

F. B. KOLLBERG & M. KRAUT.

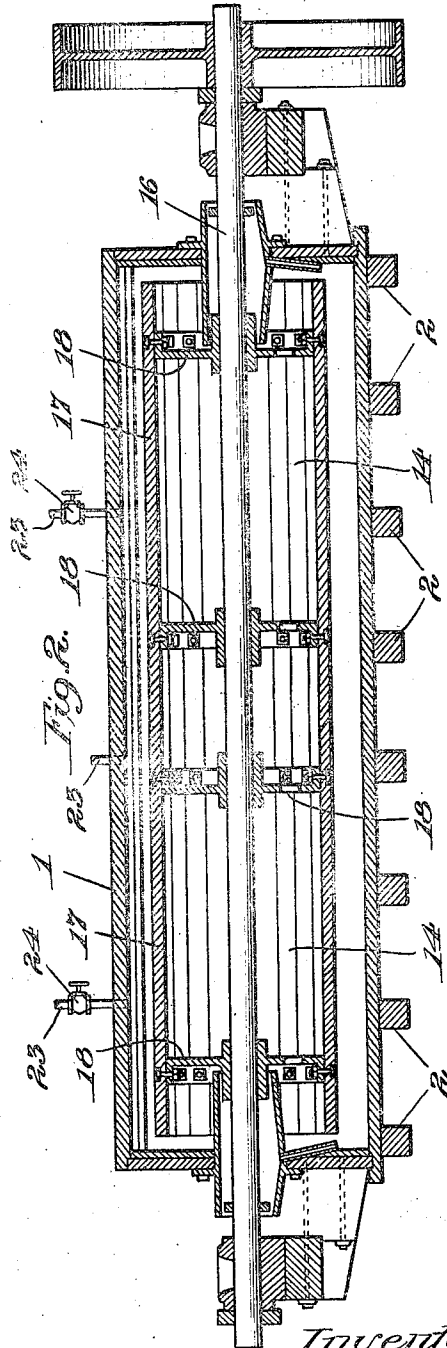
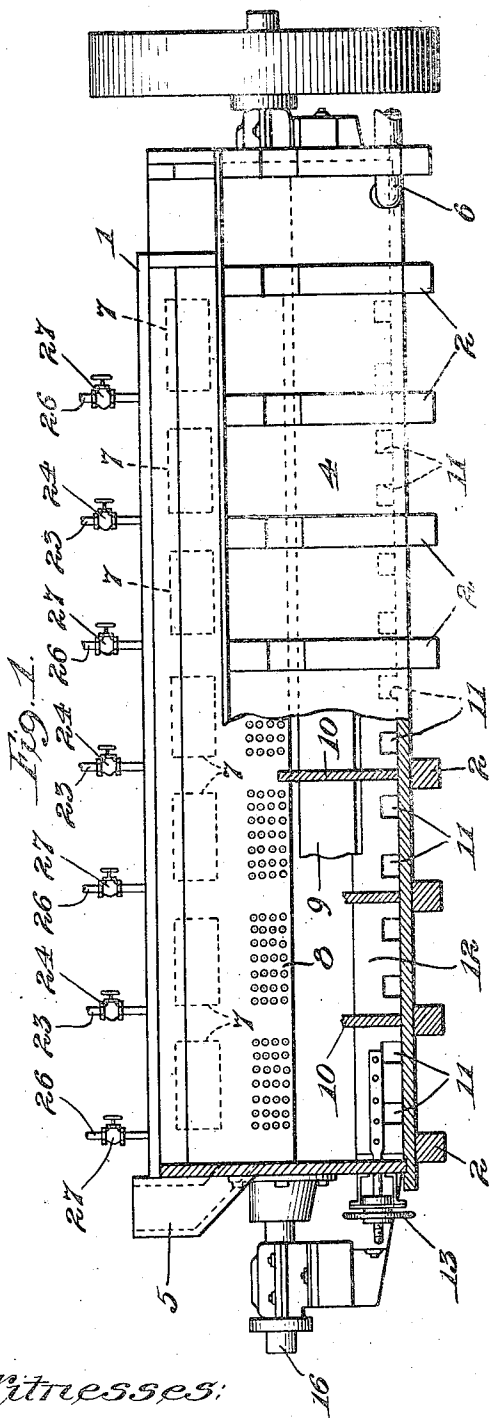
FLOTATION MACHINE.

APPLICATION FILED AUG. 2, 1915.

1,174,737.

Patented Mar. 7, 1916.

2 SHEETS—SHEET 1.



Witnesses:
H. S. B. nee
A. A. Olson

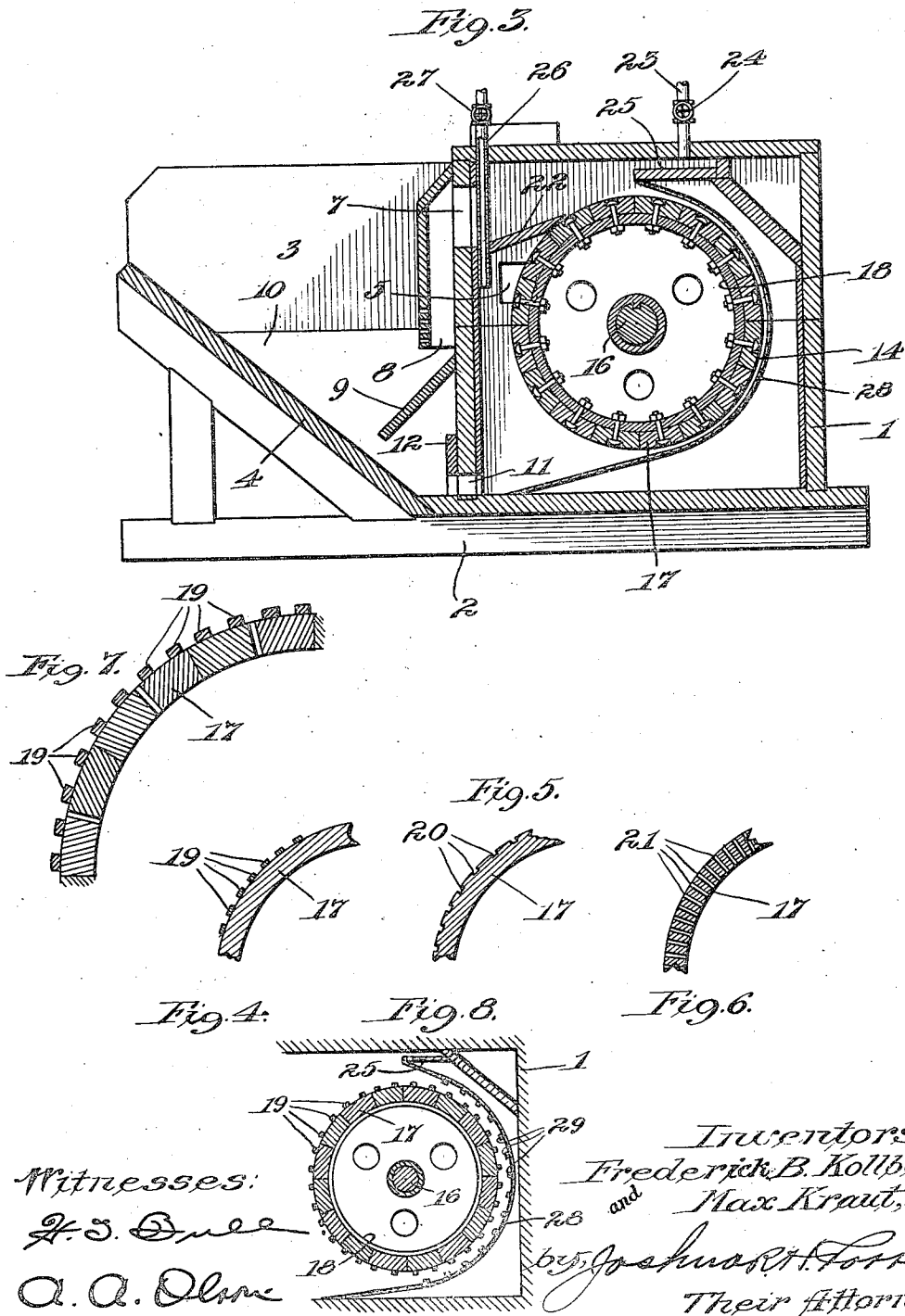
Inventors
Frederick B. Kollberg,
and Max Kraut,
by Joshua H. T. Lora
Their Attorneys.

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 by Joshua R. Forre
 Their Attorney.

UNITED STATES PATENT OFFICE.

FREDERICK B. KOLLBERG AND MAX KRAUT, OF BISBEE, ARIZONA.

FLOTATION-MACHINE.

1,174,737.

Specification of Letters Patent.

Patented Mar. 7, 1916.

Application filed August 2, 1915. Serial No. 43,218.

To all whom it may concern:

Be it known that we, FREDERICK B. KOLLBERG and MAX KRAUT, citizens of the United States, and residents of the town of Bisbee, county of Cochise, and State of Arizona, have invented certain new and useful Improvements in Flotation-Machines, of which the following is a specification.

Our invention relates to improvements in flotation machines, the present application being an improvement upon the subject matter of our co-pending application Serial No. 31,274, filed May 29th, 1915.

The object of this invention is to provide means for still further increasing the efficiency of a machine of the character under consideration, in the matter of capacity as well as in the reduction of power consumption.

A further object is the production of a flotation machine which will be of simple construction and hence of low cost to construct.

Other objects will appear hereinafter.

With these objects in view the invention consists generally in the employment of a drum or cylinder for effecting spraying in the spraying chamber of the machine and further in the provision of means for controlling the introduction of air supply to the spraying chamber to greater advantage.

Through experiment with spraying wheels of the bladed or vaned type in conjunction with flotation apparatus we have found that the thickness of layers of pulp skimmed off the surface of the pulp level inside the spraying chamber bears a certain proportion to the number of revolutions of the wheel and the number of blades with which the wheel is provided. With a given quantity of pulp to be treated and a given speed for the spraying wheel, it is obvious that the greater the number of blades, the greater will be the number of skimmings per revolution, and therefore, with a given rate of inflow of pulp, the greater the number of skimmings, the finer will be the layers of pulp skimmed, and consequently the larger the surface of pulp exposed for contact with air and therefore, the greater the useful effect of the energy employed. It appears then, that to obtain a maximum useful effect, a large number of blades should be employed in the spraying wheel. At the limit of such large number of blades, a drum or cylinder is simply formed by the surface of said blades,

which rotating in the spraying chamber, should result for reasons outlined above, in a maximum economical effect. But as the power of adhesion of the pulp to a theoretically smooth surface of a cylinder or drum would be too small for practical purposes, this surface is roughened, such a cylinder forming the principal subject matter of the present application.

The invention will be best understood by reference to the accompanying drawings forming a part of this specification, and in which,

Figure 1 is a partially sectional front elevation of a flotation apparatus embodying the invention, Fig. 2 is a vertical central longitudinal section through the spraying chamber of the apparatus, Fig. 3 is an enlarged vertical transverse section of the apparatus, Figs. 4, 5, 6 and 7 are detail sectional fragments of the spraying drum showing various forms which may be employed, and Fig. 8, a detail section illustrating a modified form of casing for the drum.

The preferred form of construction, as illustrated in the drawings, comprises an elongated substantially rectangular spraying chamber 1 mounted upon suitable supporting framework 2. Extending along one side of the chamber 1 and substantially co-extensive therewith is a frothing chamber or box 3 which is open at its upper side and provided with an inclined bottom 4.

Communicating with one end of the spraying chamber 1 is an entrance opening or passage 5 through which the pulp, to be treated, is introduced into said chamber. Leading from the bottom of the frothing chamber 3, at the opposite end of the machine is a discharge pipe 6 through which the demineralized pulp or tailings is discharged.

Formed in one side of the chamber 1, adjacent the upper edge thereof, is a plurality of spaced outlet openings 7 from which lead downwardly extending passages 8 which communicate at their lower ends with the chamber 3, as shown.

Arranged below the lower ends of passages 8 is a baffle board or flange 9 which serves to deflect the pulp discharged through said passages outwardly in order to give a larger area for the mineral froth to rise to the surface. Provided in the bottom of the frothing chamber 3 is a plurality of verti-

cally extending partitions 10, the lower ends of passages 8 terminating below the plane of the upper edges of said partitions, as shown in Fig. 3.

5 Leading from the bottom of frothing chamber 3 to the bottom of spraying chamber 1 is a plurality of spaced return openings 11 which are controlled by a sliding gate valve 12 having a notched lower edge to correspond with said openings 11. Said
10 valve 12 is manually adjusted through the medium of a hand wheel 13 cooperating with one end thereof.

Arranged in the spraying chamber 1 is
15 the spraying element or drum 14, the specific construction of which is the subject matter of a divisional application, Serial No. 56,694, filed October 19, 1915. Said drum consists of a cylindrical wall 17 which is
20 bolted, as shown, to disks 18 fixed to a shaft 16 extending centrally through the spraying chamber and having its ends suitably mounted in bearings provided at the ends of said chamber. The periphery of the wall
25 17 is roughened by arranging thereon a plurality of closely spaced longitudinally extending riffles 19, as shown in Fig. 4, or correspondingly arranged recesses 20, as shown in Fig. 5, or by providing said wall
30 with closely arranged perforations 21, as shown in Fig. 6, or both riffles and perforations as shown in Fig. 7.

Provided in the chamber 1, at the lower edges of the outlet openings 7, is an inwardly projecting flange 22 which serves to direct the spray formed in said chamber and thrown from the spraying element, toward said outlet openings 7. Communicating
35 with the upper end of the spraying chamber is a plurality of air supply pipes 23, passage through which is controlled by suitable valves 24. Arranged in chamber 1, below the lower ends of air supply pipes 23,
40 is a deflecting board 25 so arranged that the air which is supplied to the chamber 1 will be introduced into said chamber adjacent the periphery of the spraying element, tangentially thereto, and in a direction toward the outlet openings 7.

50 Oil supply pipes 26 are employed, communicating with the interior of chamber 1, controlled by valves 27.

A casing 28 is arranged about the rear or inward portion of drum 17, as indicated in
55 Fig. 3, to prevent spraying of the pulp through this portion of the travel. To perfect the mixing of the oil with the pulp, longitudinal riffles are provided on the interior surface of casing 28, as indicated in
60 Fig. 8.

In operation the spraying element or drum 14 is rotated at a suitable speed. The pulp level inside the spraying chamber is maintained by means of the gate valve 12,
65 at such a height that the spraying drum

will be slightly immersed in the pulp. In the rotation of the drum, a certain quantity of the pulp adheres to the peripheral surface of the drum in a thin layer or film, thus exposing a maximum of surface for contact
70 with air. The pulp is carried around with the rapidly revolving drum, and is thrown off tangentially by centrifugal force at the highest point in the form of a fine spray which is discharged through the opening 7
75 into the frothing chamber. Any pulp thrown by centrifugal force against the casing 28 will be projected back onto the drum by the action of the casing, thus preventing useless agitation or churning in the
80 spraying chamber and causing the immediate discharge in the form of a spray of all pulp adhering to the periphery of the drum. The riffles on the interior surface of casing 28 tend to cause thorough mixing of
85 the oil and pulp, thus facilitating the process and dispensing with the necessity of previously mixing the oil and pulp. The spray in being thrown off the surface of the drum entrains in its passage to the frothing chamber a quantity of air, which is required to
90 raise the mineral froth formed to the surface. Through the provision of the deflecting board 25 arranged as described, the air supplied to the spraying chamber is introduced into said chamber right at the
95 point or line where the pulp is thrown off the surface of the revolving drum. The pulp in its passage to the outlet opening 7 induces a strong suction, the air being taken
100 from the space between the deflecting board 25 and the upper wall of the spraying chamber, along the entire length of said space, and in this manner an ample supply of air is insured at the place most needed, the air
105 introduced being automatically controlled by the suction or demand created for the same. The perforations in the periphery of the drum, in effect, produce a certain roughening thereof and also permit escape of air
110 and pulp from the interior of the drum. As the drum rotates centrifugal force is imparted to the air or pulp within the same and thus this air and pulp are forced outwardly through said perforations adding
115 to the aerating effect of the device and insuring the utilization of any pulp which may enter the drum when stationary. It will be noted that air may readily enter the interior of the drum through the hollow
120 drip cups at each end of chamber 1.

The spraying drum employed extends practically the entire length of the spraying chamber, thus utilizing the entire length of said chamber for spraying purposes. All
125 of the pulp picked up by the revolving drum and sprayed therefrom is immediately discharged through the openings 7 and thus churning of the pulp inside the spraying chamber completely obviated. A maximum
130

economical effect is thus obtained at a minimum expenditure of energy.

While we have illustrated and described the preferred forms of construction for carrying our invention into effect, these are capable of variation and modification without departing from the spirit of the invention. We, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail ourselves of such variations and modifications as come within the scope of the appended claims.

Having described our invention what we claim as new and desire to secure by Letters Patent is:

1. Apparatus of the class described comprising a spraying chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a fluid supply communicating with said spraying chamber; and means in said chamber for directing the fluid supplied to said spraying chamber toward said outlet opening, substantially as described.

2. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a fluid supply communicating with said spraying chamber; and means in said spraying chamber for directing the fluid supplied to said spraying chamber in a direction substantially tangentially of said spraying element and toward said outlet opening, substantially as described.

3. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a fluid supply communicating with said spraying chamber; and means in said spraying chamber for introducing into said spraying chamber the fluid supplied thereto adjacent the periphery of said spraying element and in the direction of said outlet opening, substantially as described.

4. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a fluid supply communicating with said spraying chamber; and means in said spraying chamber for introducing into said spraying chamber the fluid supplied thereto adjacent the periphery of

said spraying element, substantially tangentially thereto, and in the direction of said outlet opening, substantially as described.

5. Apparatus of the class described comprising a spraying chamber; a frothing chamber, there being an outlet opening in one side of said spraying chamber adjacent the top thereof through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a fluid supply communicating with the upper portion of said spraying chamber; and means in the upper portion of said spraying chamber for directing the fluid supplied to said spraying chamber toward said outlet opening, substantially as described.

6. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening in one side of said spraying chamber adjacent the top thereof through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a fluid supply communicating with the upper portion of said spraying chamber; and a deflector board in the upper portion of said spraying chamber for introducing into said spraying chamber the fluid supplied thereto adjacent the periphery of said spraying element, substantially tangentially thereto and in the direction of said outlet opening, substantially as described.

7. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a valved air supply pipe communicating with said spraying chamber; and means in said spraying chamber for introducing into said spraying chamber the air supplied thereto adjacent the periphery of said spraying element, substantially tangentially thereto and in the direction of said outlet opening, substantially as described.

8. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a plurality of valved air supply pipes communicating with said spraying chamber; and means in said spraying chamber for introducing into said spraying chamber the air supplied thereto adjacent the periphery of said spraying element, substantially tangentially thereto and in the direction of said outlet opening, substantially as described.

9. Apparatus of the class described comprising a spraying chamber; a rotary spraying drum in said chamber; a frothing cham-

ber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; and means for introducing air into said spraying chamber adjacent the periphery of said drum and substantially tangentially thereto, substantially as described.

10. Apparatus of the class described comprising a spraying chamber; a rotary spraying drum in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; means for introducing air into said spraying chamber adjacent the periphery of said drum and substantially tangentially thereto; and a casing closely surrounding a portion of said drum, substantially as described.

20. 11. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; and a casing loosely surrounding a portion of said spraying element extending from the under side thereof to the point at which the spray in leaving said element passes toward said opening to said frothing chamber, substantially as described.

12. Apparatus of the class described comprising a spraying chamber; a rotary spraying drum in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; and a casing loosely surrounding a portion of said spraying drum extending from the under side thereof to the point at which the spray in leaving said drum passes toward said opening to said frothing chamber, substantially as described.

13. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a fluid supply communicating with said spraying chamber; means in said spraying chamber for directing the fluid supplied to said spraying chamber in a direction substantially tangentially of said spraying element and toward said outlet opening; and a casing loosely surrounding a portion of said spraying element extending from the under side thereof to said last mentioned means, substantially as described.

14. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said

frothing chamber; a fluid supply communicating with said spraying chamber; means in said spraying chamber for introducing into said spraying chamber the fluid supplied thereto adjacent the periphery of said spraying element and in the direction of said outlet opening; and a casing loosely surrounding a portion of said spraying element extending from the under side thereof to said last mentioned means, substantially as described.

15. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a fluid supply communicating with said spraying chamber; and means in said spraying chamber for introducing into said spraying chamber the fluid supplied thereto adjacent the periphery of said spraying element; substantially tangentially thereto, and in the direction of said outlet opening; and a casing loosely surrounding a portion of said spraying element extending from the under side thereof to said last mentioned means, substantially as described.

16. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening in one side of said spraying chamber adjacent the top thereof through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a fluid supply communicating with the upper portion of said spraying chamber; a deflector board in the upper portion of said spraying chamber for introducing into said spraying chamber the fluid supplied thereto adjacent the periphery of said spraying element, substantially tangentially thereto and in the direction of said outlet opening; and a casing closely surrounding a portion of said spraying element extending from the under side thereof to said deflector board, substantially as described.

17. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a valved air supply pipe communicating with said spraying chamber; means in said spraying chamber for introducing into said spraying chamber the air supplied thereto adjacent the periphery of said spraying element, substantially tangentially thereto and in the direction of said outlet opening; and a casing loosely surrounding a portion of said spraying element extending from the under side thereof

to said last mentioned means, substantially as described.

18. Apparatus of the class described comprising a spraying chamber; a rotary spraying element in said chamber; a frothing chamber, there being an outlet opening through which the spray created in said spraying chamber is adapted to pass to said frothing chamber; a plurality of valved air supply pipes communicating with said spraying chamber; means in said spraying chamber for introducing into said spraying chamber the air supplied thereto adjacent the periphery of said spraying element, substan-

tially tangentially thereto and in the direction of said outlet opening; and a casing loosely surrounding a portion of said spraying element extending from the under side thereof to said last mentioned means, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

FREDERICK B. KOLLBERG.
MAX KRAUT.

Witnesses:

FRED. SUTTER,
GEO. J. REARDON.