No. 730,983. PATENTED JUNE 16, 1903.

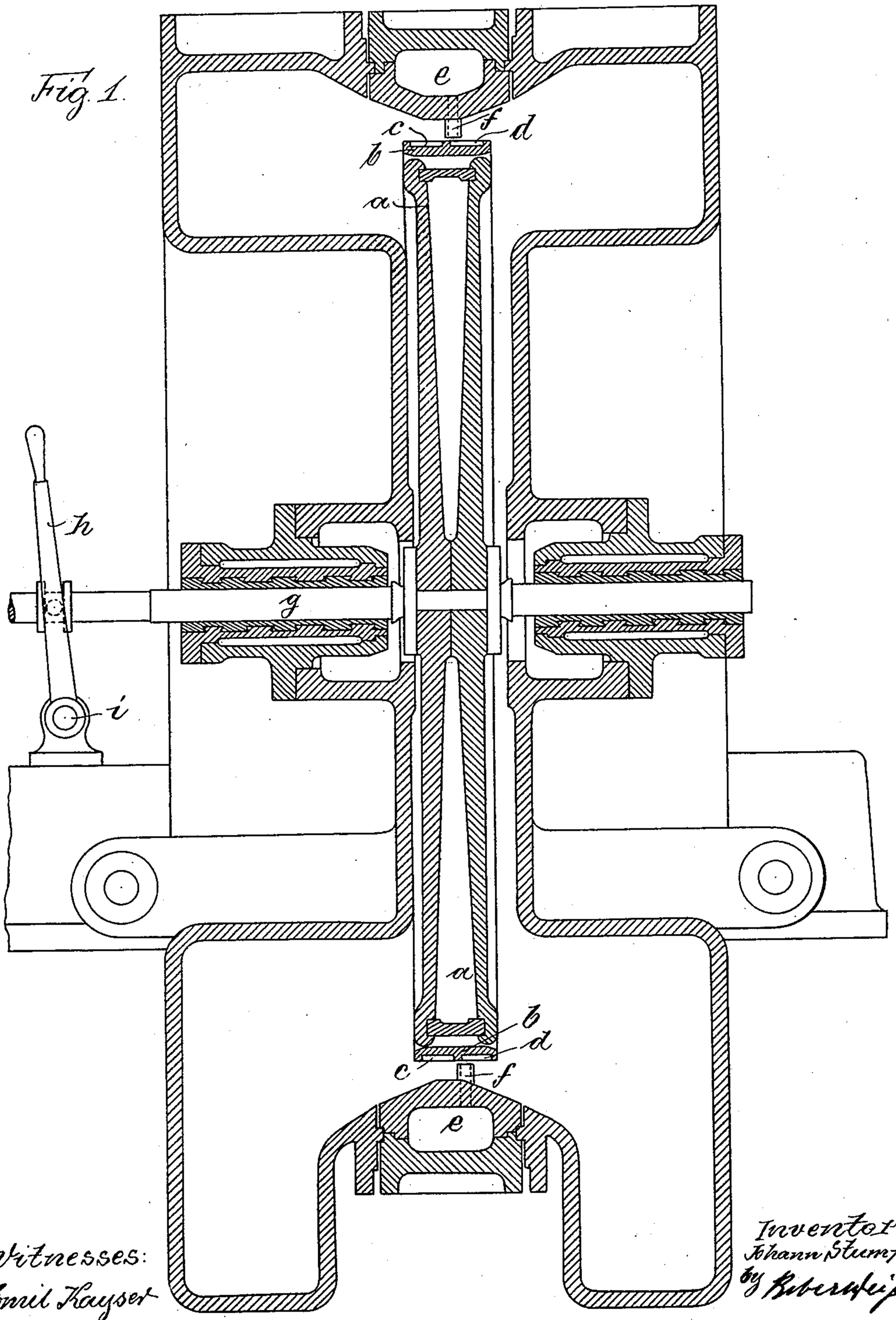
J. STUMPF.

STEAM TURBINE.

APPLICATION FILED FEB. 24, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

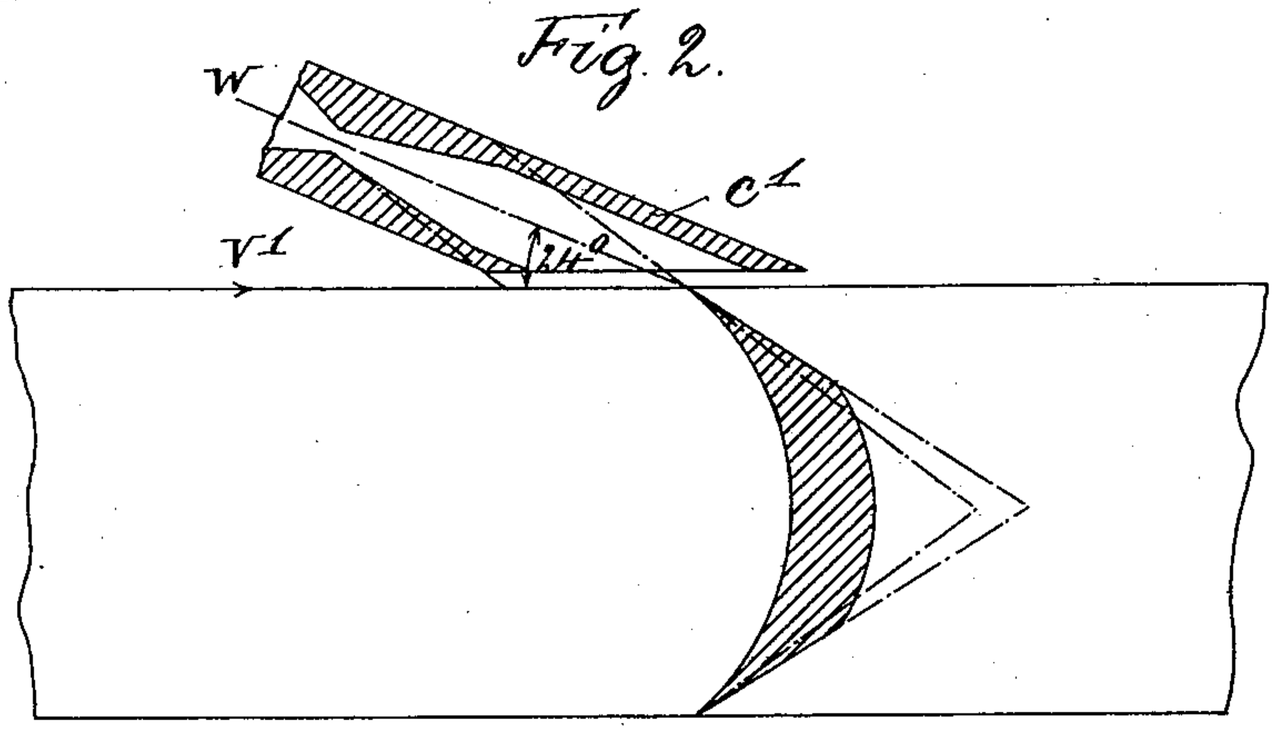


Fig. 3.

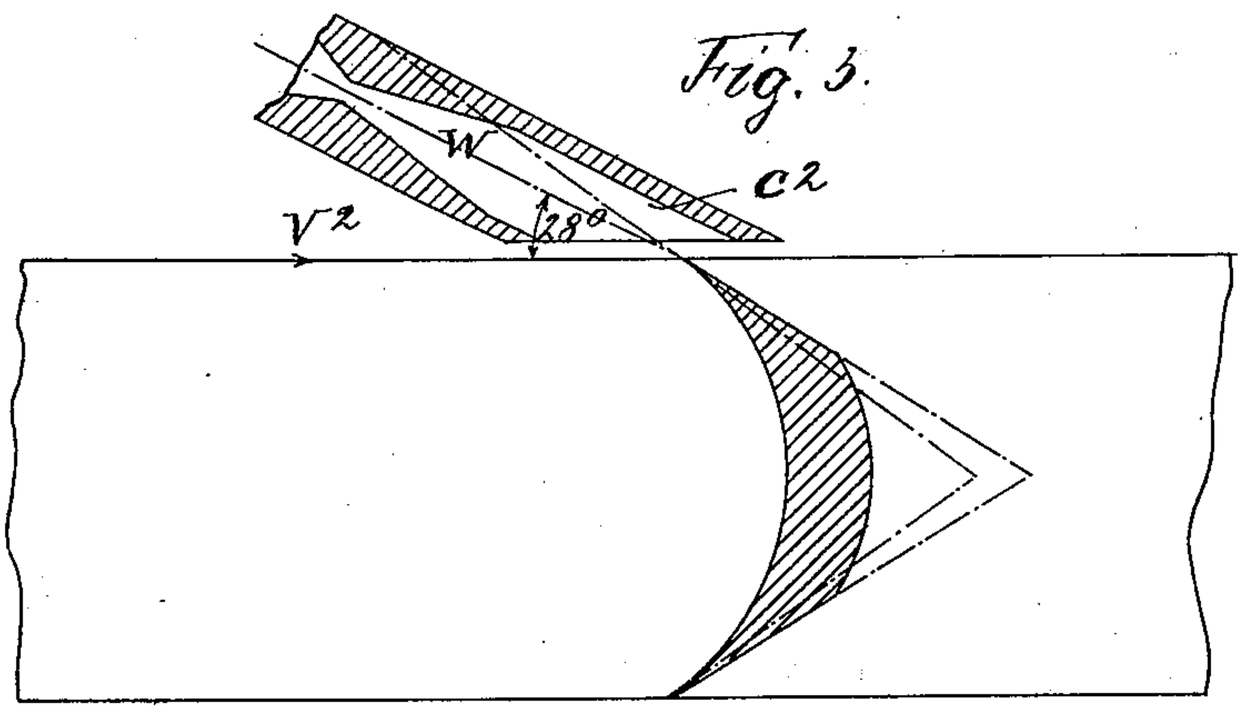
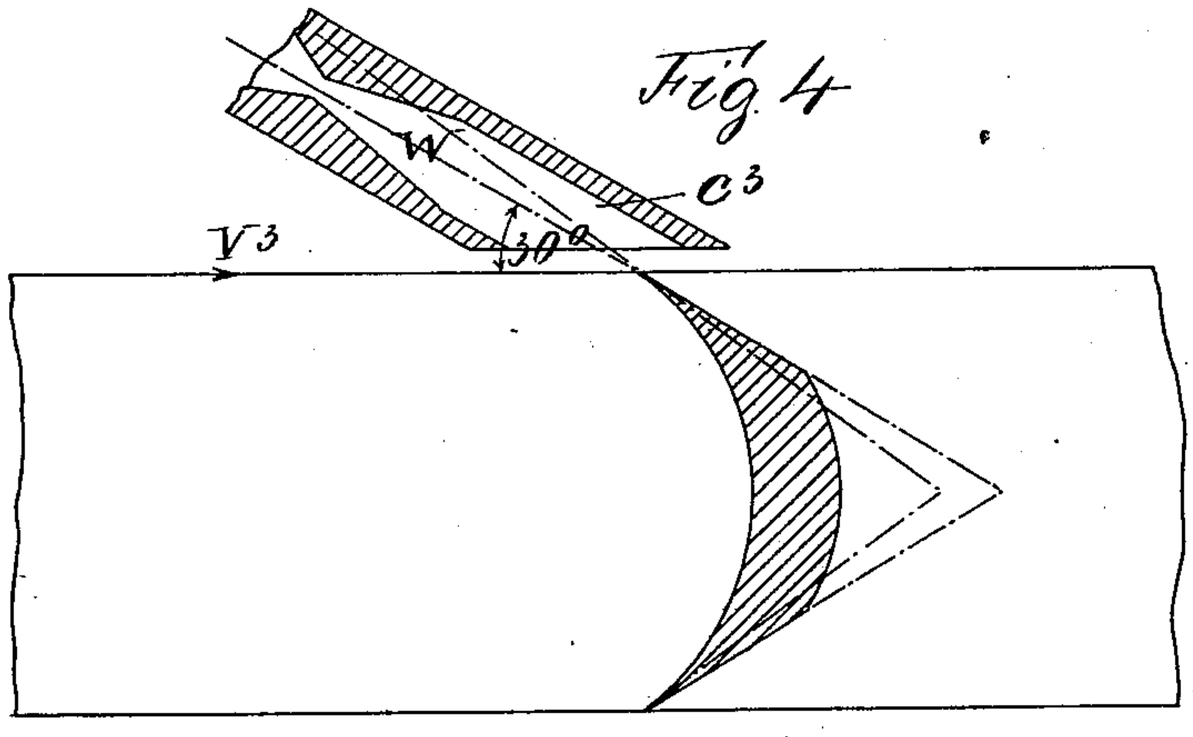


Fig. 4



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No. 730,983. Patented June 16, 1903.

UNITED STATES PATENT OFFICE.

JOHANN STUMPF, OF CHARLOTTENBURG, GERMANY.

STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 730,983, dated June 16, 1903.

Application filed February 24, 1903. Serial No. 144,683. (No model.)

To all whom it may concern:

Be it known that I, JOHANN STUMPF, a subject of the King of Prussia, German Emperor, and a resident of 28 Rankestrasse, Charlottenburg, near Berlin, Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Steam or Gas Turbines, of which the following is an exact specification.

My invention relates to improvements in steam or gas turbines, and more especially to means for varying the speed of such turbines.

In using steam-turbines for actuating screw-propellers, pumps, and the like apparatus, in which it is sometimes necessary to alter or change the number of revolutions for units of time, great disadvantages always result, owing to the fact that the angle of delivery of the steam—that is, the angle which the inlet-nozzles make with the turbine-wheel—is always adjusted to a certain number of revolutions. If the turbine runs at any other speed, small shocks arise in the turbine in consequence of the angle of inclination of the nozzles not being suitable for this different number of revolutions. In all turbines the streaming velocity of the steam, the velocity of the circumference of the turbine-wheel, and the angle of inclination of the nozzles, as well as of the buckets or shovels of the turbine-wheel, are dependent upon one another. This dependence may easily be seen from the diagram of velocities.

The losses mentioned above are avoided according to the present invention by arranging several rows of buckets or vanes in the turbine-wheel, the buckets or vanes of each row being different in form or construction.

In order to make my invention more clear, I refer to the accompanying drawings, in which—

Figure 1 is a vertical section of a turbine constructed according to my invention. Figs. 2, 3, and 4 are diagrams.

In the drawings, *a* is a turbine-wheel, the rim *b* of which is provided with two rows of buckets or vanes *c* and *d*, of different forms, as will be hereinafter described and shown. In the example shown the buckets are on the circumference of the turbine-wheel; but it will be understood that the invention is applicable to any other construction of turbines. An admission-channel *e* is situated around this turbine-wheel, in which channel nozzles *f* are provided, through which the steam flows in the well-known manner upon the turbine-wheel.

The turbine-wheel *a* is fixed upon a shaft *g*, which can be moved sidewise by means of a lever *h*, journaled at *i*, or by means of any other suitable device. The drawings show the turbine-wheel in the position in which the steam flows into the buckets *d*. If the shaft *g* is shifted to the right-hand side by means of the lever *h*, the steam will flow into the buckets *c*.

In Figs. 2 to 4 of the accompanying drawings turbine-wheel vanes of the well-known Laval type are shown, applicable for different speeds. The streaming velocity of the admission-steam is in all three cases shown represented by the letter w and equals, say, nine hundred and eighty meters. In Fig. 2 the turbine is supposed to run at three thousand revolutions, in Fig. 3 at two thousand two hundred revolutions, and in Fig. 4 at fifteen hundred revolutions. The velocity at the circumference of the turbine-wheel is consequently v' equals three hundred and fifty meters, v^2 equals two hundred and sixty meters, and v^3 equals one hundred and seventy-five meters in Figs. 2, 3, and 4, respectively. The relative streaming velocities of the admission-steam for the vanes will consequently be found to be c' equals six hundred and seventy-five meters, c^2 equals seven hundred and forty meters, and c^3 equals eight hundred and ten meters, the angle of inclination of the nozzles being in all three cases twenty-four degrees.

The contact-surface for the steam in each vane forms a segment of a circle, and the vanes are constructed so that the lines c', c^2, and c^3 form tangents of these circles. The radii of the circles of the different vanes are different and are in the examples given r' equals sixty-three millimeters, r^2 equals sixty millimeters, and r^3 equals fifty-eight millimeters.

The construction shown in the drawings may be modified in different ways—so, for instance, instead of moving the turbine-wheels

sidewise the nozzle-rim may be moved, while the turbine-wheel remains in its position.

Having thus fully described the nature of this invention, what I desire to secure by Letters Patent of the United States is—

In a turbine, the combination of steam-admission nozzles, with a turbine-wheel provided with several rows of buckets, and means for changing the relative positions of the nozzles and rows of buckets, substantially as described and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHANN STUMPF.

Witnesses:

HENRY HASPER,

WOLDEMAR HAUPT.