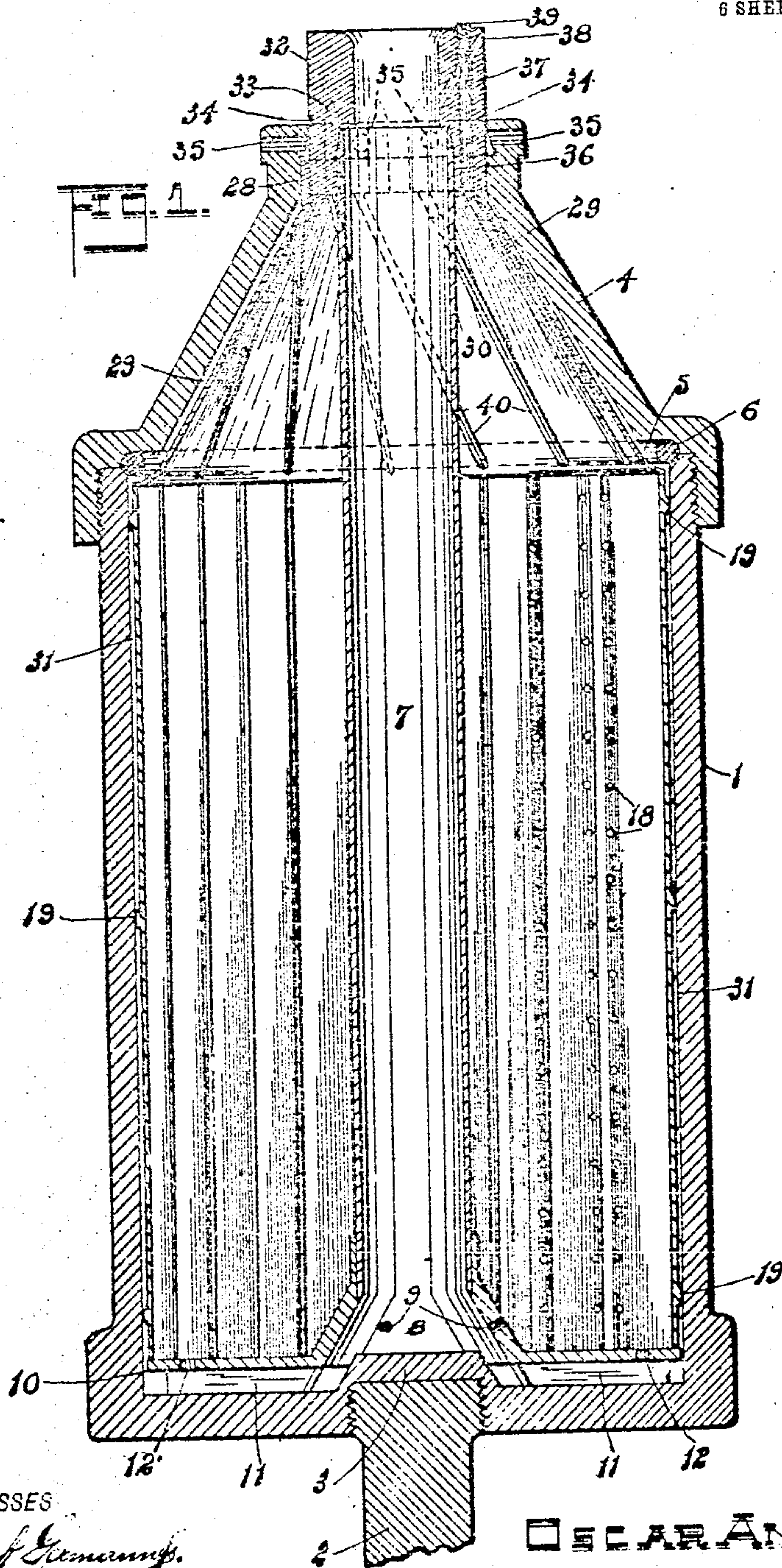


No. 877,158.

PATENTED JAN. 21, 1908.

O. ANDERSON.
CENTRIFUGAL CREAM SEPARATOR
APPLICATION FILED OCT. 18, 1906.

6 SHEETS—SHEET 1.



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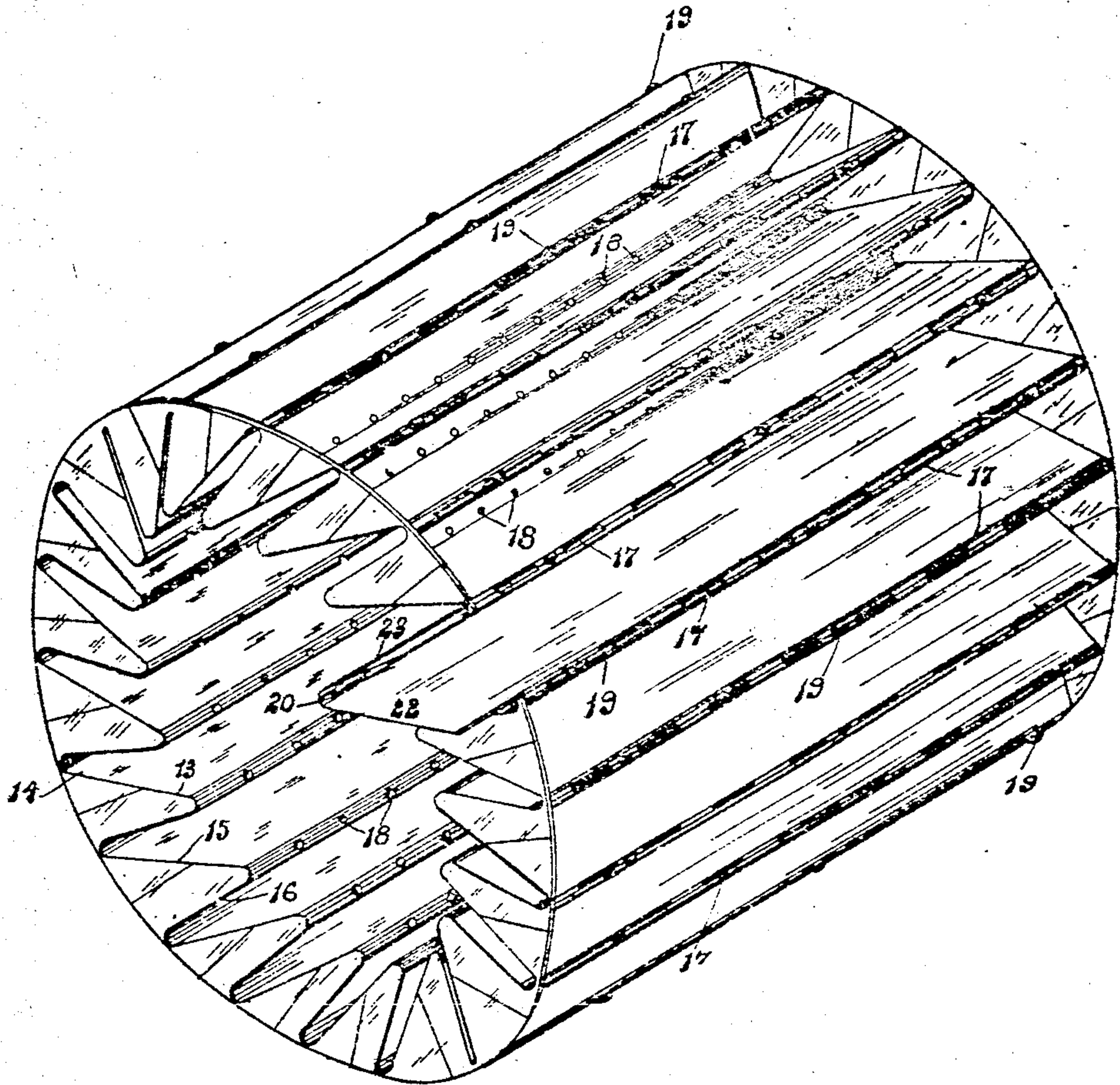
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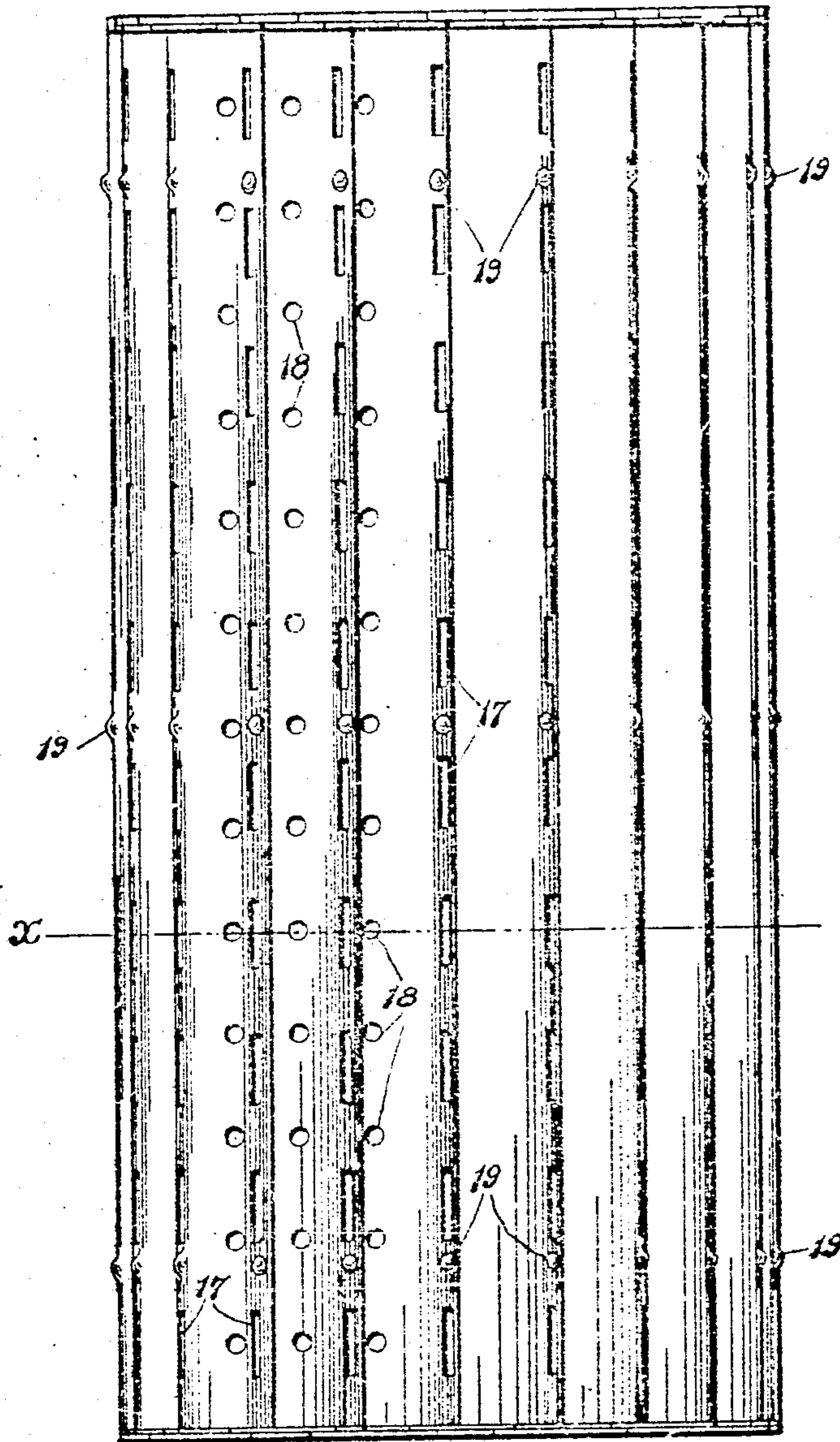
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6 SHEETS—SHEET 3



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6 SHEETS—SHEET 4.

FIG. 4.

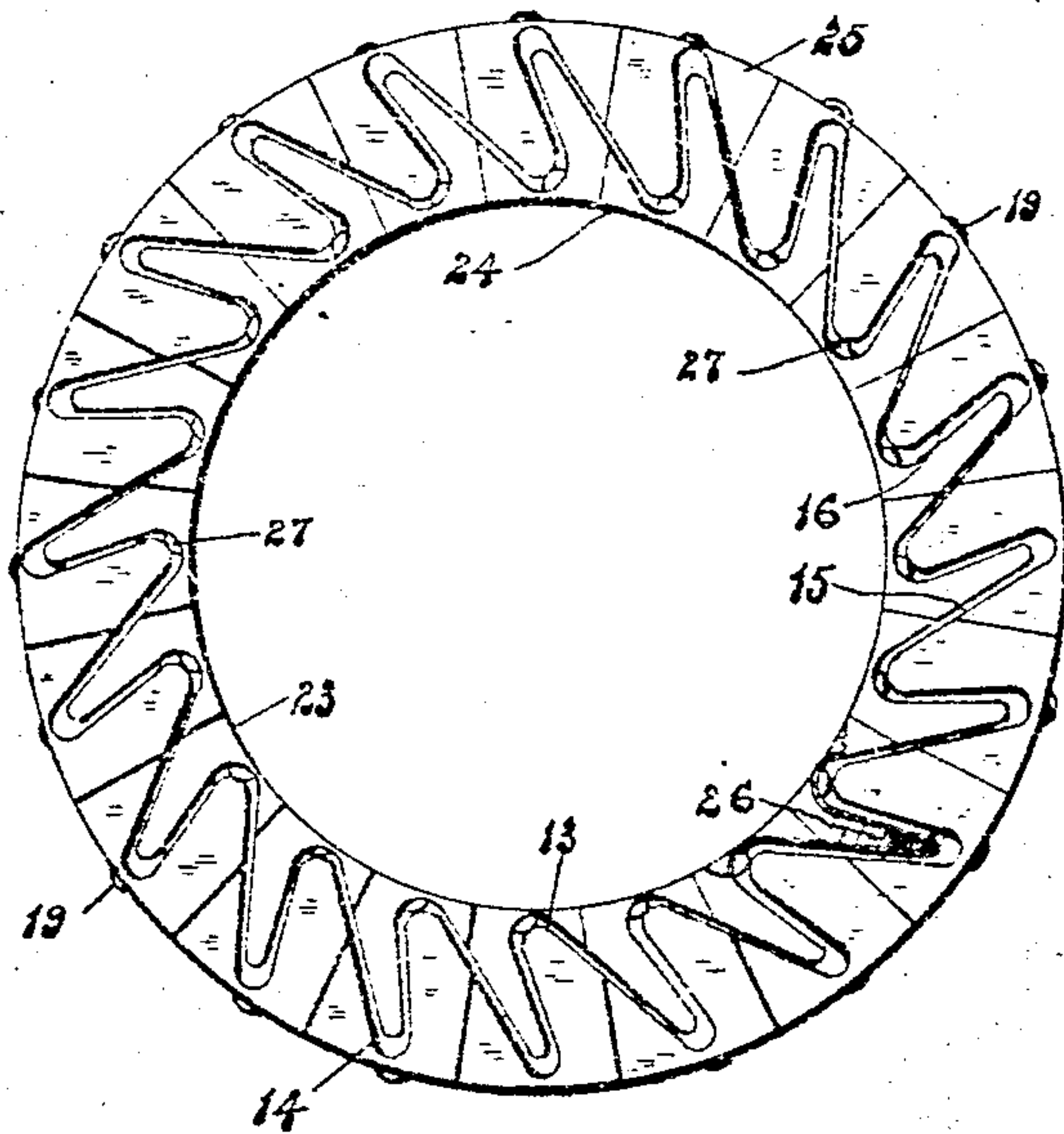
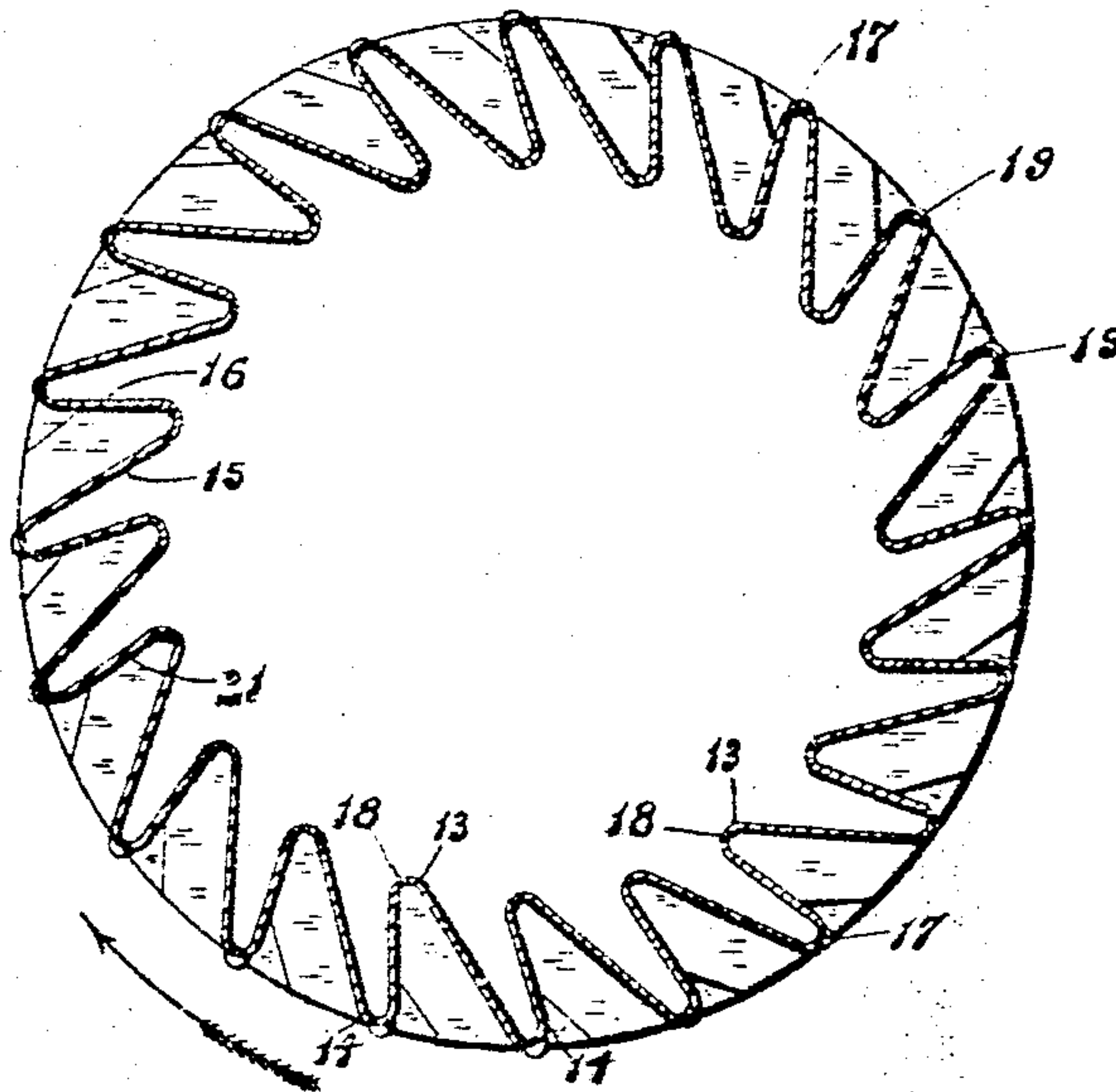


FIG. 5.



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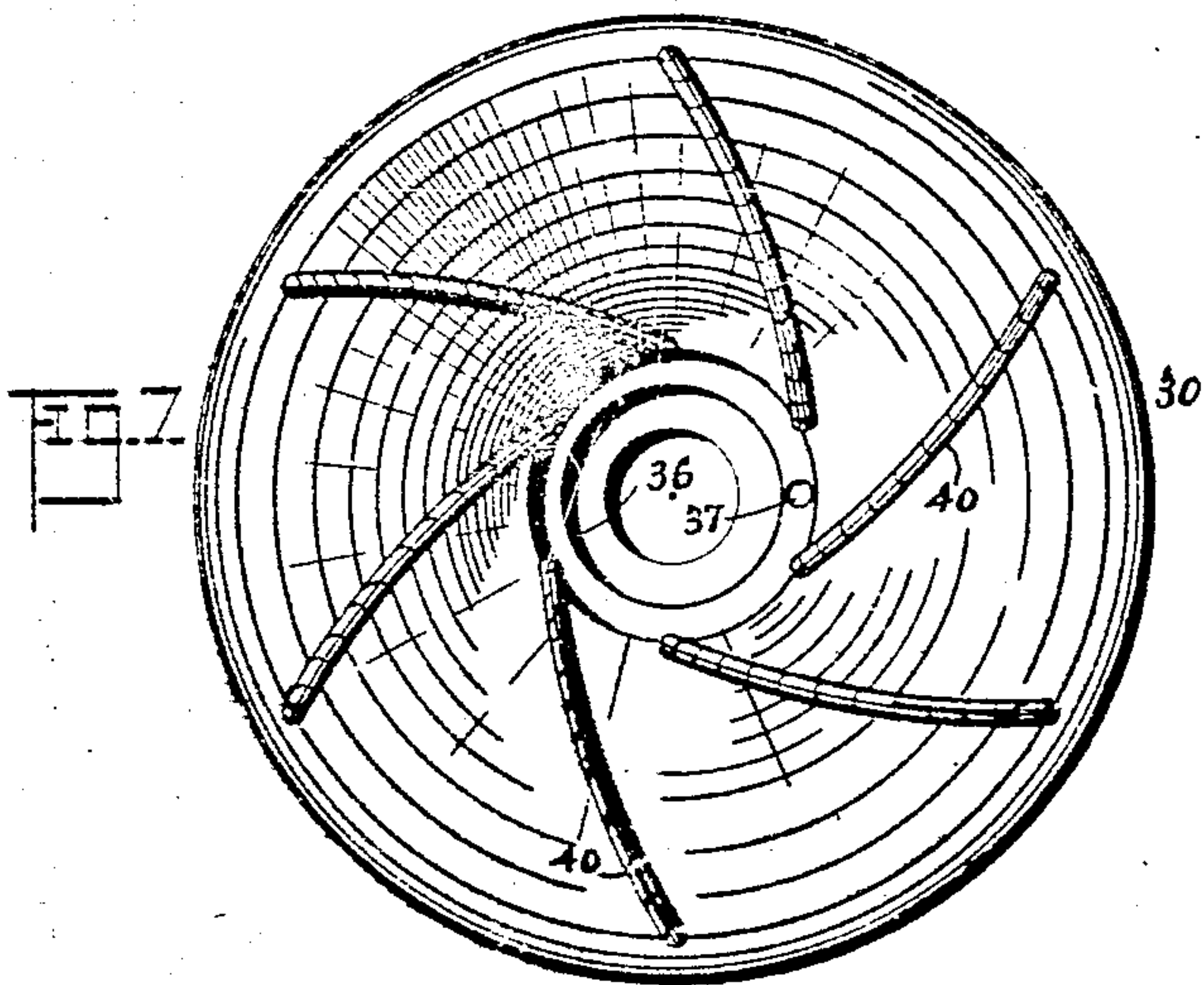
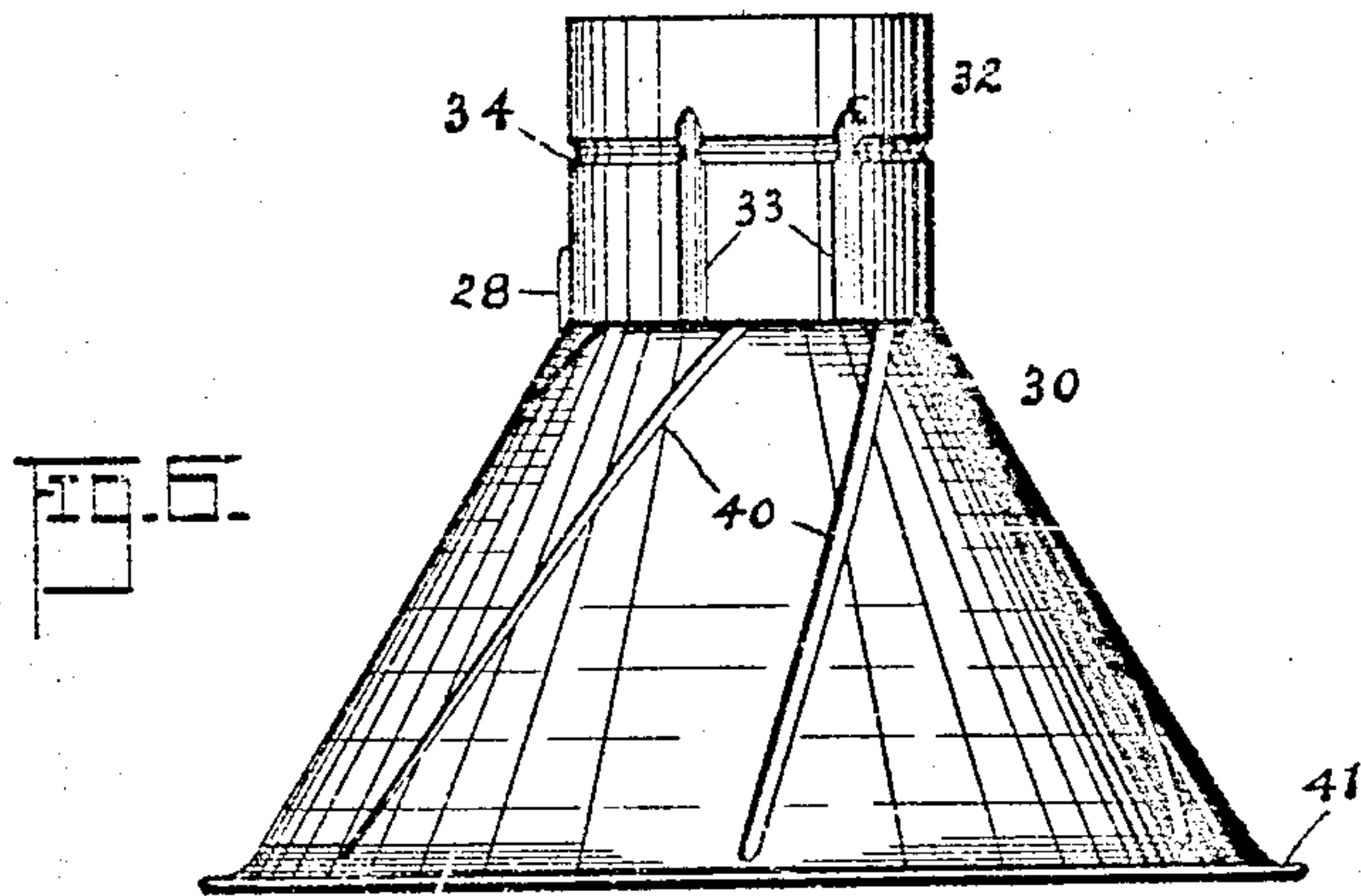
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6 SHEETS—SHEET 5.



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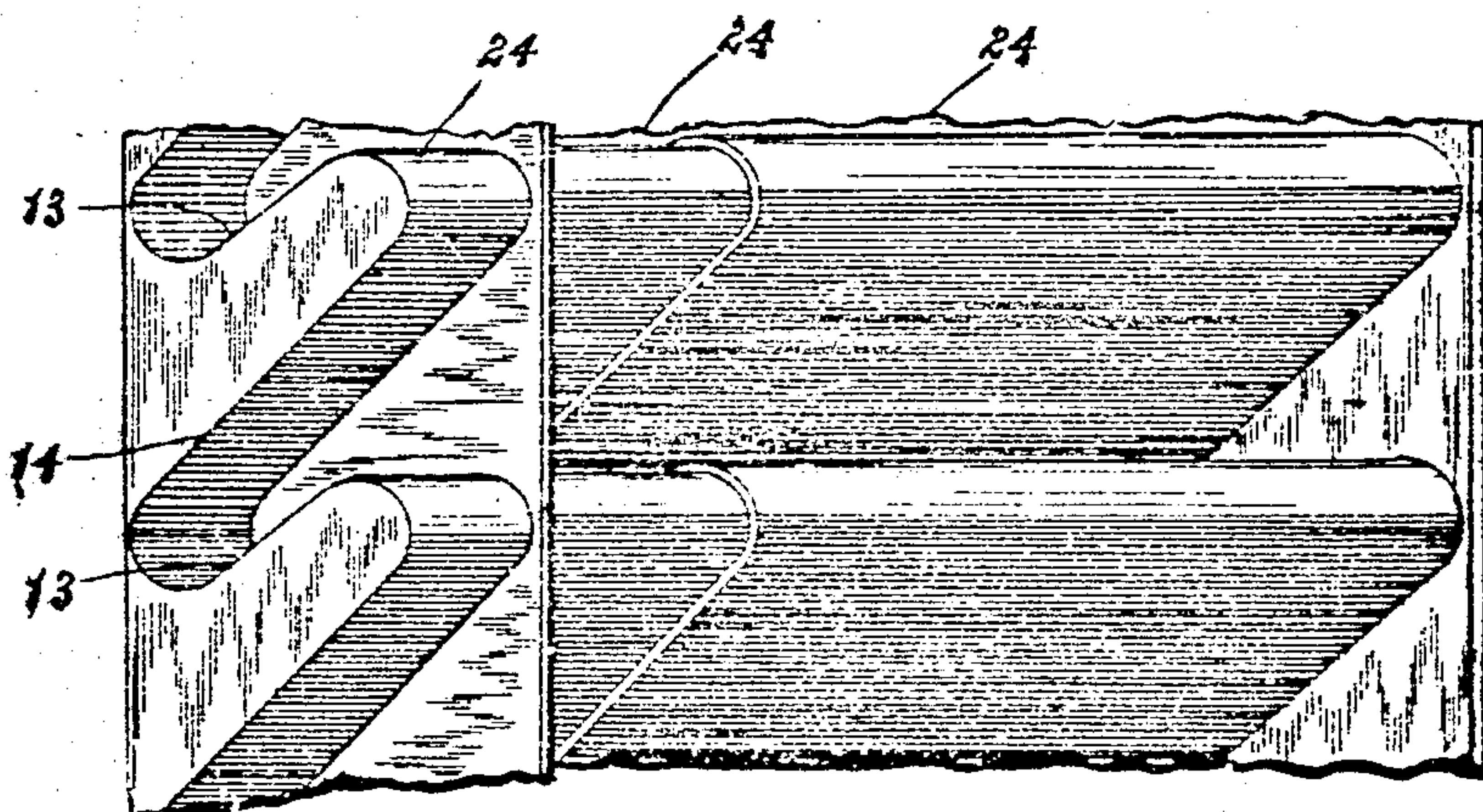
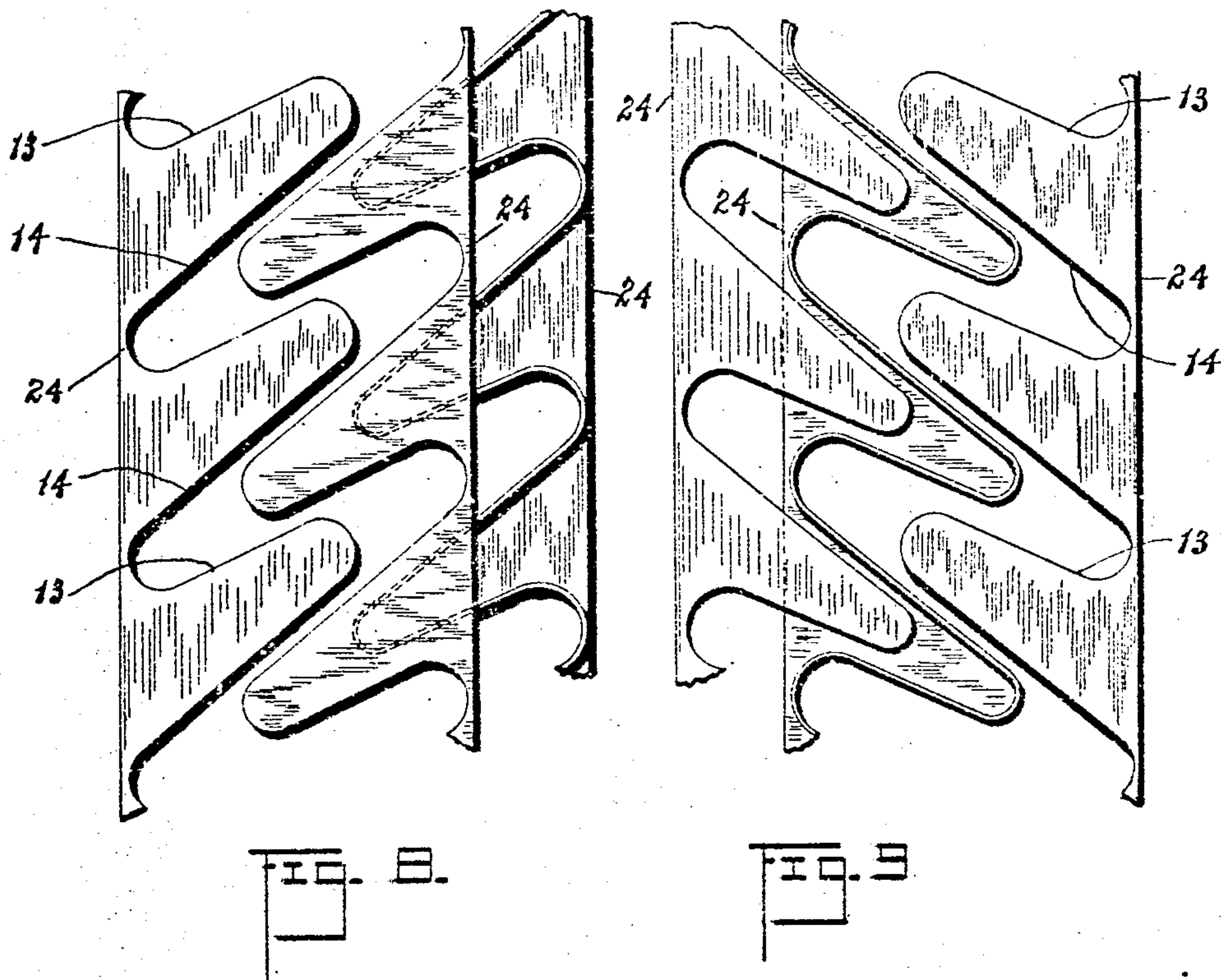
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6 SHEETS—SHEET 6.



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FIG. 10.

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OSCAR ANDERSON, OF KEARNY, NEW JERSEY.

CENTRIFUGAL CREAM-SEPARATOR.

No. 877,158.

Specification of Letters Patent

Patented Jan. 21, 1908.

Application filed October 18, 1906. Serial No. 339,484.

To all whom it may concern:

Be it known that I, OSCAR ANDERSON, a citizen of the United States, residing at Kearny, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Centrifugal Cream-Separators, of which the following is a specification.

The objects of this invention are to provide
10 for a centrifugal cream separator a liner or liner skimming device in which there shall be a large number of upright surfaces arranged in a transverse plane at inclines to the radii, said surfaces being inclined all in the same
15 general direction with reference to the radii; to thus present a maximum skimming area in a minimum space, and secure complete and perfect separation; to at the same time retain simplicity of construction and a small
20 number of parts; to secure sufficient strength in such a device so that it will not collapse under the strain of centrifugal force; to enable a plurality of such skimming devices to be nested and employed in a single separator;
25 to provide an improved skimming-shield for the top of the bowl; to provide for the convenient escape of the separated cream and skim milk; to enable both the skimming device and skimming shield to be easily and
30 perfectly cleaned; to secure a simple, durable and inexpensive construction throughout, and to obtain other advantages and results as may be brought out in the following description.

Referring to the accompanying drawings, in which like numerals of reference indicate corresponding parts in each of the several drawings, Figure 1 is a central vertical section of the bowl and interior devices of a cen-
40 trifugal cream separator of my improved construction; Fig. 2 is a perspective view of the liner or skimming device employed in the body of the bowl, and Fig. 3 is a side elevation of the same; Fig. 4 is a top or plan view
45 of two liners or skimming devices of my improved construction as employed together, and Fig. 5 is a transverse cross section on line *z*, Fig. 3; Fig. 6 is a side elevation of the skimming shield for the top or cover of the
50 bowl. Fig. 7 is a view of the same from beneath, Fig. 8 is a diagrammatic view showing an end view of parts of three skimming devices spread out or "developed", Fig. 9 is a
55 similar view of the opposite ends of such de-

of said part so developed and somewhat separated longitudinally.

In said drawings, 1 indicates the bowl of a centrifugal cream separator supported on a spindle 2 screwed into a hub 3, and sur- 60 mounted by a cover 4 which screws on, as is common. A rubber ring 5, under centrifugal force lies outward in a suitable groove 6 over the joint formed by the body and cover of the bowl, to prevent leakage at said joint. With- 65 in the said bowl is the usual centrally disposed supply tube 7, and which is provided at its bottom with a flaring portion 8, having a wide radial flange or plate 10. This bottom or distributing plate extends to the side 70 walls of the bowl, and is held up from the floor thereof by means of ribs 11, being perforated between said ribs, as at 12, to permit an up-passage of fluid to the liners or skimming devices. The perforations 9, are with- 75 in the cream-wall and serve to relieve the bottom 8 of the supply tube of such cream as may have at that point become already separated under certain conditions. The liner or skimming device, as it is sometimes 80 called, comprises a sheet metal body portion of cylindrical shape in general outline, the walls however being crimped or plaited into longitudinal corrugations which present alternate inward and outwardly directed an- 85 gles, 13, 14, as clearly shown in Figs. 2, 4 and 5 of the drawings, more particularly. Said bendings of said walls are at comparatively sharp angles, so that the greater part of the skimming device consists of transverse sur- 90 faces 15, 16, all inclined one with respect to another in a transverse plane of the liner and all lying transversely with respect to the general cylindrical surface. Furthermore, it should be noted that in a transverse plane of 95 the liner the direction of each of all these skimming surfaces 15, 16, is oblique to the radii of the circle which it cuts, and all are inclined in the same direction with regard to the rotation of the machine. In other words, 100 if a radius be drawn at any point in such a plane, it will form an acute angle with any surface 15 or 16 which it cuts; and furthermore, each surface is inclined inward from the outer circumference of the cylindrical 105 liner in the same direction, viz. forwardly with respect to the direction of rotation of the bowl. Or, to state it in another way, both sides or skimming surfaces of each corrugation rake the same way, i. e., are tangent 110

on the same side of the center of rotation to circles struck from that center. This is a very important feature of my invention, since it enables many more surfaces to be provided than would be possible if they diverged widely in different directions across the radii. From the construction, it follows that the acute angles formed in any transverse plane between radii and the inner sides of the skimming surfaces, will all be on the same side of said radii with reference to the direction of rotation. While said surfaces should extend longitudinally of the bowl or be upright in that sense, they need not necessarily be vertical; again, though I have shown the liner cylindrical, it could obviously be of other forms without departing from my invention. The walls of the said liner are at their outwardly presented angles 14, longitudinally slotted, as at 17, while the inwardly presented angles 13, have similarly disposed rows of perforations 18. Said slits 17 provide a ready outward passage of the skim-milk or heavier portion of the liquid in the operation of the machine, as will be hereinafter described, while the perforations 18, enable the cream or lighter portion of the liquid to move inwardly toward the cream wall. Furthermore, the outer ridges or angles 14, have bosses 19, to engage the inner walls of the bowl and hold the liner away therefrom, to provide opportunity for free horizontal and vertical flow of the skim-milk or heavier portion of the liquid. These bosses are preferably arranged, as shown, in three circumferential rows near the top, bottom and middle of the liner respectively, although any other arrangement found necessary might be employed equally well.

The manner of constructing the ends of the liner is shown in Fig. 2 more particularly, where one of the corrugations is left open or unfinished. This end is first slitted as at 20, along its inner angle or bending, and the inner corner cut off of one flap 22, thus formed, as at 21, Fig. 5; then the flap is folded into a right angular plane and the other flap 23 is folded on top of it, its projecting corner being cut off or folded over as preferred. The edges of the two folded flaps then conform on the inside of the liner to the V-shaped corrugation, and are trimmed on the outside to conform to the circular outer boundary of the liner. The flaps being afterward soldered or otherwise secured firmly together, provide a strong connection or brace of the two sides of the V-shaped corrugation, so that said sides cannot be displaced with respect to each other by the ordinary amount of centrifugal force developed in a separator. Furthermore, the connection joins the corrugations or of the liner to each other and forms a continuous ring at the end of the same. The grooves between the inner angular projections are entirely open at their ends for wash-

ing or cleaning, and the outer ones are easily accessible because they are on the outside, so that the entire device is very readily cleaned or washed.

If desired, more than one of these liners may be employed in a single separator, the different ones of such a series being nested as shown in Fig. 4, where the outer liner is of the same construction previously described, while the inner one 24 has the inner angles between its adjacent inward projections or corrugations closed by folding over the ends as above described in connection with the outer liner 25. This is only a matter of convenience, so as to enable the two liners to be nested, and it should be noted that the skimming surfaces of both are similarly disposed. The inner liner 24, therefore has open grooves on its outside, and on its inside, grooves closed at their ends; hence, in order to facilitate cleaning these latter, it may be desirable to place in the end corners fillets 26, of any approved formation to prevent the accumulation of dirt. The angles at or between the outward projections or corrugations thus formed upon the inner cylindrical liner 24 have at intervals bosses 27, to engage the edges of the entering projections or corrugations upon the outer liner 25, and thus hold the two liners at a proper distance apart.

If still further liners were employed, as for instance a third one, the folded flaps would be left off of the second liner 24 at one end, and the third or inner liner would be open at one end or devoid of folded flaps, to accommodate the closed end of the second liner, and provided with flaps or closed at the opposite end to occupy the space where the inner liner was devoid of such appurtenances. In this way as many liners or skimming devices as desired could be combined in a single machine, all separable and yet when put together presenting as a whole closed ends, as shown in Fig. 4. This is illustrated in Figs. 8, 9 and 10, in which three such skimming devices 24 are shown. Owing to the difficulty of showing such parts in their true cylindrical curvature, they are shown as if spread out or "developed"; and in Figs. 8 and 9 the three devices 24 are shown as if somewhat separated laterally, while in Fig. 10 they are shown as if separated somewhat longitudinally.

At the top of the cylindrical liner described is a conical sheet metal skimming shield 30, which is keyed to the bowl cover, or similarly secured to the supply tube, so as to preserve balance of the bowl, as at 28, and provides between itself and the inner surface of the bowl-cover, a flow space 29 for the skim milk or heavier portion of the liquid being separated. This flow space is practically a continuation of the space 31, between the outer cylindrical liner 25, and the walls of the bowl, as will be understood. At its apex,

the said shield has a cylindrical neck 32, adapted to fill the central opening of the bowl cover, and which is for its lower part, adjacent to the conical portion of the shield, provided with longitudinal grooves 33, for the up-passage of the skim-milk. Said grooves extend to or beyond the plane of an annular groove 34, in the inner wall of the central opening of the bowl cover, so that the skim milk has free access thereto and from the same to outlet passages 35 in the said bowl cover. This neck 32 of the skimming shield is interiorly recessed at its lower part, as at 36, to receive and fit upon the upper end of the milk tube 7, the entire shield being preferably supported or held in place this way. The said neck 32 furthermore has a longitudinal cream passage 37 arranged close to the supply duct 7, and which near its upper end is intersected by an inclined boring 38 and fitted with a cream screw 39, which is adapted to regulate the exact position of the outlet, as is common. The outer surface of the conical skimming shield, I preferably provide with grooves 40, which extend from its lower edge upwardly to the neck 32, and are inclined or slanted rearwardly with respect to the direction of rotation of the bowl and its parts. By this means as the skim-milk is crowded inwardly from the larger circumference of the bowl to the smaller neck 32, the energy lost in the retardation of its movement is expended upon the walls of the grooves to assist in rotating the bowl. Preferably, these grooves 40 are attained by corrugating the sheet metal shield, so that it is uneven on both the inside and the outside. Furthermore, the lower edge 41, of the conical shield meets the outer upper edge of the cylindrical liner or liners, and forms at its outside a rest for the rubber ring 5, when slackened, and from which it rises by centrifugal force when the machine operates, to provide a skim-milk passage between itself and said shield.

In the operation of my improved separator, the milk as supplied passes downward through the tube 7 and radially outward at its bottom beneath the plate 10, escaping upward through the apertures 12 of said plate, to a point just inside the cylindrical liners. From here the cream already separated by centrifugal force moves inward, while the remaining milk passes outwardly through the slits 17, and over the skimming surfaces. Here further separation occurs and the cream moves inward through the perforations 18, while the milk goes onwardly outward through the slits. This operation is carried on through the successive liners, until separation is completed and the different products discharged from the bowl, as has been above indicated.

Having thus described my invention, what I claim as new is:

1. In a centrifugal separator, a liner having corrugations the contiguous sides of which in a transverse plane of the liner extend across radii of the bowl in the same general direction. 65

2. In a centrifugal separator, a liner having corrugations the contiguous sides of which in a transverse plane of the liner extend across radii of the bowl and are inclined outwardly backward with respect to the direction of rotation. 70 75

3. In a centrifugal separator, a liner having corrugations the contiguous sides of which in a transverse plane of the liner extend across radii of the bowl and form at their inner surfaces acute angles with said radii on the same sides thereof with respect to the direction of rotation. 80

4. In a centrifugal separator, a liner providing a circumferential series of adjacent skimming surfaces which in a transverse plane of the liner extend across radii of the liner in the same general direction, the opposite edges of each skimming surface being connected one to the next preceding surface and the other to the next succeeding one. 85 90

5. In a centrifugal separator, a liner corrugated approximately parallel to the axis, the sides of said corrugations being nearly parallel and pointing in the same general direction cutting the radii of said liner at similar angles. 95

6. In a centrifugal separator, a liner having corrugated walls, the sides of said corrugations in a transverse plane of the liner extending alternately in opposite directions with respect to the direction of rotation. 100

7. In a centrifugal separator, a liner having longitudinal corrugations both sides of which lie in planes tangent on the same side the axis of rotation to circles struck therefrom. 105

8. In a centrifugal separator liner, the combination of a circumferential series of adjacent skimming surfaces which in a transverse plane of the liner extend across radii of the liner in the same general direction, the opposite edges of each skimming surface being connected one to the next preceding surface and the other to the next succeeding one, and means at the ends of said skimming surfaces holding them in said position. 110 115

9. In a centrifugal separator, a liner having longitudinal corrugations the sides of which in a transverse plane of the liner cut radii of the liner in the same general direction forming similar angles therewith, and means at the ends of the liner holding said corrugations in said position. 120

10. In a centrifugal separator, the combination with a bowl and cover therefor, of a skimming shield arranged in said cover and forming between itself and the cover a passage for liquid, said shield having upon its 125

surfaces ribs which are inclined from the outer part of said shield inwardly backward with respect to the direction of rotation.

11. In a centrifugal separator, the combination with a bowl and a conical cover therefor, of a conical skimming shield arranged in said cover and forming between itself and the cover a passage for liquid, and a series of ribs upon the outer surface of said shield extending from its base spirally toward the apex and backward with respect to the direction of rotation.

12. In a centrifugal separator, the combination with a bowl and a cover therefor, of a hollow skimming shield arranged in said cover having longitudinal portions of its walls displaced from the normal surface thereof and forming projecting ribs on one side of the walls and corresponding grooves at the other side, said ribs and grooves being inclined from the outer part of the shield inwardly backward with respect to the direction of rotation.

13. In a centrifugal separator, the combination of a bowl, a cover therefor open at its top, a supply tube centrally disposed in said bowl and terminating at the top of the cover, and a skimming shield having an annular body portion lying in said cover forming a flow passage therewith and an annular neck filling the top opening of the cover and projecting therebeyond, said neck having its interior passage radially enlarged for its lower portion to receive and hold the supply tube and having its exterior surface longitudinally grooved from the bottom up to provide an exit from between the cover and the body portion of the shield and having intermediate of its outer end inner surfaces a longitudinal boring to afford an outlet from within the body portion of the shield.

OSCAR ANDERSON.

In the presence of—

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ETHEL B. REED.