enlarged detail of a portion of the apparatus, partly in vertical section. Fig. 3 is a detail view taken on the line $x\ x$ of Fig. 2. Fig. 4 is a vertical sectional view of the lower end of the atomizing-tube. Fig. 5 is an adjustable sleeve which takes over the lower end of the atomizing-tube.

I prefer to construct the apparatus substantially as follows: Two vertical standards A A, resting upon a base B, have secured to their upper ends two uprights $a\ a$, having sockets $a'\ a'$ in each end through which two parallel horizontal pipes C and C′ take and are secured. The pipes C and C′ are also connected to each other at a convenient distance apart by a series of stop-cocks D in such a manner as to answer the double purpose of conveying compressed air or gas from the upper horizontal pipe C′ downward and at the same time holding the two horizontal pipes C and C′ securely in position.

From below the lower horizontal pipe C, and directly beneath each of the stop-cocks D, is suspended a receptacle or atomizing-flask E for the reception of liquid medicines into which descends a small atomizing-tube F, conveying compressed air from the upper horizontal pipe C′, through the stop-cock D, into the atomizing-flasks E.

At or near the center of the lower horizontal pipe C is a fitting J, which takes over pipe C and projects above it in the shape of a hollow ball j, and below is extended to form a shoulder j' and screw-thread j^2, to which is secured a larger receptacle or mixing-flask G, into which the atomized products from the atomizing-flasks E are conveyed through pipe C, received and thoroughly commingled, and the coarser particles deposited and eliminated from the finer and more desirable atomized product, which is conveyed through exit-tube H to the discharge-tube I, from which the liquid medicines in their atomized and commingled state are projected in great volume and with whatever force may be desirable or necessary to reach the respiratory tract, eyes, ears, the rectum, vagina, or other passages, cavities, or surfaces of the body in the most effective manner. By carrying the atomized products into the mixing-flask before administering it makes it impossible to force over any coarse particles which would cause irritation if introduced into the trachea or deeper air-passages.

I prefer to have the flasks fitted with strong metal caps e, permanently cemented to the necks and having a strong thread by which they are screwed securely in position, and made air-tight by means of a gasket. The stop-cocks D and the fittings to which the flasks are screwed may be made of one piece, the upper end being finished in a tail which screws into the upper horizontal pipe C′, mak-

ing an air-tight joint. Below the key *d* the stop-cock expands into a spherical collar *d'*, forming a socket d^2, through which the lower horizontal pipe C is passed and firmly united. Beneath pipe C it forms the thread j^2 and shoulder *j'*, to which the flask is secured. The opening from the upper horizontal pipe C' down through the stop-cock D is small until the spherical collar *d'* is reached, below which it expands into a much larger opening, up through which the atomizing-tube F is passed and screwed into its socket just above the spherical collar *d'* and just below the key *d*.

The uprights *a a*, which connect the horizontal pipes C and C' at the ends, and into which the vertical standards A A are inserted, are preferably finished with a spherical collar a^2, through which the ends of the horizontal pipes are passed. The ends of the pipes thus left open are closed in the lower pipe by an ornamental screw-plug *c* at each end and in the upper pipe by an ornamental screw-plug *c'* at one end and a coupling c^2 at the other, the plug *c'* and coupling c^2 being interchangeable, so that the coupling can be attached to either end of the apparatus, according as it may be most convenient to introduce the compressed air from the tube O at one side or the other. The closing of the ends of the pipes by screw-plugs the full size of the inside diameter of the pipe is for the purpose of convenience in cleaning, as the plugs can be removed and a swab run through the whole length of each pipe.

The fitting J, to which the central mixing-flask G is attached, is in the form of a ball-shaped collar, with ball *j* above and shoulder *j'* and thread j^2 below. The fitting J is slipped over the lower horizontal pipe C and secured firmly in position. The ball *j* above has a horizontal opening j^3 through it from front to rear, as shown in Fig. 2, in the rear of which is inserted an exhaling stop-cock K and in front a nipple L for the attachment of the flexible discharge-tube I. From the center of the horizontal opening j^3 another opening extends downward, expanding below the spherical or ball-shaped collar in the same manner as the openings below the stop-cocks D. Into this opening is inserted exit-tube H, which descends into the mixing-flask G. It is screwed into its socket just above the ball-shaped collar in such a manner as to form (when the stop-cock K at the rear is closed) a continuous air-tight passage from the bottom of the mixing-flask to the mouthpiece N on the outer end of the projecting tube.

The stop-cock K (shown in Fig. 3) is to permit the patient to exhale without removing the mouthpiece while the atomized medicines are being administered.

The openings in all the fittings to which the flasks are screwed are all large enough to allow free circulation of the atomized product around the tubes where they pass through the necks of the flasks and upward through the lower horizontal pipe C to where they enter the sockets.

The exit-tube H in the mixing-flask is a plain tube with a small hole *h* in the bottom and other small holes *h'* in the sides, near the bottom, to allow the ingress of air and medicines in the atomized state.

The atomizing-tubes F in the atomizing-flasks E are so constructed as to reduce the liquid medicines to infinitesimal particles. This is accomplished in the following manner: The atomizing-tube F is closed at the lower end and a groove *f* cut on the outside. From the bottom of this groove *f*, at a convenient distance from the end of the tube, a small hole *f'* is drilled at the proper angle to the central opening of the tube F. An adjustable sleeve f^2 is then fitted over the end of the tube F, so that the top of the sleeve f^2 is even with the hole *f'* in the groove *f*. The addition of this sleeve transforms the groove into a closed canal f^3, having its lower opening at the bottom of the tube and its upper opening forming a junction at an acute angle with the hole *f'* in the tube F. Thus the air introduced into the tube F from the stop-cock D above passes down and out of the tube at an upward angle through hole *f'*, as indicated by the arrow, across the upward opening of the canal f^3. The lower end of the tube F being immersed in the liquid M a partial vacuum is formed in the canal, through which the liquid rises until it comes in contact with the current of air, by which it is violently thrown out in a fine spray against the sides of the flasks E. The upper end of the sleeve f^2 is a cut at a blunt angle, so that by turning it in either direction the edge can be raised or lowered where it crosses the groove *f*, in order to so adjust it as to make the canal f^3 and the hole *f'* in the groove form an exact intersection. The advantages which I secure in constructing the tube in this way, or substantially this way, are efficiency of operation, obtained by the exact adjustment of the hole *f'* and canal f^3, so that their outlets form but one opening and unite at an acute angle to form the most complete vacuum possible by such means, and at the same time economizing all the force of the air. It thus produces a better spray at a lower pressure and with less volume of air than any heretofore made. The adjustment of the sleeve f^2 is easily accomplished by simply turning it in either direction. Another advantage of this tube is simplicity and cheapness of construction. There are no screw-threads, no small tubes or points, and no fine canals of any length. No great accuracy is necessary in the construction of any part. The length of the groove, the angle of the hole, the length of the sleeve, and the angle of its upper end may all vary to almost any extent without impairing the efficiency of operation, because the relation of the openings to each other, upon which the efficiency of operation depends, is not perma-

nently fixed in the construction of the parts, but is secured by the ready adjustment of those parts to each other by the simple operation of turning the sleeve. I am also enabled to clean the tubes with ease and facility. If the openings become clogged by sediment in the medicine, or from any other cause, there are no long narrow canals to be cleared. The groove can be thoroughly cleared in its whole length either by passing a wire through it perpendicularly or by the removal of the sleeve, while the hole in the tube, being short, extending only from the outer to the inner wall of the tube at an upward angle of about forty-five degrees and less than ninety degrees, is easily cleared by the insertion of the end of a small wire. The flasks, being suspended, are easily removed for filling, cleaning, &c., without disturbing the tubes, and is one of the convenient and desirable features of my invention.

The operation of the apparatus is as follows: Compressed air, oxygen, or other gas, as may be desired, is introduced at the end of the upper horizontal pipe C′ through tube O and immediately passes through the whole length of pipe C′. On any one of the stop-cocks D being opened the compressed air passes down through the atomizing-tube F into the atomizing-flask E directly beneath and escapes through the small hole *f′* at an upward angle, carrying with it a portion of the medicine from the bottom of the atomizing-flask, which it atomizes by forcing it violently outward in the form of a fine spray. The pressure accumulated in the atomizing flask by the expansion of the compressed air carries the atomized medicine in the form of a white cloud up through the neck of the atomizing-flask into the lower horizontal pipe C, through which it passes to the center of the apparatus and down to the bottom of the large mixing-flask on the outside of the central or exit tube H, as indicated by the arrows, where the coarser particles are deposited. The accumulating pressure then forces the fine atomized product through the openings in the sides and bottom of the exit-tube H, through which it passes upward and out through the discharge-tube I in voluminous clouds. When two or more stop-cocks D are turned on at the same time, the atomizing process takes place simultaneously in all the flasks to which the compressed air is thus admitted, and the atomized products all pass over simultaneously and in the manner already described into the mixing-flask, where they are thoroughly mixed by the currents of air before escaping through the exit-tube H. The amount of air introduced into each flask can be controlled by the keys *d* and the amount of atomized product forced over into the mixing-flask regulated accordingly, so the dose can be made mild or strong, as desired, and the atomized product from two or more atomizing-flasks mixed in any desired proportion.

The atomizing process can take place and the product be administered under any desired pressure; but as the process depends upon the expansion of air in the atomizing-flasks the pressure in the inlet horizontal pipe C′ and in the atomizing-tubes F must be greater than in the atomizing-flasks E, the outlet-pipe C, the mixing-flask G, exit-tube H, and the discharge-tube I.

I claim—

1. An atomizer having a compressed air inlet-pipe C′ communicating with one or more atomizing tubes F, each taking into separate atomizing flasks E communicating with a mixing flask G, having an exit tube H communicating with a discharge tube I, substantially as and for the purposes specified.

2. An atomizer having an inlet-pipe C′ communicating by one or more interposed stop-cocks D with suspended atomizing tubes F taking into suspended atomizing flasks E communicating with a suspended mixing flask G having an exit tube H communicating with discharge tube I, substantially as described and for the purposes set forth.

3. An atomizer having an inlet-pipe C′ communicating with one or more suspended atomizing tubes F having atomizing holes *f′* of smaller area than any of the subsequent openings in the flasks E, pipe C, mixing flask, exit and discharge tubes into which the atomized product is projected to permit the expansion of air therein, substantially as and for the purposes specified.

4. An atomizer having two or more atomizing receptacles E, provided with atomizing tubes F, in combination with a mixing receptacle G, substantially as described.

5. The combination in an atomizer, of an atomizing flask with an atomizing tube having its lower end immersed in liquid said tube being provided with a hole leading from the vertical opening in the tube to and forming an acute angle with a canal (with which said tube is provided) leading from the liquid, substantially as described.

6. In an atomizer, an atomizing tube having the lower end of the vertical opening closed, said tube being provided with a hole from the central vertical opening to a groove on the outside at an angle of less than ninety degrees therewith and an adjustable sleeve taking over the tube thereby transforming the groove and providing the tube with a canal leading from the liquid in the atomizing flask to said hole, substantially as described.

7. An atomizing tube F, having groove *f*, hole *f′* opening therefrom at an acute angle upwardly, sleeve f^2, canal f^3 arranged and operating substantially as and for the purposes set forth.

8. In an atomizer, an atomizing tube closed at its lower end said tube having a groove on the outside thereof, an adjustable sleeve having its upper end cut at a blunt angle taking over the lower end of said tube thereby forming a canal from the liquid to a hole extending from the central vertical opening at an

acute angle to said canal, substantially as described.

9. In an atomizer a compressed-air inlet-pipe communicating with a stop-cock having attached thereto an atomizing flask and a suspended tube closed at its lower end, said tube having a hole extending therefrom at an upward angle to a groove on the outside of the tube and a sleeve taking about the lower end of the tube covering the groove and forming a canal communicating with the liquid to be atomized, substantially as described.

10. In an atomizer the tube O, coupling c^2, pipes C and C', stop-cocks D, atomizing tubes F, atomizing flasks E, mixing flask G, exit tube H, fitting J, stop-cock K, nipple L, discharge tube I and mouth-piece N, all combined and operating substantially as and for the purposes set forth.

11. In an atomizer, the combination of the base B, standards A A, uprights a a, pipes C and C', having plugs c, c' and coupling c^2, stop-cocks D, flasks E and G, tubes F, H and I and stop-cock K, substantially as described.

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Witnesses:
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JAMES N. RAMSEY.