(No Model.)

J. A. MORRELL.

APPARATUS FOR EVAPORATING LIQUIDS.

No. 441,321. Patented Nov. 25, 1890.

Fig. I

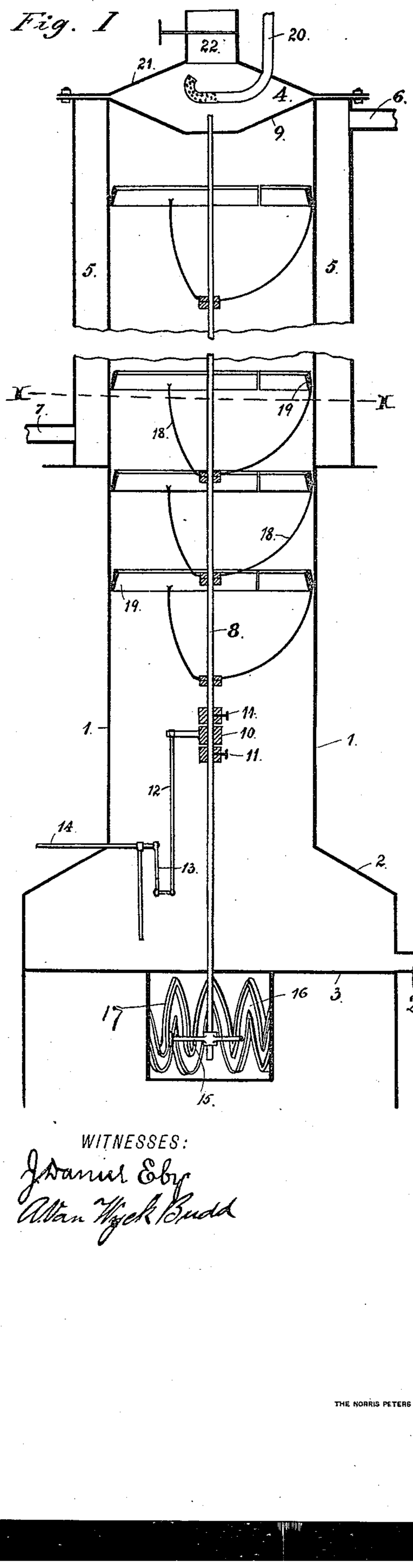


Fig. II

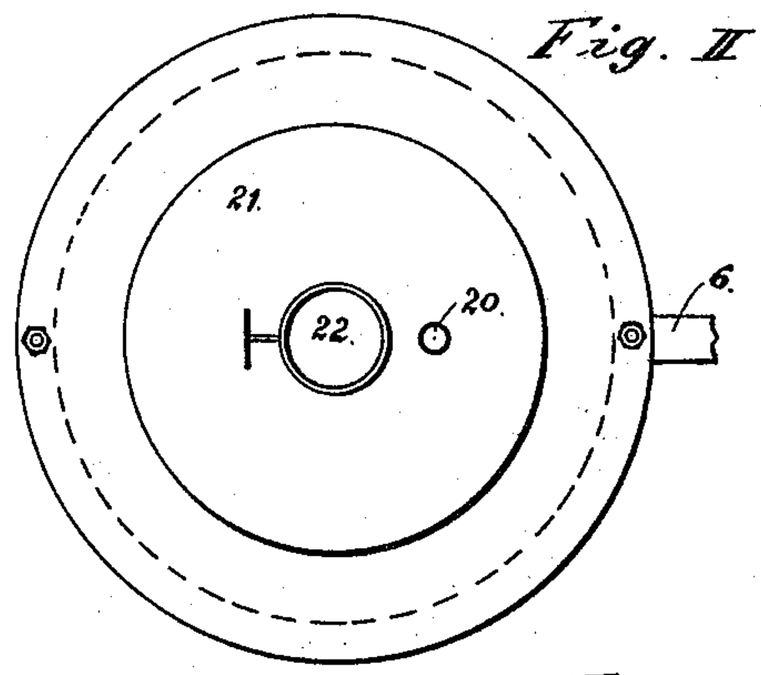


Fig. III

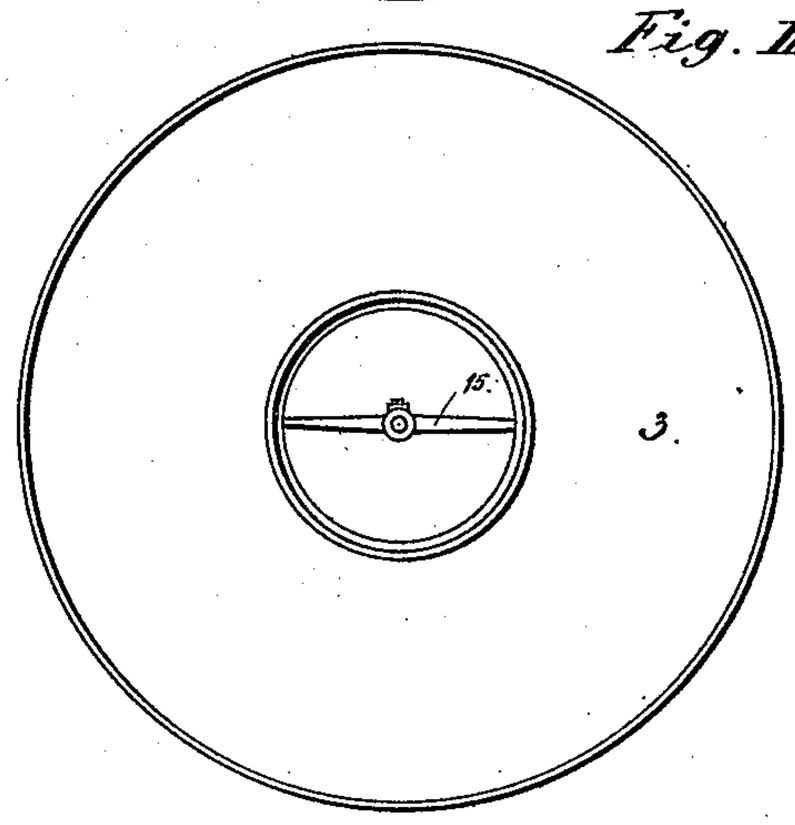
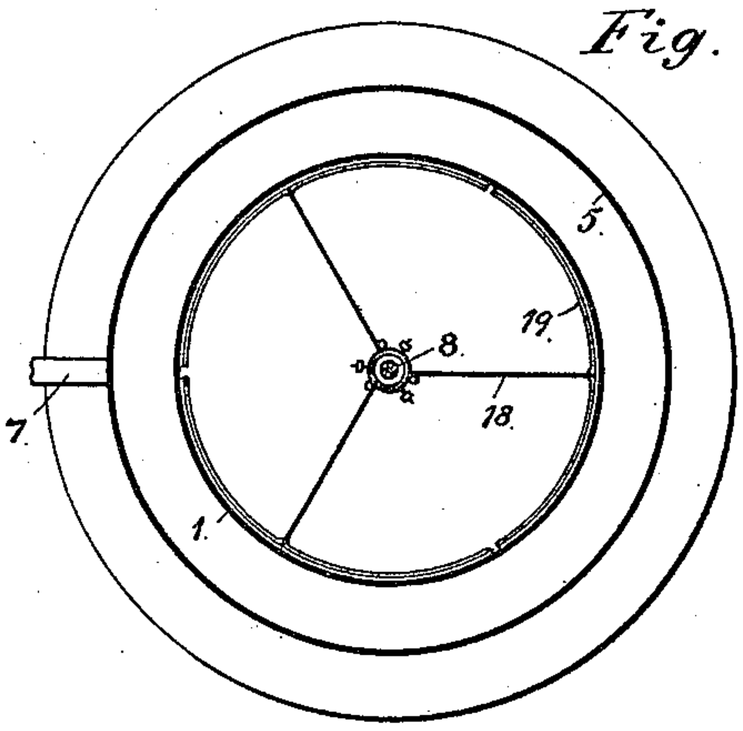


Fig. IV



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR EVAPORATING LIQUIDS.

SPECIFICATION forming part of Letters Patent No. 441,321, dated November 25, 1890.

Application filed December 13, 1888. Renewed April 1, 1890. Serial No. 346,175. (No model.)

To all whom it may concern:

Be it known that I, JAMES A. MORRELL, a citizen of the United States, residing at Lansdale, in the county of Montgomery and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Evaporating Liquids and Concentrating Solutions; and I do hereby declare the following to be a sufficiently full, clear, and exact description thereof as to enable others skilled in the art to make and use the said invention.

This invention relates to apparatus for evaporating liquids and concentrating solutions, and has for its object the more expeditious working of such operations by mechanically removing the thickened portion of such solutions from the heat-imparting surfaces of such apparatus; and it consists in a steam-jacketed vessel combined with an internal scraping apparatus constructed as hereinafter described, and shown in the accompanying drawings, in which—

Figure I shows a vertical central section of the apparatus; Fig. II, a top plan view; Fig. III, a bottom view, and Fig. IV a horizontal section in the plane indicated by the dotted lines *x x* in Fig. I.

The same reference-marks indicate like parts in the several figures.

1 is an upright cylinder enlarged at the base 2 and closed at the bottom 3 and closed at the top 4. From the top 4 downward through the greater part of its length the cylinder 1 is surrounded by a chamber 5, in which steam or other heating-fluid is circulated, and which is introduced through pipe 6, the water of condensation being withdrawn through pipe 7.

In the center of the cylinder 1 and extending from below and through the bottom 3 up and through the entire length of said cylinder is a shaft 8, which is supported and guided by passing through a cross-bar 9 at the upper end, and which reciprocates vertically and also rotates.

The reciprocating motion of the shaft 8 is imparted to it by a collar 10, fitting on the shaft, so as to permit it to turn thereon, and held lengthwise between two collars 11, secured firmly to the shaft 8 and turning with it. The collar 10 acquires reciprocating motion from a connecting-rod 12, operated by a crank 13 on a rotating shaft 14, passing through the side of the cylinder 1 and rotated by any of the usual means for propelling revolving shafts.

Upon the lower end of the shaft 8 is secured an arm 15, which engages in the groove 16 of an internal cylindric cam 17, and thereby acquires a rotatory motion, in which the shaft 8 participates, the groove 16 being in the form of connected segments of right and left internal or female screw-threads.

Secured upon the shaft 8, so as to turn and reciprocate with it within the cylinder 1, is a series of spring-arms 18, bearing against and supporting scraping-blades 19, which fit against and scrape the internal surface of the cylinder 1 and serve to detach any material deposited upon said surface. The scraper-blades being supported by spring-arms, they acquire an up-and-down motion, controlled to some extent by the weight of the liquid in the cylinder 1. At the top 4 of the cylinder 1 is a pipe 20, having small perforations therein, from which the liquid or solution to be concentrated is introduced in the form of spray into the cylinder 1, where it acquires a high temperature, and the fluid portion is vaporized and, passing upward, is discharged into the cover 21 out through the chimney 22. The thickened fluid or residuum, descending, is collected and removed from the base 2 by the pipe 23, the internal surface of the cylinder 1 being maintained in a clean and effective heat conducting and radiating condition by the action of the scrapers 19.

Having described this invention, what I claim is—

1. In an apparatus for concentrating solutions by heat, the combination of the hollow cylinder 1, the steam-chamber 5, partially inclosing the said cylinder, with a series of reciprocating scrapers located within the said

cylinder, the spring-arms 18, and the rotating shaft 8, substantially as and for the purpose set forth.

2. In an apparatus for concentrating solutions by heat, the hollow heated cylinder 1, having the opening 22 at its top and a closed bottom, the pipe 20, having its spraying portion located in the top 4 of the said cylinder, and the cylindric cam 17, in combination with the shaft 8, spring-arms 18, and scrapers 19, substantially as and for the purpose set forth.

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Witnesses:
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