(No Model.)

E. KRULL.

INHALING APPARATUS.

No. 401,502. Patented Apr. 16, 1889.

FIG. II.

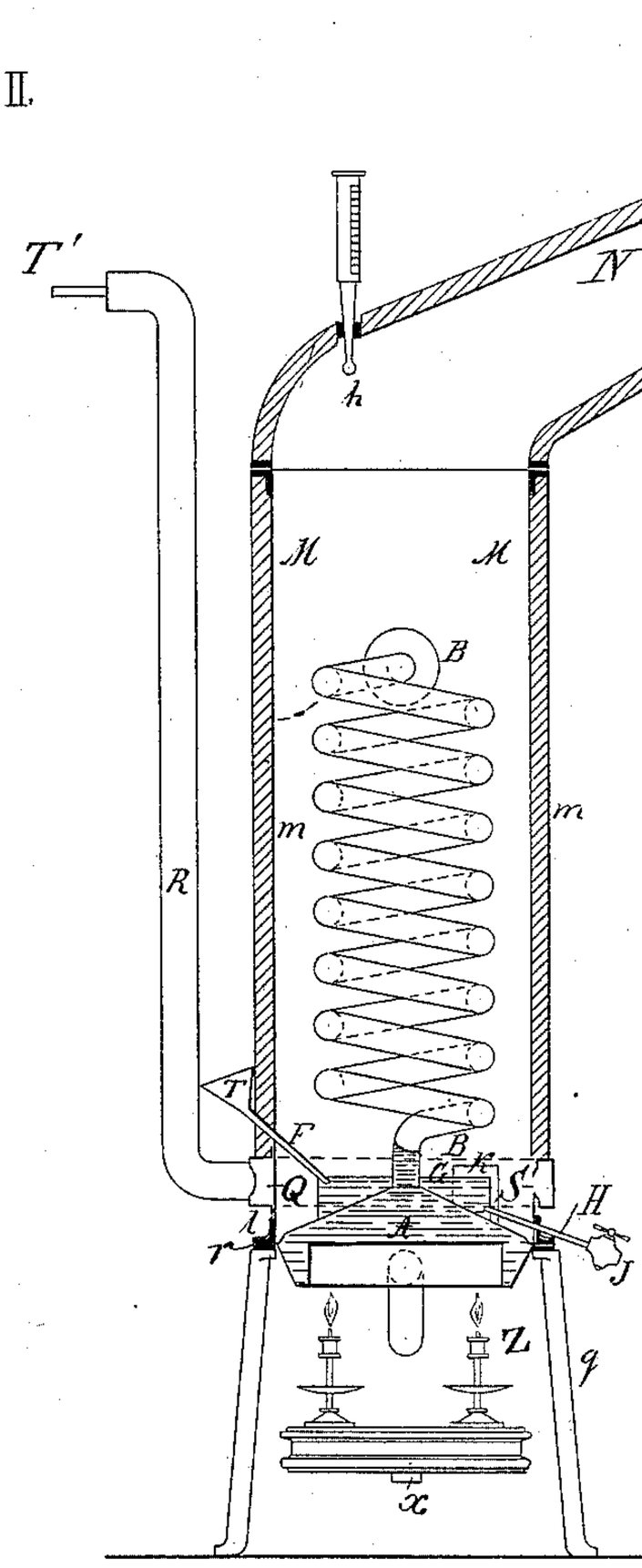


FIG. I.

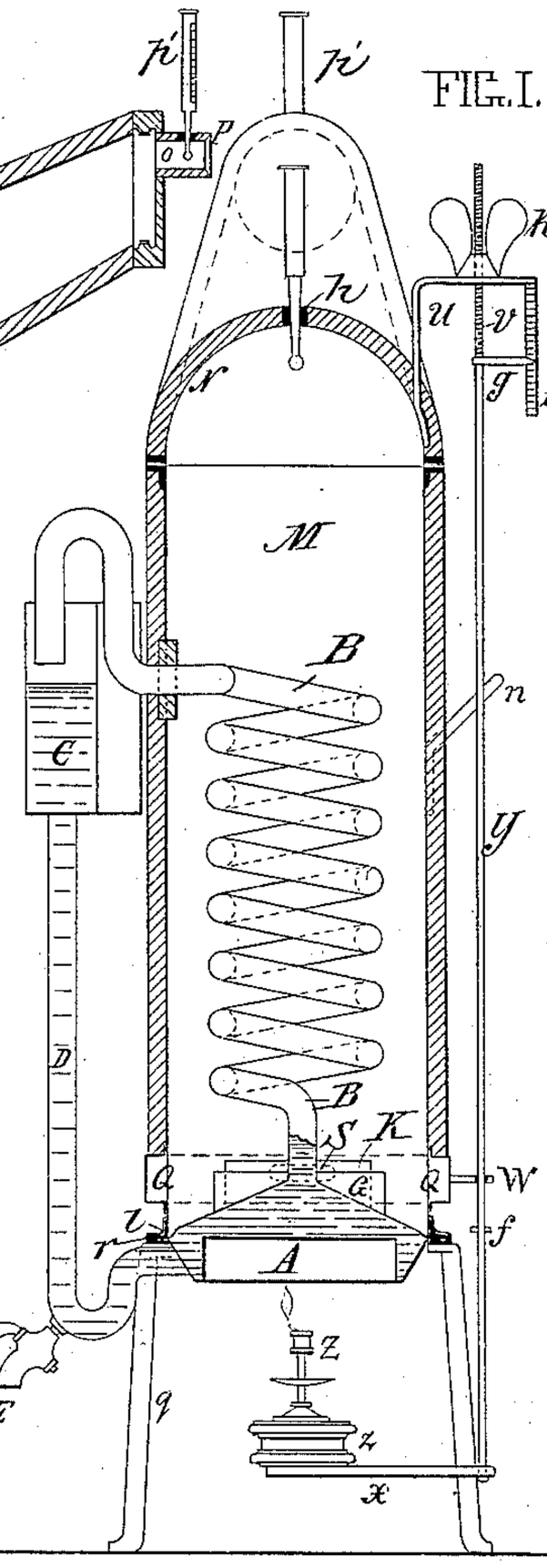
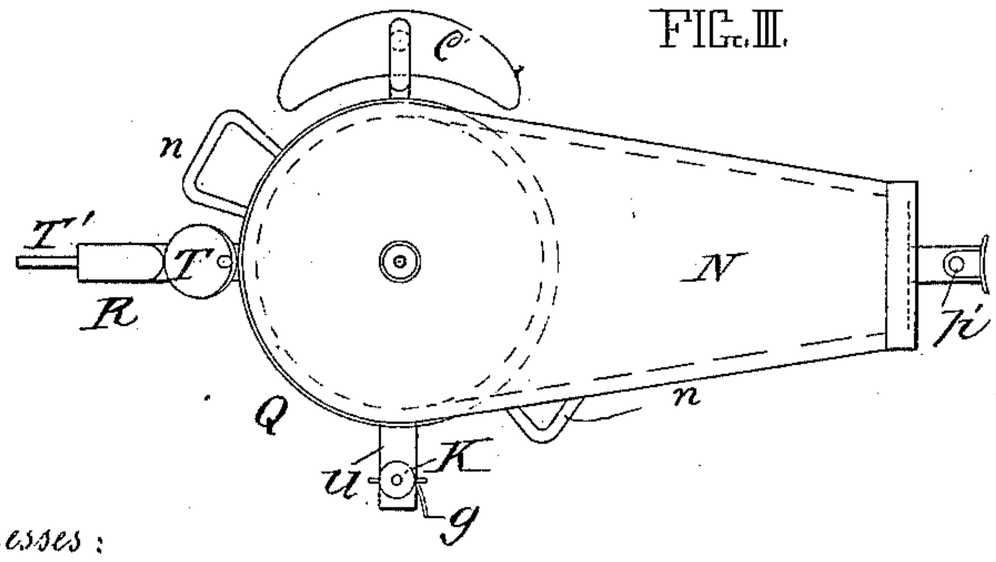


FIG. III.



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UNITED STATES PATENT OFFICE.

EDUARD KRULL, OF GÜSTROW, MECKLENBURG-SCHWERIN, GERMANY.

INHALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 401,502, dated April 16, 1889.

Application filed March 2, 1887. Serial No. 229,406. (No model.) Patented in Germany June 16, 1886, No. 38,641; in England February 8, 1887, No. 1,957; in Belgium February 15, 1887, No. 76,122; in Italy May 7, 1887, No. 21,140; in Denmark May 31, 1887, No. 47; in Austria-Hungary June 11, 1887, No. 10,338 and No. 5,484, and in France June 20, 1887, No. 181,301.

To all whom it may concern:

Be it known that I, EDUARD KRULL, doctor of medicine, of Güstrow, in the Grand Duchy of Mecklenburg-Schwerin, Germany, have invented a new and useful Portable Inhaling Apparatus, (for which I have obtained patents in Germany, No. 38,641, dated June 16, 1886; Great Britain, No. 1,957, dated February 8, 1887; France, No. 181,301, dated June 20, 1887; Italy, No. 21,140, dated May 7, 1887, and Denmark, No. 47, dated May 31, 1887; Belgium, No. 76,122, dated February 15, 1887; and Austria-Hungary, No. 10,338 and No. 5,484, dated June 11, 1887,) of which the following is a specification.

My invention relates to portable apparatus for respiration of moist warm air of a certain stable temperature.

Figures 1 and 2 show vertical sections, and Fig. 3 a plan of inhaling apparatus arranged and constructed in accordance with my improvements.

The apparatus consists of a metal kettle or boiler, (advantageously of tinned copper,) A, having a tinned copper or other suitable metal serpentine tube, B B, connected thereto, with its bent open outlet descending into the vessel C, the lower end of which is connected by the tube D with the kettle or boiler A. The pipe D is provided with a delivery-cock at E. The kettle or boiler A is provided with a rim or flange, *r*, and support *q*, being also connected by the flange *r* with the upper casing, M, of the apparatus.

The boiler A is formed hollow underneath, (in order to prevent the metal parts of the apparatus getting ignescent,) and is heated by two gas, oil, or other lamps having suitable burners adapted to the special purpose for which they are designed. The lamps are mounted on a plate or bar, X, which is connected with the adjusting device to allow of its being raised or lowered.

The adjusting device consists of the rod Y, having on its upper extremity a screw-thread, V, and the winged nut *k*, by which means the rod Y and lamp or burners can be raised or lowered.

W is the lower guide for guiding the rod Y. The upper guide consists of the rectangular arm U, forming a bearing for the winged nut *k*. On the end of the horizontal arm of support U a vertical arm is fixed, having a metrical scale, *i*, thereon, by which the index finger or pointer *g* on rod Y indicates the raising or lowering of the heating apparatus. *f* is a fixed stop on the rod Y to prevent the lamp from being raised too high.

Upon the boiler A and around the serpentine tube B a casing of tinned iron or other suitable metal, M M, is placed, which, on its upper extremity, is provided with the elbow-shaped cap N, that is advantageously made of tinned iron or of other suitable metal. The casing M M, as also the cap N, is covered with a thick coating of silicious sinter or other suitable non-conducting material.

The casing M M is fixed at *l* on the kettle or boiler and its flange *r*, and with this latter secured by metal flanges onto the lower part or support *q*. About one inch and three-quarters (or about four and a half centimeters) above the lower end of the casing there is fixed an annular-shaped air-channel, advantageously of tinned iron, (or other suitable metal,) Q Q, which surrounds the casing, and the inner wall of which is formed by the casing itself. This air-channel Q communicates by an opening, S, with the inner space of the casing. On the opposite side the air-channel Q is connected with the air tube or pipe R, which on its upper end is provided with the smaller pipe, T′. The elbow-shaped cap N is, at *h*, provided with an opening arranged to receive a thermometer, and at the upper end with a short tin pipe, *o*, on which there is screwed the mouth-piece P. The mouth-piece P is formed with an opening for inserting a centigrade, *p*′. Upon kettle or boiler A a vessel, G, is fixed, about five centimeters high, which communicates with the pipe F, connected with the funnel T, outside of the casing M. The vessel G is formed by placing a short cylindrical piece of sheet-iron on the top of the boiler A, the cylindrical piece of sheet-iron forming the sides of the open vessel and the top of boiler

A forming the bottom of the open vessel G. Between the vessel G and the opening S of the air-channel Q there is fixed concentrically with the vessel G a sheet-iron shield, K, which is bent in the form of a segment of a circle.

Fig. 3 is a plan of Fig. 2. *n n* are two handles fixed on the casing for carrying the apparatus. C, Fig. 3, shows the crescent-shaped form of the vessel C, Fig. 1.

The main object of the apparatus may be described as follows: The apparatus is designed to warm atmospheric air with its temperature undergoing the different changes when passing through the apparatus for the purpose of inhalation. The air is so warmed and saturated with humidity as always to keep when issuing from the apparatus the same temperature and humidity as may be desired. This result is obtained in the first place by producing the requisite heat by means of the water-heating apparatus A B C D.

The construction of the water-heating apparatus is such as to prevent any danger to the patient when using. In case the heat should get too intense the boiling water will flow out of the serpentine pipe or tube B into the vessel C, while through the pipe D there is always carried a certain quantity of water out of the vessel C into the kettle or boiler A. The vessel C is designed to act (owing to its extended surface) as a cooler for the hot water that may pass over into cap N.

The necessary augmentation of the humidity or moisture of the air is obtained by the evaporation of the water from the open vessel G.

When using the apparatus, the water in the vessel G is heated to about 60° centigrade, and at this temperature about one hundred to one hundred and fifty grams of water are evaporated every hour, this being more than amply sufficient to completely saturate the air passing through the apparatus.

In order to prevent the air in passing through the opening S impinging directly against the sides of the vessel G, and thus cooling down the water in vessel G, a protecting-shield, K, is interposed between them.

By the construction of the apparatus previously described and the exact regulation of the heating medium the necessary constant equal temperature of the air is obtained from the outlet used for inhaling. To obtain such a constant equal temperature or a constant temperature that does not vary more than one degree, care must always be observed as regards the degree of temperature of the air that is entering the apparatus. The number of flames or burners used for heating the apparatus is under certain conditions always the same.

The regulation of the temperature of the apparatus is obtained by raising or lowering the heating apparatus. The thick coating of silicious sinter (or other suitable non-conductor of heat) prevents the heat passing out through the outer casing.

The action or working of the apparatus is as follows: After having closed the cock E, water poured into the vessel C fills up the warm-water-heating system A B C D, so that the water in C does not touch or obstruct the outlet of the serpentine pipe B. The stop-cock J on the pipe H, connected with the vessel G, (which is thus emptied,) is then closed and one-half a pint of water is then poured through the funnel T into the vessel G. The lamp is then lighted with its two burners (the one having fifteen, the other one ten, flames, or other suitable numbers) and raised as high as possible, which can be done by raising the adjusting device until the stop *f*, around the rod Y at W, touches the lower part of the adjusting device. Now, supposing that the patient requires air for inhaling of 42° or 43° centigrade, which is the temperature made use of in most cases, then only let the heating of the air in the apparatus go on until the thermometer *p*, in the tube *o* shows 31° centigrade, then put out the burner with fifteen flames and have the other ten flames burning alone. This being done, the temperature of the room is allowed for supposing it to be 17½° centigrade. Then as soon as the thermometer shows 40° centigrade lower the lamp five centimeters by turning the screw-nut *k*. When the thermometer has got to 41° centigrade, the patient will have to sit down and inhale full drafts of the warm air through the mouth by means of the mouth-piece P. When exhaling, the patient will have to close his mouth and exhale through the nose. To get used to the inhalation through the mouth and the exhalation through the nose, it is advisable to first close the nose while inhaling by pressing the nostrils together with the fingers. In about ten minutes the centigrade will be up to 42° centigrade, and then the temperature may be regulated with perfect ease between 42° and 43° by means of the regulating device. If the rising of the heat over 42° centigrade be too rapid, as may happen when the patient has not got much practice or is very weak and consuming a very little air only, then it will be necessary to lower the lamp one or two centimeters after having inhaled for about half an hour. This can be done without the patient moving from the seat or ceasing the respiration by simply turning the nut *k*. If, on the contrary, by a profound respiration and a considerable consumption of air, the temperature has risen a little only over 42° centigrade, the patient will have to raise the lamp one or two centimeters in the manner previously described.

The following index shows the method of proceeding at different temperatures of the room, in order to obtain air for inhalation at

a constant temperature of 42° or 43° centigrade:

Supposing the heat of the room to be—	and the centigrade at *p* to have risen to—	the heating apparatus with its fifteen flames must be lowered to—
Réaumur.	*Celsius.*	*Centimeters.*
14° and 15°	40°	5
16°	40°	6
17°	40°	7
18°	39½°	7
19°	39½°	8
20°	39°	8
21°	39°	9
22°	38½°	9
23°	38°	10
24°	38°	11
25°	38°	11
26°	38°	12

Thus, for obtaining the temperature of 42° or 43°, it is necessary to proceed accordingly when any other temperature is required.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In a portable apparatus for inhaling damp or warm moist air of a certain and unvarying temperature, the combination, with the water-containing boiler A, for heating the water, and evaporating-vessel G, of the serpentine pipe B, the cold-water reservoir C, and the pipe D, substantially as set forth.

2. In a portable apparatus for inhaling damp or warm air of certain and unvarying temperature, the combination, with the water-evaporating vessel G and boiler A, of the serpentine pipe B, cold-water reservoir C, and pipe D, and the lamp-regulating device consisting of the guided rod Y, provided with a screw-thread, *v*, arm *x*, and fixed stop *f*, substantially as described.

3. In a portable apparatus for inhaling damp or warm air of a certain and unvarying temperature, the combination, with the serpentine pipe B, cold-water reservoir C, and pipe D, of the ring Q, having opening S, and provided with pipe R, for introducing cold air into the inhaling apparatus, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

EDUARD KRULL.

Witnesses:

OSCAR KRUJENBERG,

ERWIN G. BURNS.