No. 659,188. Patented Oct. 2, 1900.

# G. B. UNDERWOOD.

## INHALER.

(Application filed Dec. 3, 1896.)

(No Model.) 3 Sheets—Sheet 1.

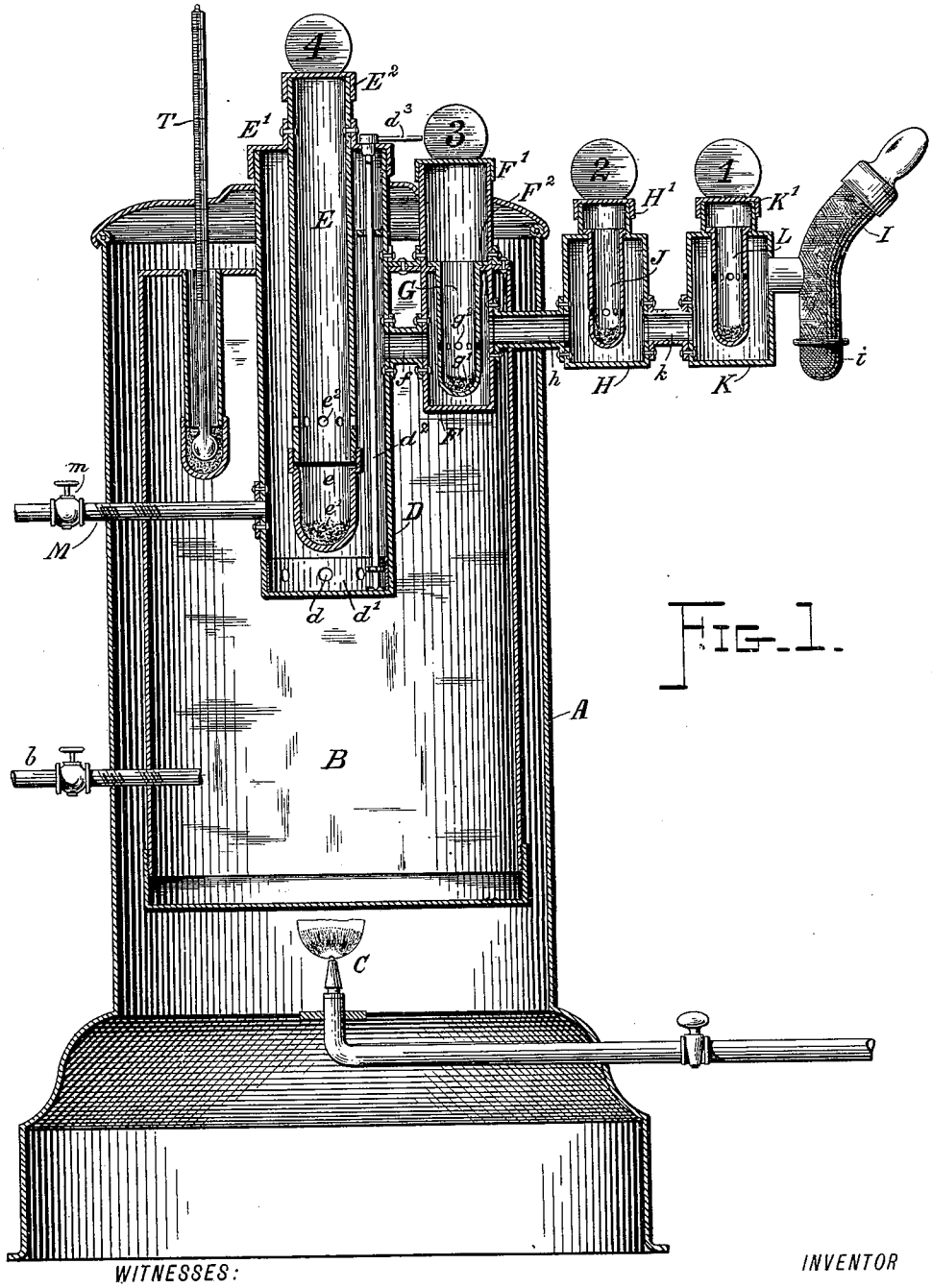


FIG. 1.

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FIG. 2.

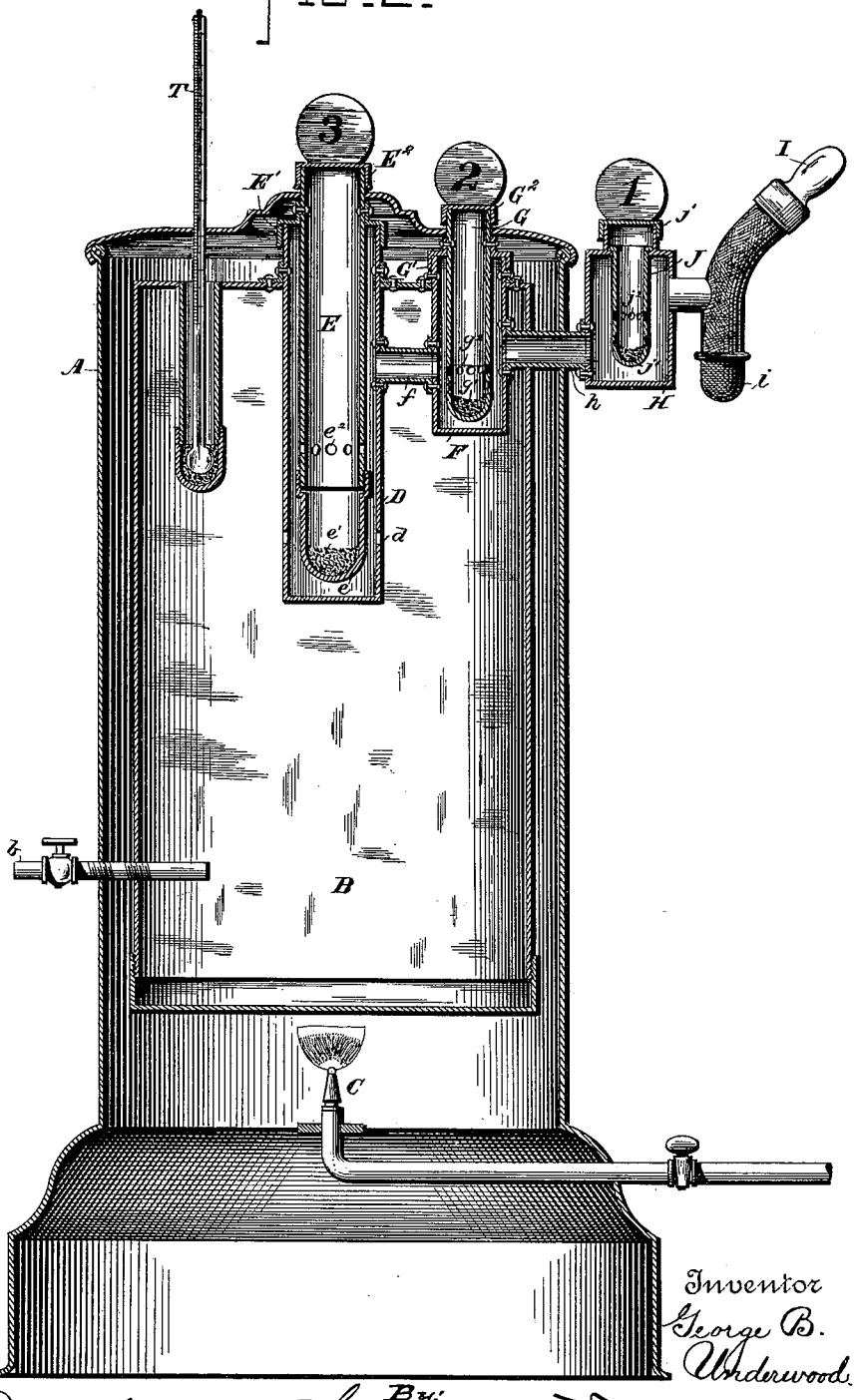


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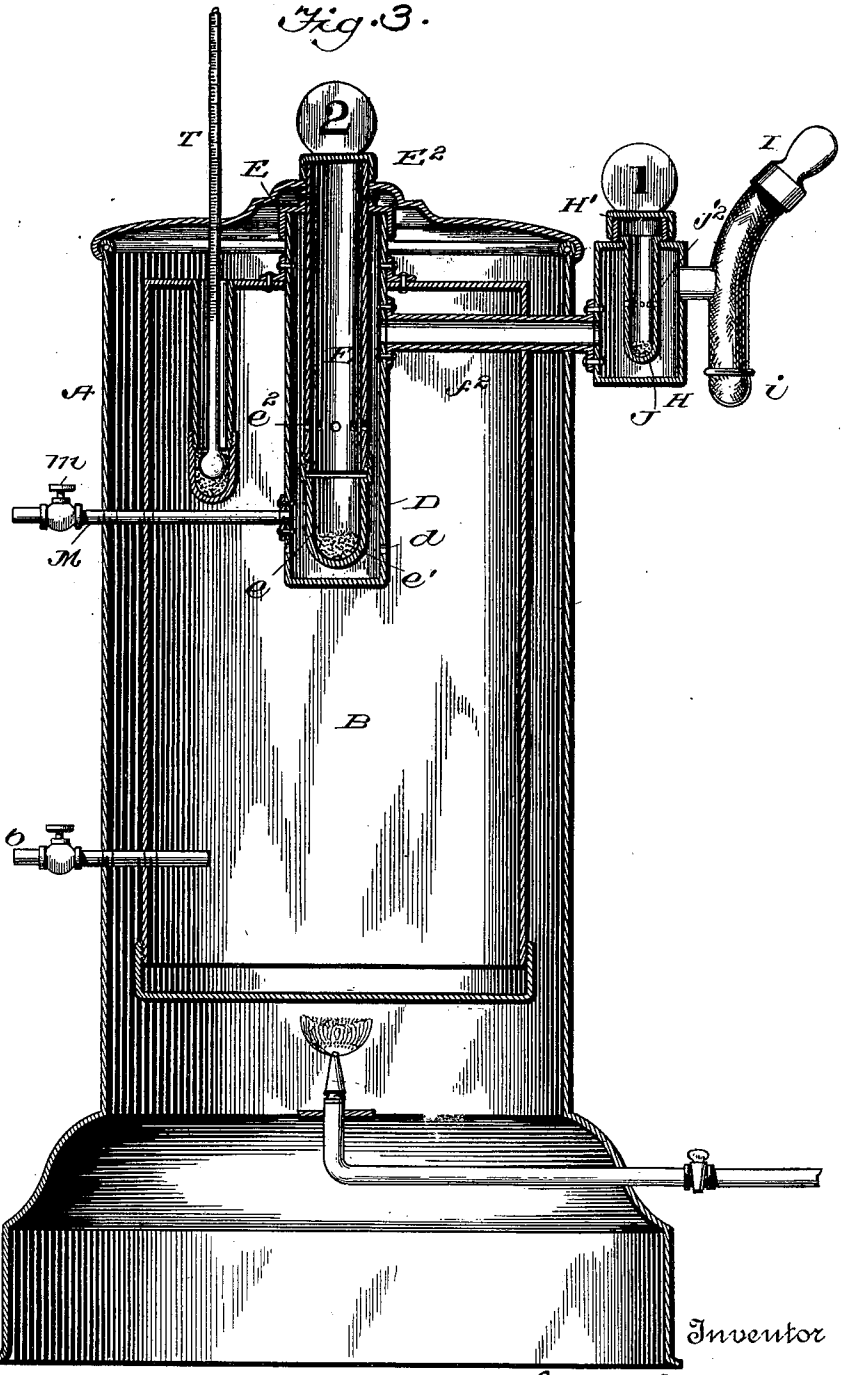
Fig. 3.




Witnesses

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# UNITED STATES PATENT OFFICE.

GEORGE BROWN UNDERWOOD, OF NEW YORK, N. Y.

## INHALER.

SPECIFICATION forming part of Letters Patent No. 659,188, dated October 2, 1900.

Application filed December 3, 1896. Serial No. 614,351. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE BROWN UNDERWOOD, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Pulmonary Inspirators; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improvement in volatilizers, inhalers, pulmonary inspirators, or apparatus for administering heated air and gases or volatile medicines; and its object is to so construct the apparatus that medicines which volatilize at different temperatures may be simultaneously volatilized in it by providing separate receptacles for each medicine, which receptacles are subjected to practically uniformly different temperatures—that is, there will always exist an approximately-certain difference in temperature between the various receptacles, so that when the temperature of one is known that of the others can be readily ascertained.

A further object of the invention is to enable the temperature of the inhaled gases to be instantaneously controlled and regulated by means of an independent cold-air inlet and also to enable oxygen or other medicinal gases to be administered by the same apparatus, if desired.

The invention therefore consists in the combinations and constructions of parts summarized in the claims and hereinafter described, and illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical sectional view of an inspirator embodying the invention. Figs. 2 and 3 are similar views of slight modifications thereof.

Referring to said drawings, A designates a casing within which is an air-heating drum B, below which is a burner C, air being admitted to the drum through the pipe *b*. These parts are substantially like similar parts in Patent No. 547,322, on which this invention is an improvement.

Depending centrally and vertically into and from the top of the drum B is a cylinder D, whose upper end projects also slightly through the top of the casing, and near its lower end it has a series of perforations *d* in its sides. These perforations, as shown in Fig. 1, can be closed or regulated in size by means of the annular valve *d'*, which can be operated by a rod $d^2$, extending upward in the tube and having a detachable handle $d^3$ on its upper end, so that it can be turned without uncovering the cylinder. Within this cylinder is a removable tubular receptacle E, the lower portion *e* of which is detachably attached to the upper portion by a screw-thread or other simple joint for convenience in cleansing. The receptacle extends above the cylinder and has an annular flanged collar E' near its upper end, which fits over and closes the upper end of cylinder D and at the same time suspends and centers the receptacle therein, as shown. The upper end of the receptacle is closed by a removable cap $E^2$, which may bear an identifying number 4, as shown in Fig. 1, or 3, as shown in Fig. 2. In the bottom of part *e* is placed asbestos fiber *e'*, upon which the medicine can be dropped and which will facilitate its gradual volatilization. Above part *e* are a series of perforations $e^2$, through which the volatilized medicine escapes into cylinder D, from whence, mixed with hot air, it passes through a short pipe *f* into a second shorter cylinder F, suspended within drum B at one side of cylinder D. Said cylinder F preferably has no direct communication with the interior of drum B. As shown in Fig. 1, cylinder F also extends through the head of drum and cover of the casing and is closed by a cap F', which may bear the number 3, and within the cylinder is a removable receptacle G, suspended therein on an annular flange $F^2$.

In Fig. 2 the receptacle G is suspended in cylinder F by a collar G', which closes the upper end of said cylinder, receptacle G being therein shown as similar to receptacle E, but shorter, and is closed by a cap $G^2$, bearing a number 2.

In the lower part of receptacle G is a wad of asbestos fiber *g'*, upon which the medicines can be dropped, and above part *g'* are perforations $g^2$ for the escape of the volatilized medicines, which commingle with the volatilized medicine and air entering through pipe *f* and, together therewith, passes through a pipe *h* into a cylinder H outside of casing A,

pipe *h* leading through the walls of the drum and casing, as shown. The upper end of cylinder H is closed by a cap H', which may bear the number 2 in Fig. 1, (1 in Fig. 2,) and within cylinder H is suspended a removable receptacle J, similar to receptacle G. Beside cylinder H and communicating therewith by a pipe *k* is a similar cylinder K, closed by a cap K', bearing a number 1, and within said cylinder K is a removable receptacle L, similar to receptacles H and F. Connected to this cylinder K is an inhaler-tube I, which is provided with a detachable saliva-trap *i* near its junction with said cylinder. In Fig. 2 the inhaler-tube is connected to cylinder H, as cylinder K is omitted.

The receptacles J and L are provided with a wad and perforations for the escape of volatilized medicines, like receptacle G.

A thermometer T is suspended in the hot-air drum beside cylinder D and projects above the casing, so that the temperature within the hot-air drum can be readily ascertained.

In Fig. 1 a pipe M is shown leading through the casing and air-drum to the interior of cylinder D. This pipe is provided exterior to the drum with a valve *m* and is intended for the admission of cold air or gases, as hereinafter explained.

It will be observed that in Fig. 1 there are four separate receptacles for receiving the medicines, (designated and marked Nos. 1, 2, 3, and 4 in the drawings,) with a thermometer in position. In Fig. 2 there are three such receptacles, (marked 1, 2, and 3.) These receptacles are so situated that a constant differential range of temperature of from 50° to 70° Fahrenheit exists in them, the thermometer registering the highest temperature in the drum. Thus in Fig. 2 if the thermometer should register 470° Fahrenheit the temperature in No. 3 would be 400° Fahrenheit; in No. 2, 330° Fahrenheit, and in receptacle No. 1 it would be 260° Fahrenheit. I therefore have a scientific apparatus in which the volatilization and vaporization of drugs that volatilize and vaporize at different temperatures can take place simultaneously. For example, a drug whose volatilizing temperature is 400° Fahrenheit placed in receptacles would volatilize at the same time as those requiring a temperature of 330° Fahrenheit and 260° Fahrenheit placed in receptacles 2 and 1, respectively.

To illustrate more clearly, suppose it is desired to give an inhalation of the volatile agents ichthyol, pinus sylvestris, and an iodo-phenol solution. Ichthyol volatilizes at about 350° Fahrenheit, oil pinus sylvestris at about 280° Fahrenheit, and the iodo-phenol solution at about 210° Fahrenheit. I therefore would place the ichthyol in receptacle No. 3, the oil of pinus sylvestris in receptacle No. 2, and the iodo-phenol solution in receptacle No. 1. When the thermometer registered 420° Fahrenheit, a constant and uniform volatilization of these drugs would ensue and a more perfect admixture of their atoms taking place than could be obtained by any other method.

In the apparatus shown in Fig. 1 four drugs of different volatilizing temperatures could be simultaneously volatilized, the drug volatilizing at the highest temperature being placed in receptacle 4.

It often happens that the temperature of the apparatus becomes too high while it is in use and during the administration of medicines, necessitating in old styles of volatilizers the stoppage of treatment while the apparatus cooled down. In the apparatus shown in Fig. 1 should the inhaled gases be too hot the physician or patient can by opening valve *m* instantly reduce the temperature sufficiently to enable the treatment to be continued without interruption, varying the amount of cool air admitted into cylinder D as required.

If it is desired to administer oxygen or other medicinal gases either alone or in combination with hot air or medicaments, the gases can be admitted through pipe M, when the perforations in cylinder D should be closed to prevent the gases in the cylinder escaping and coming in contact with the heated bottom of the drum B, thus preventing oxidation or corroding of the said bottom by such gases.

In Fig. 3 the most simple form of the inhaler is shown, having but two differential volatilizing-compartments. The parts are constructed substantially like the inhaler shown in Fig. 2, only the cylinder F and receptacle G is omitted and cylinder D is connected directly to the exterior chamber H by a pipe $f^2$. Similar letters of reference on Figs. 2 and 3 indicate like and corresponding parts, and further description of the last modification is unnecessary. It is useful where it is only desired or necessary to have two differently-heated volatilizing-receptacles.

Volatilizers constructed in accordance with my invention are capable of use for almost every purpose for which volatilizers are used or designed for use, and hot air, hot gases, and combinations of both or either with medicaments can be administered at will or as desired.

The utility of my invention is obvious from the foregoing and capable of various modifications and embodiments in various styles of apparatus.

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

1. The combination of an air-heating drum, two or more receptacles arranged in series so as to be of different temperatures, and means for drawing air from the drum through said receptacles successively, with means for regulating the admission of hot air into the first receptacle; and means for admitting cool air or gases into said receptacle to reduce the temperature therein, for the purpose and substantially as described.

2. The combination of an air-heater, a plu-

rality of cylinders suspended therein and communicating with each other, and arranged to be of different temperatures, and means for drawing hot air successively through said cylinder; with removable medicine-receptacles in said cylinder provided with outlets for the vaporized medicines, substantially as and for the purpose described.

3. The combination of an air-heater, two or more cylinders heated thereby to different temperatures and communicating with each other; means for admitting air from the heater into one cylinder and for withdrawing it from the other cylinder, and means for introducing volatilizable drugs into said cylinders, and a pipe for admitting cool air or gases into the first cylinder, for the purpose and substantially as described.

4. The combination of an air-heater, a plurality of cylinders suspended therein and communicating with each other, and arranged to be of different temperatures, a cylinder exterior to the heater, communicating with said inner cylinders, and means for conducting air successively through the cylinders and from the outer cylinder to the patient; with medicine-receptacles in the cylinders provided with outlets for the escape of the volatilized medicines, all substantially as and for the purpose described.

5. The herein-described apparatus for administering medicines by inhalation, comprising an air-heater, a pair of cylinders of different sizes suspended therein, and arranged to be of different temperatures, the largest of said cylinders communicating with the interior of the heater and also with the smallest cylinder; a pair of communicating cylinders exterior to the heater communicating with each other and the smaller inner cylinder, and an inhaler-tube connected to the outermost one of the said outer cylinders, with removable receptacles in said cylinders, adapted to receive volatilizable medicines, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

GEORGE BROWN UNDERWOOD.

Witnesses:

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J. H. CALDWELL.