No. 674,833. Patented May 21, 1901.

# W. & J. BOCKEL.

## SPRAY TUBE FOR NEBULIZERS.

(Application filed Oct. 16, 1900.)

(No Model.)

Fig. 2.

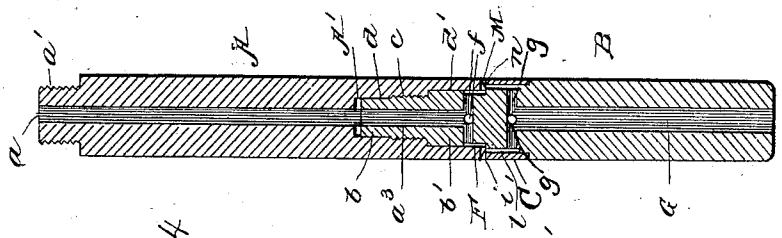



Fig. 4.

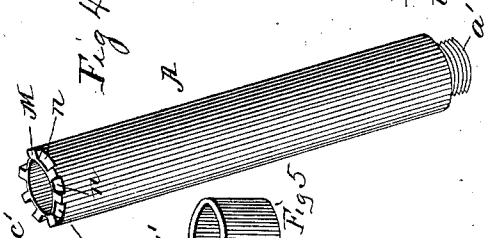



Fig. 3.

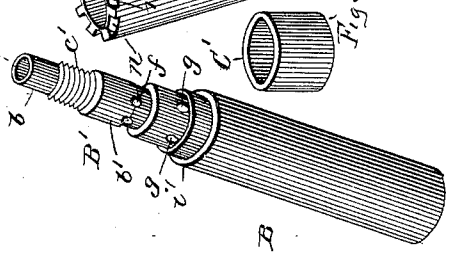
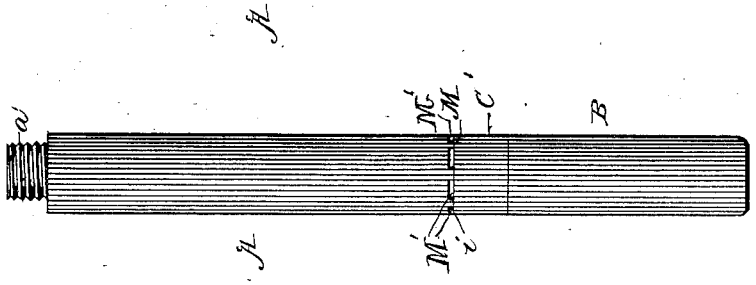



Fig. 5.



Fig. 7.




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# UNITED STATES PATENT OFFICE.

WILLIAM BOEKEL AND JULIUS BOEKEL, OF PHILADELPHIA, PENNSYLVANIA.

## SPRAY-TUBE FOR NEBULIZERS.

SPECIFICATION forming part of Letters Patent No. 674,833, dated May 21, 1901.

Application filed October 16, 1900. Serial No. 33,253. (No model.)

*To all whom it may concern:*

Be it known that we, WILLIAM BOEKEL and JULIUS BOEKEL, citizens of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Spray-Tubes for Nebulizers and Similar Articles; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to spray-tubes consisting of detachable sections; and it consists in the construction and combination of parts hereinafter more particularly set forth and claimed.

In the accompanying drawings, Figure 1 represents an elevation of a spray-tube embodying our invention; Fig. 2, a longitudinal central section of Fig. 1. Fig. 3 represents a perspective detail view of the lower section of the tube. Fig. 4 represents a perspective detail view of the upper section of the tube inverted, and Fig. 5 represents a detail perspective view of the removable collar.

A and B designate, respectively, the upper and lower main sections of the tube, and C designates a collar of the same external diameter as the said sections, which rests against a shoulder $i'$ of the lower section B and surrounds the lower part of a reduced upward extension B′ of the said lower section. This extension is screw-threaded at $c'$ near its upper end to engage corresponding internal screw-threads $c$ of upper tube-section A, which section is provided in its lower part with a recess A′, having the general shape of the said extension and adapted to receive the latter. Cylindrical smooth parts $b$ and $b'$ are formed on said extension above and below the said screw-threads $b'$, being the greater in diameter, and fit similar parts $d$ and $d'$ of the recess A′, so as to guide the tube-sections and brace the threaded part of the extension when the parts A and E are screwed together.

Near its base the extension B′ is reduced in circumference to form an annular liquid-outlet $l$, which is surrounded by the collar C and extends to the upper end of the latter. Below the cylindrical part $b'$ the said extension is reduced again, leaving an annular air-outlet F between it and the wall of recess A′. These two annular outlets for air and liquid discharge through spray-holes M′, alternating with lugs M on the lower end of section A, which lugs are held in contact with the upper edge of collar C when the sections A and B are screwed together and the tube is ready for use. The material of the lower end of tube A is beveled outwardly and upwardly between these lugs, as shown at $n$, giving to each of the spray-holes a flaring shape on the upper side for better spraying effect.

The section A has a central air-passage $a$ extending down from its upper end and registering with an air-passage $a^3$ in extension B′, these two passages $a$ and $a^3$ constituting together the main air-passage of the tube. The lower end of the latter is provided with radial branch air-passages $f$, leading to the said annular air-outlet F. The lower section B is provided with a central main liquid-passage G, extending upward from its lower end and of greater diameter than the main air-passage. From the upper end thereof radial branch liquid-passages $g$ lead to the annular liquid-outlet $l$, which is of greater capacity than the air-outlet F.

The collar C ordinarily remains with the lower section B, fitting it tightly enough to prevent accidental dislodgment; but it is removable, constituting a third part or section. Its detachability facilitates the boring of the branch liquid-passages, also the cleaning of them and the liquid-outlet. In all other respects it answers the same functions and purposes as if it were integral with section B.

The operation of the tube is like that of any other spray-tube having the usual upper air-passage and lower liquid-passage discharging through a common spray hole or holes. By slightly unscrewing the sections A B the area of spray-openings between section A and removable collar C may be enlarged to assist in clearing the tube by a blast of air; but normally the collar C is fastened securely against lugs M by screwing sections A and B together, as described. The number of branch air and liquid passages and of spray-holes may of course be varied at will. Each spray-hole M′ is narrower at its inner edge than the diame-

ter of the branch air-passages and liquid-passages for the purpose of securing the maximum spraying action. The air and liquid passages and outlets are, however, for the purpose of lessening friction, made as large as is possible without weakening the tube.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A spray-tube having an annular air-outlet and spray-openings formed between two parts which are fastened together for use and being further provided with an annular liquid-outlet and with air and liquid passages, the said passages being respectively in distinct separable parts or sections of the tube substantially as set forth.

2. A spray-tube consisting of two sections which screw together and an intervening part C′, one of the said sections being provided with a portion of an air-passage, and the other section being provided with the remainder of the said air-passage branch air-passages and an annular liquid-outlet the said tube being also provided with an air-outlet, and the said intervening part and one of the said sections forming spray-openings between them, which communicate with the air and liquid outlets substantially as set forth.

3. A spray-tube consisting of two sections screwed together and an intervening removable part C′, one of the said sections having projections on its end presented toward the said part to leave spray-openings, the said tube being also provided with an annular air-outlet communicating with said spray-openings, an annular liquid-outlet and air and liquid passages communicating with the said outlets respectively and being formed in separable parts of the said tube substantially as set forth.

4. A spray-tube consisting of two sections and an intervening part normally attached to one of the said sections and held against the other, the said part and the latter section being formed to leave an annular series of spray-openings between them and the said tube being provided with air and liquid passages and annular air and liquid outlets supplied thereby and discharging through the said spray-openings substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

WM. BOEKEL.
JULIUS BOEKEL.

Witnesses:
CHAS. M. STEINMULLER,
JOHN H. SCHERER.