

No. 801,312.

PATENTED OCT. 10, 1905.

R. FÖLSCHÉ.
SUGAR CRYSTALLIZING APPARATUS.

APPLICATION FILED NOV. 10, 1903.

2 SHEETS—SHEET 1

Fig. 1

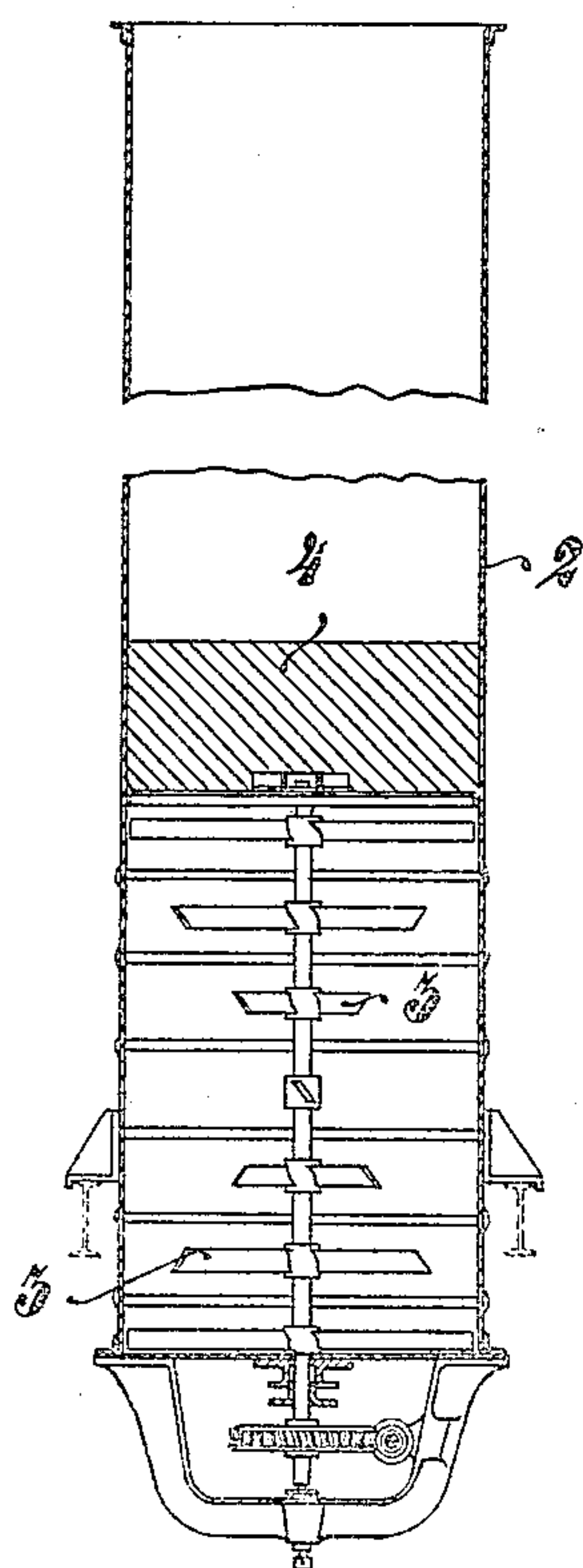
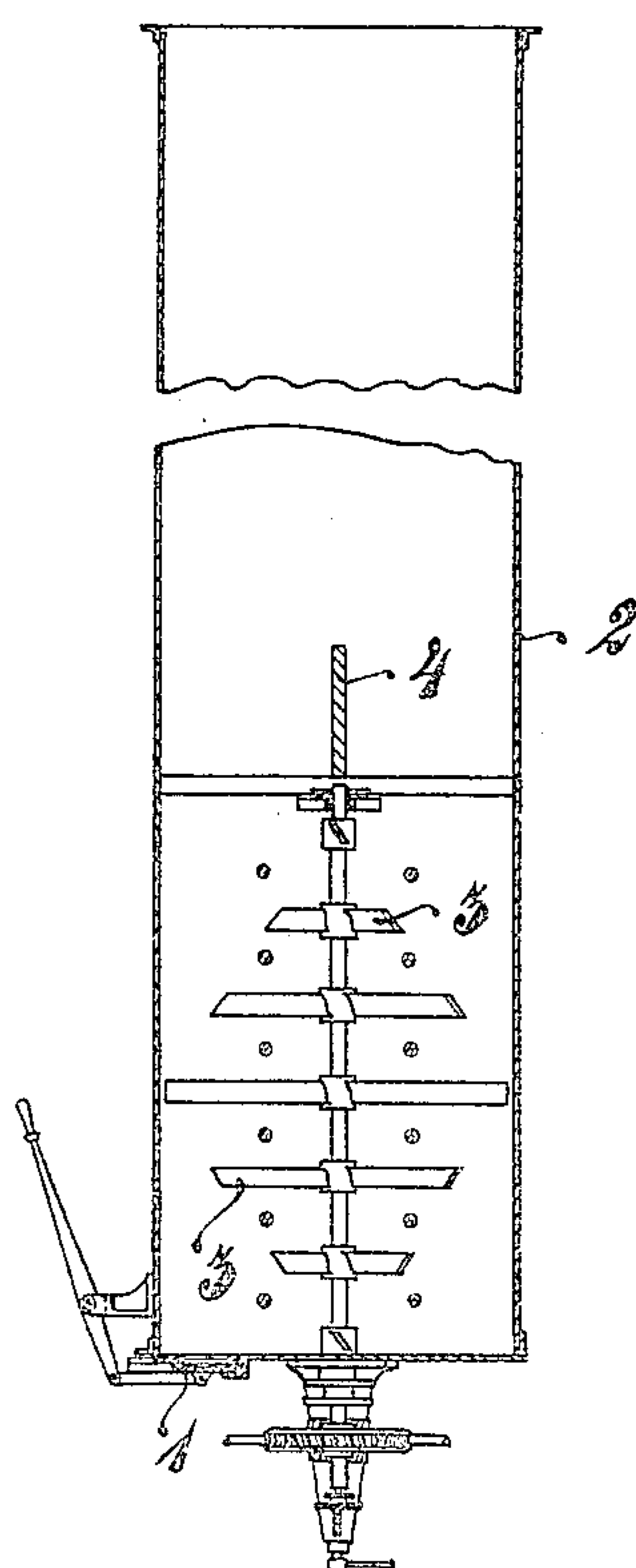


Fig. 2



WITNESSES:

Paul Lomey.

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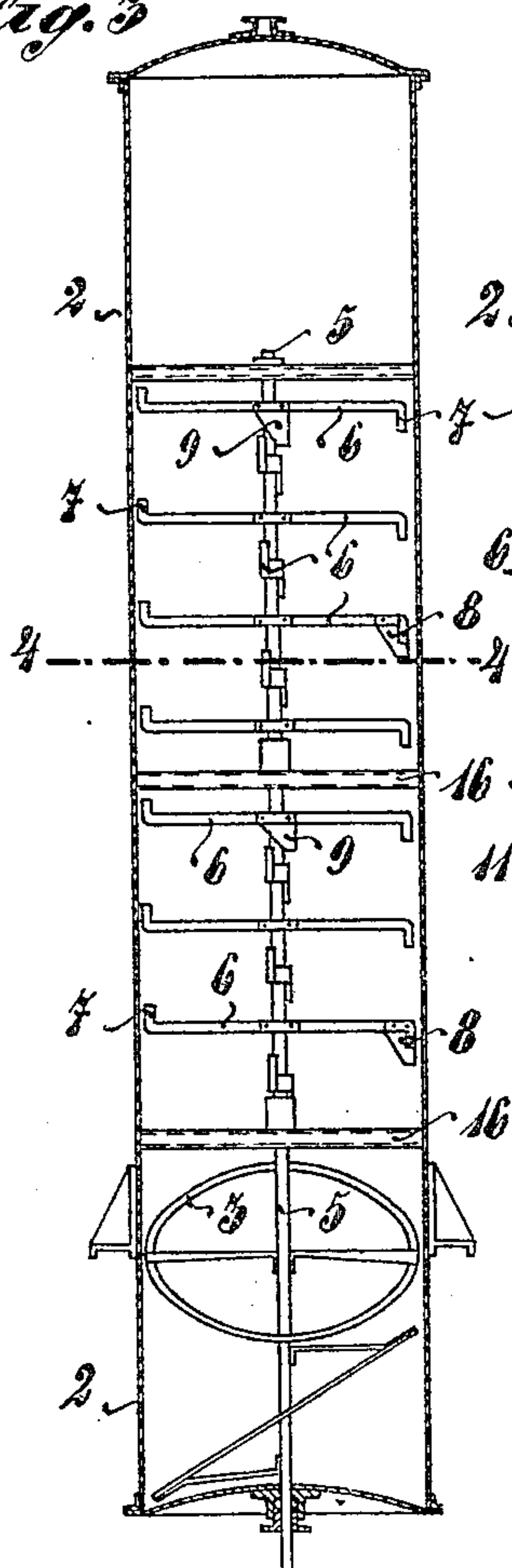
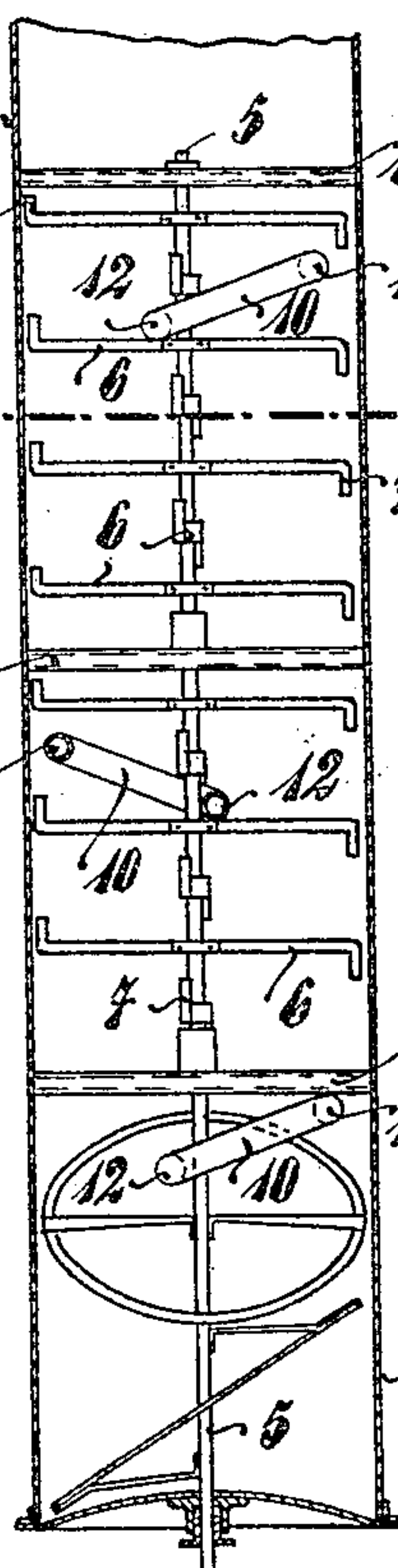
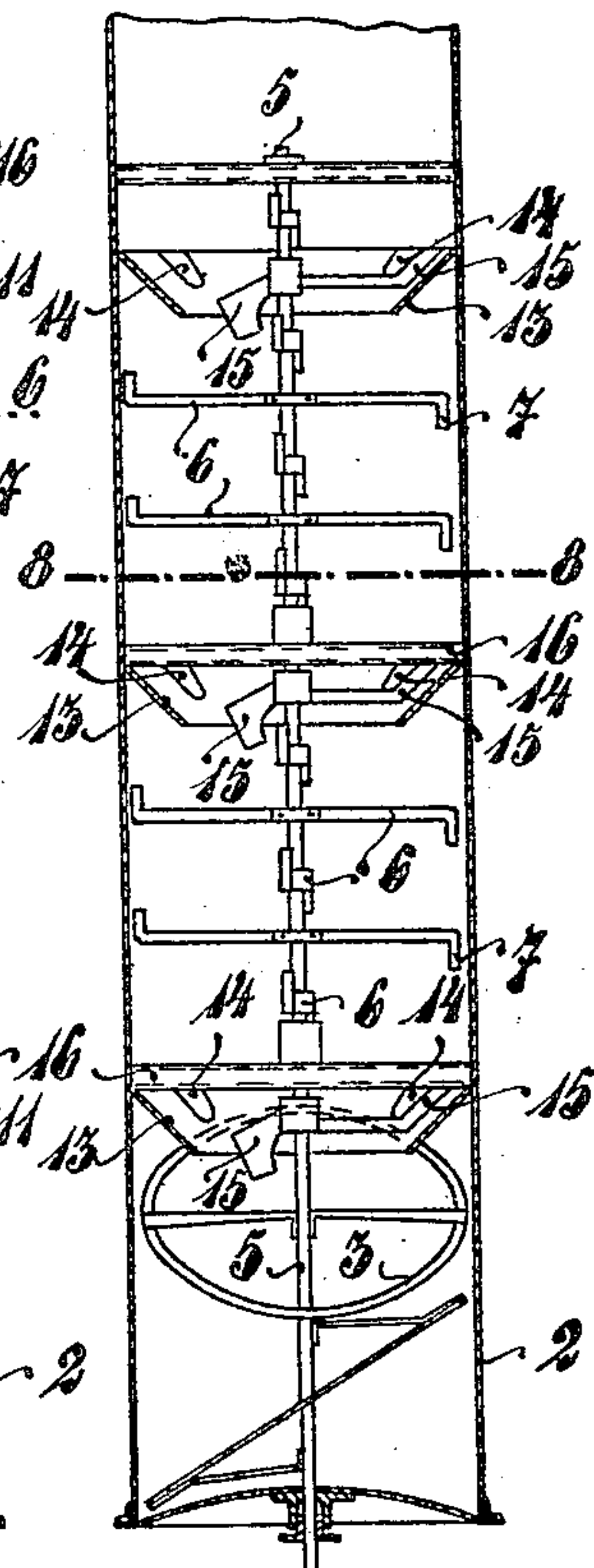
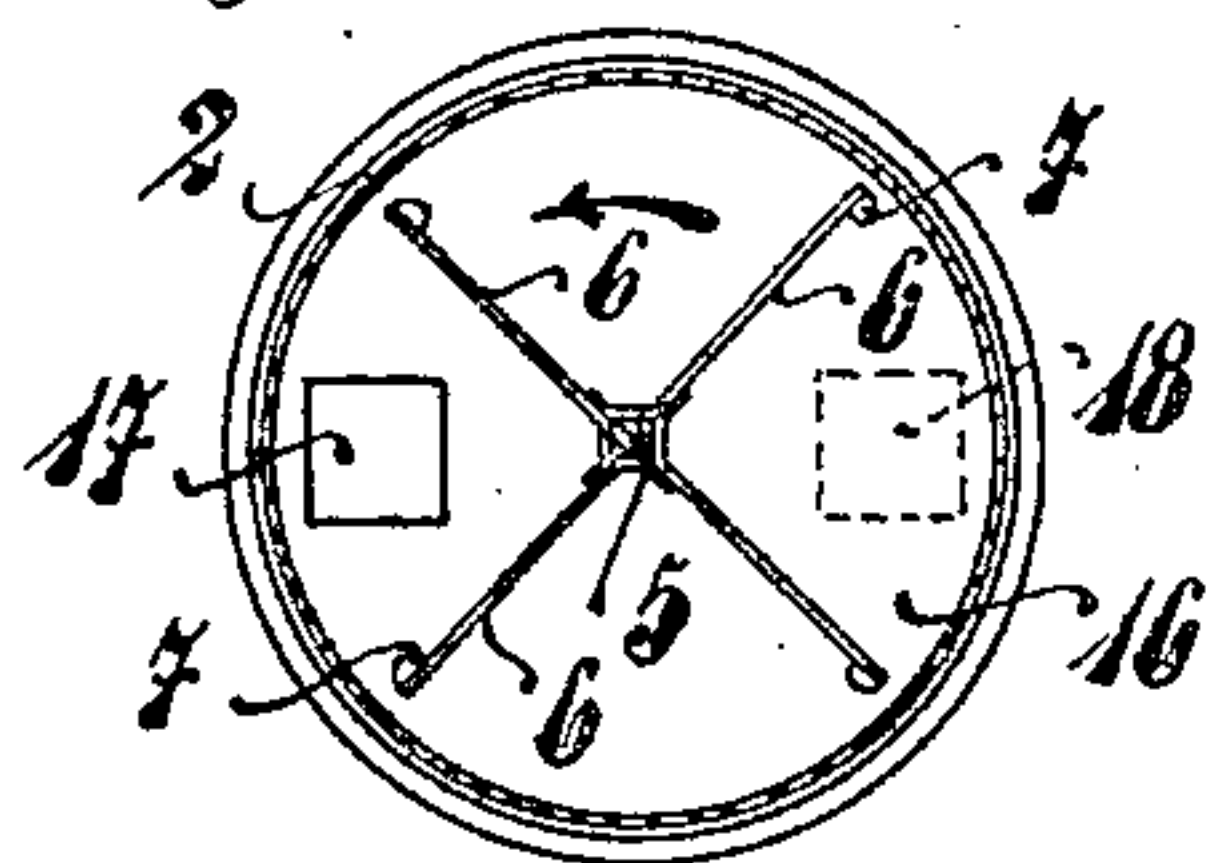
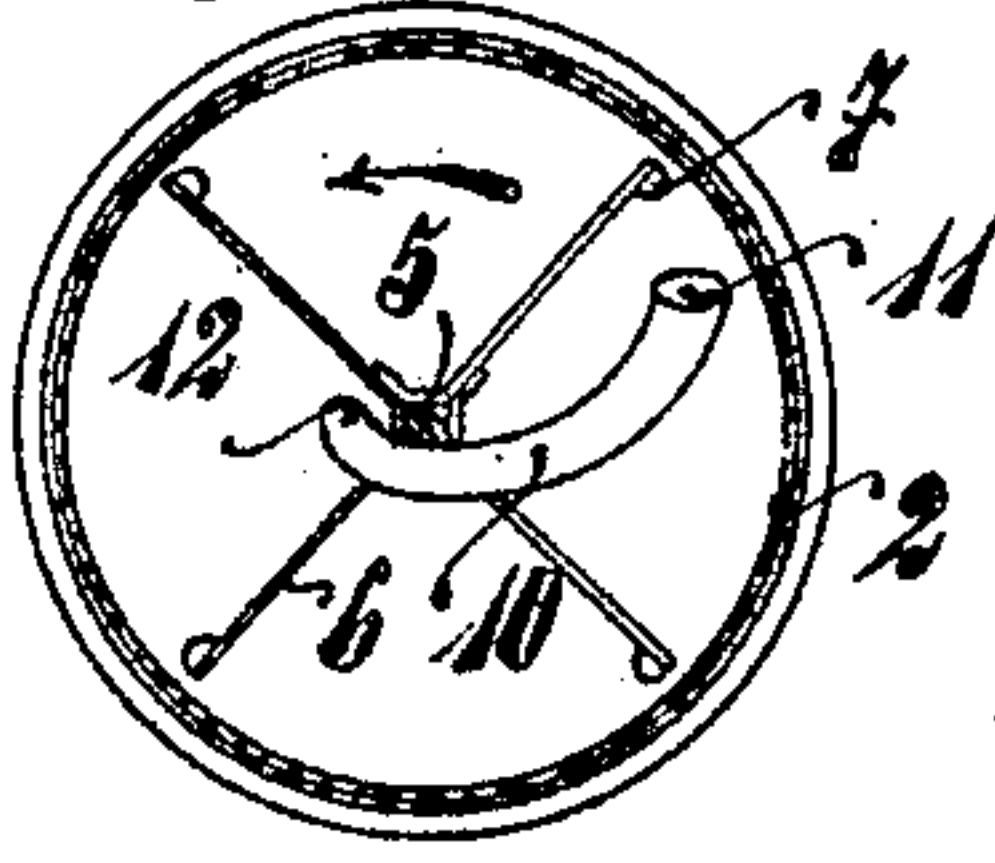
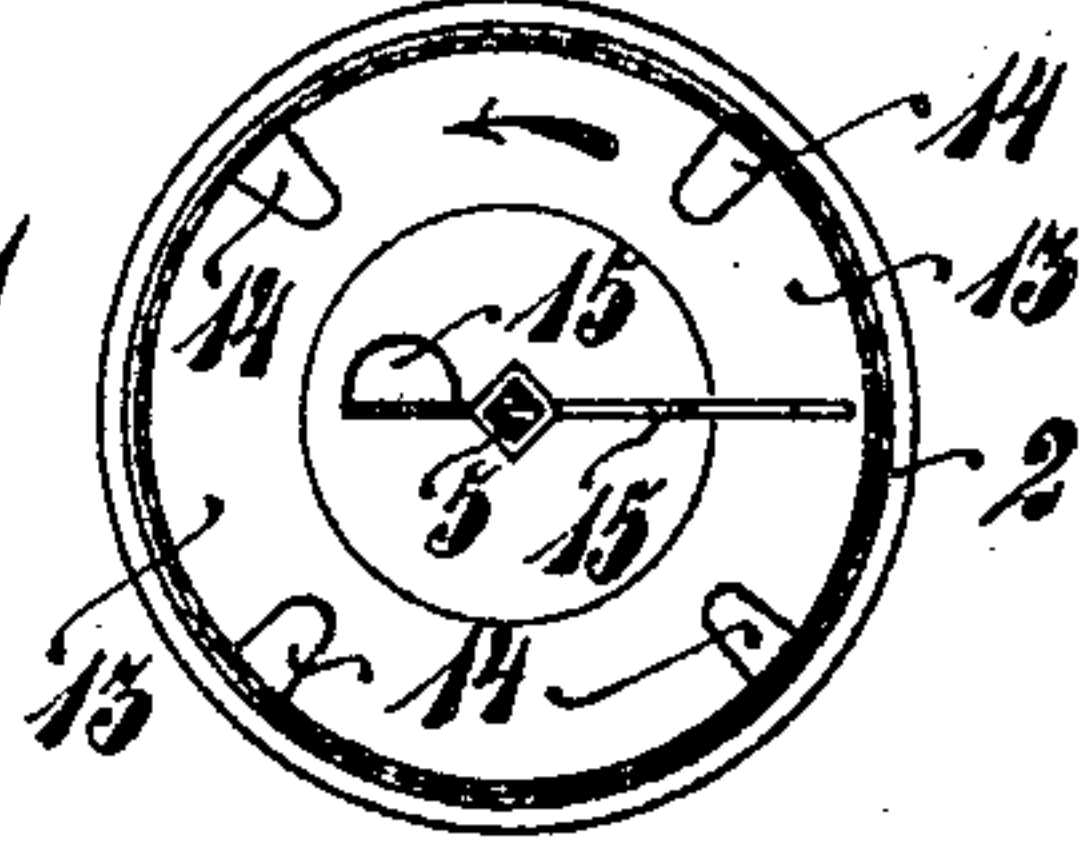
INVENTOR:

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SUGAR CRYSTALLIZING APPARATUS.

APPLICATION FILED NOV. 10, 1903.

2 SHEETS—SHEET 2.

Fig. 3*Fig. 5**Fig. 7**Fig. 4**Fig. 6**Fig. 8*

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UNITED STATES PATENT OFFICE.

RUDOLF FÖLSCHE, OF HALLE-ON-THE-SAALE, GERMANY.

SUGAR-CRYSTALLIZING APPARATUS.

No. 801,312.

Specification of Letters Patent.

Patented Oct. 10, 1905.

Application filed November 10, 1903. Serial No. 180,634.

To all whom it may concern:

Be it known that I, RUDOLF FÖLSCHE, civil engineer, residing at 5 Hagenstrasse, in Halle-on-the-Saale, in the Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Sugar-Crystallizing Apparatus, of which the following is a specification.

My invention relates to apparatus of columnar construction for promoting the better crystallization of so-called "green sugar"—that is to say, the mass from the vacuum concentrating apparatus, whether boiled "blank" (*i. e.*, to saturation) or to "grain," (*i. e.*, to crystallization.) In employing the column the concentrated mass is fed in at the top, the various boilings being introduced successively until the vessel is filled. The fully-crystallized or "ripe" mass which results is run off periodically below for removal of the mother-liquor and subsequent treatment, whereupon a corresponding quantity of the next boiling can be run in above. As the boilings are warm when poured in, the upper portions of the vessel will contain a warm mass and the lower portions a relatively cool mass, since the mass on the way from the top to the bottom gradually cools down. In this manner the sugar will crystallize out of the mass which has been poured into the vessel. Beyond the slow movement of the portions of the mass from the top downward, during which the sugar-crystals, gradually increasing in size, will sink downward with increasing rapidity, no stirring operation is necessary to promote crystallization. Care must, however, be taken that the mass does not adhere to the walls of the vessel, and for this purpose a stirring mechanism is employed to scrape off the sugar from the sides. Such column-shaped crystallization vessels possess the disadvantage that in consequence of the difference in temperature between the center portion of the mass and the outer portions the sugar does not separate out uniformly, so that the output of the apparatus is affected, for since the central portion of the mass experiences a considerably-slower cooling than the peripheral portion less crystallization takes place centrally, this portion of the mass remaining more fluid. The consequence of this is that at the periodical removals of sugar considerably more of the incompletely-crystallized central mass leaves the apparatus than of the completely-split-up peripheral mass, while a correspondingly-larger quantity of

the next boiling which is fed in will flow to the central portion than to the portion at the circumference. Thus in no part of the column are those conditions fulfilled which are necessary for insuring thoroughly uniform crystallization, for the peripheral portions of the mass travel slowly at a low temperature, while the central portions travel considerably faster at a higher temperature. It has been ascertained that more than twice the time is required by the portions at the circumference to pass through the column than by the central portions. To obviate this defect, I provide a device which while not essentially effecting the disposal of the separate superposed layers produces and maintains a combined movement of the central and peripheral portions of the mass. In this manner the peripheral portions of the mass are caused to travel toward the middle, and, vice versa, the central portions toward the circumference. By means of this to-and-fro movement of the different portions of the mass in the various layers a mass of uniform consistency, and therefore also of uniform fluidity, is obtained at the bottom of the column, while at the same time the formation of the crystals is so favorably promoted that without unduly-prolonged boiling scarcely a week is necessary to completely split up into crystals and molasses one charge of a high percentage sugar (seventy-eight to eighty-two per cent.) by a single passage through the apparatus.

With the new apparatus the molasses can be separated in raw-sugar mills in two stages at most and in refineries in two or three stages.

In the accompanying drawings several forms of construction of the apparatus are shown.

Figure 1 is a vertical section through a crystallizing-column according to the present invention. Fig. 2 is a vertical section taken at right angles to Fig. 1. Fig. 3 is a vertical section of a second form of construction of the apparatus. Fig. 4 is a transverse section on line 4 4 of Fig. 3. Fig. 5 is a vertical section of a third form of construction. Fig. 6 is a transverse section on line 6 6 of Fig. 5. Fig. 7 is a vertical section of a fourth form of construction, and Fig. 8 is a transverse section on line 8 8 of Fig. 7.

In the construction shown in Figs. 1 and 2 the apparatus consists of a column 2 of considerable height (about thirty-five to forty feet) provided at the bottom with an outlet 1. In the lower portion of the column 2 stirring

mechanism 3 is provided to assist in running off. This mechanism promotes circulation in the various layers of the mass from the sides of the vessel toward the center, and vice versa.

5 In order that the contents of the upper part of the column may not be set in rotation, a vertical partition 4 is inserted above the stirring mechanism.

10 In the modification shown in Figs. 3 and 4 the shaft 5 of the stirring mechanism 3 is prolonged to extend into the upper part of the column 2 and is provided with radial arms 6, carrying scoops 7 at their outer ends for scraping off the mass from the sides of the
15 column and pressing the same downward. These scrapers are combined at certain intervals with obliquely-set plow-shaped scoops 8, which impart to the mass a motion toward the center of the column. At suitable intervals
20 there are also arranged in the center on the shaft 5 oblique scoops 9 in such manner that they impart to the mass a motion toward the circumference. These two sets of scoops serve to move the mass in substantially horizontal di-
25 rection from the sides of the vessel toward the center and from the center toward the sides.

30 Figs. 5 and 6 show an arrangement in which the scoops 8 and 9 are replaced by tubes 10, secured to the scrapers and open at both ends. These tubes are set at an angle, say, of thirty degrees, and arranged alternately in such a manner that the upper end 11 of the tube is located outward and bent in the direction of
35 rotation of the shaft 5, while the lower end 12 is located next the shaft and bent in the direction of its rotation. Since the tubes 10 rotate with the shaft 5, the mass is forced into the upper outer ends 11, slides down the tubes
40 toward the center of the column, and there passes out at the lower ends 12 in radial direction toward the circumference.

45 In the apparatus shown in Figs. 7 and 8 there are introduced at suitable intervals between the scrapers 7 intermediate floors 13, having the form of inverted truncated cones open at the middle and provided round the outer edge with aperture 14. On the inside they are scraped by the scoops 15.

50 The desired action may be increased by dividing the columns into compartments by means of horizontal partitions 16, Figs. 3, 5, 7, provided with apertures 17 18 near the walls of the column in such manner that en-

try and exit of the mass take place at oppo- 55 site sides of each compartment. The apertures 17 18 may be provided with sliding plates to enable the separate compartments to be discharged in succession.

Having thus described my invention, I 60 claim as new—

1. An apparatus for crystallizing out the products of sugar-boiling, comprising, in combination, a column having an outlet at the bot- 65 tom, a central, vertical, rotary shaft located within the column, and a series of superposed radial devices carried by the shaft for causing the sugar mass to move substantially horizontally from the sides of the vessel toward the center and from the center toward the sides, 70 substantially as described.

2. An apparatus for crystallizing out the products of sugar-boiling, comprising, in combination, a column having an outlet at the bot- 75 tom, a central, vertical, rotary shaft located within the column, a series of superposed radial devices carried by the shaft for causing the sugar mass to move substantially horizontally from the sides of the vessel toward the center and from the center toward the sides, 80 and a plurality of superposed funnel-shaped horizontal partitions, provided with lateral apertures, located at desirable heights within the column, substantially as described.

3. An apparatus for crystallizing out the 85 products of sugar-boiling, comprising, in combination, a column having an outlet at the bottom, a central, vertical, rotary shaft located within the column, a series of superposed ra- 90 dial devices carried by the shaft for causing the sugar mass to move substantially horizontally from the sides of the vessel toward the center and from the center toward the sides, and a plurality of superposed funnel-shaped 95 horizontal partitions, provided with lateral apertures, and a plurality of superposed horizontal floors, provided with substantially, circumferential apertures alternately right and left of the shaft, said partitions and floors being located at desirable height within the col- 100 umn, substantially as described.

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

RUDOLF FÖLSCHE.

Witnesses:

RUDOLPH FRICKE,
LEON ZEITLIN.