No. 661,943. Patented Nov. 20, 1900.

F. J. AREND.

CENTRIFUGAL LIQUID SEPARATOR.

(Application filed Sept. 19, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

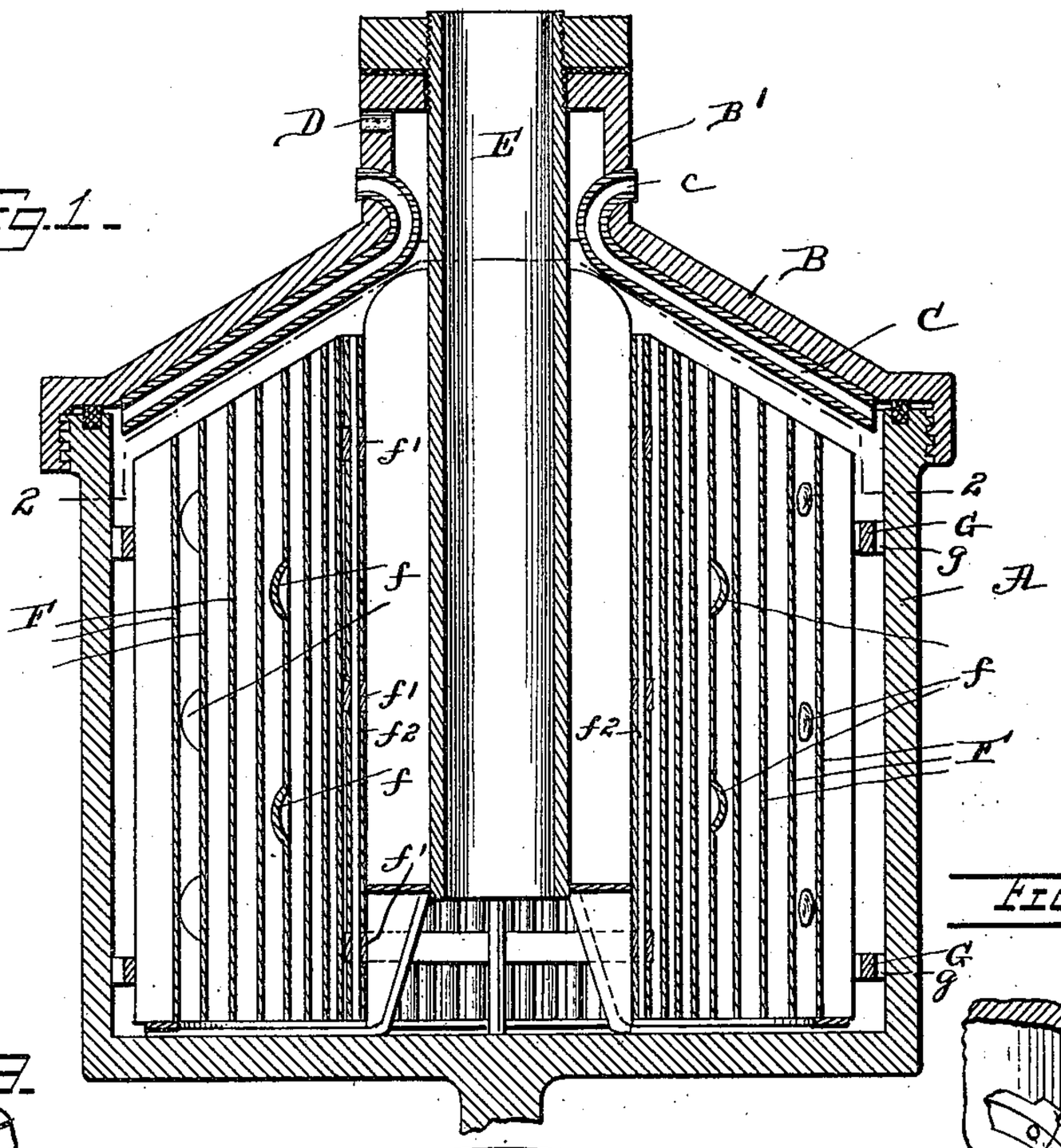


Fig. 4.

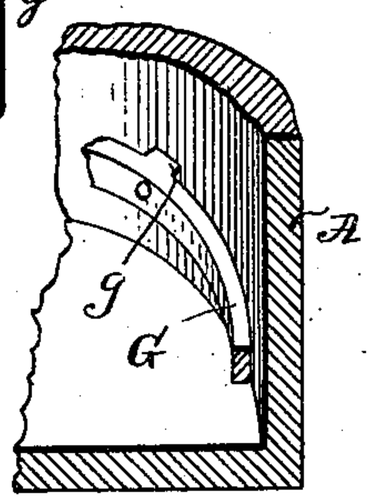


Fig. 3.

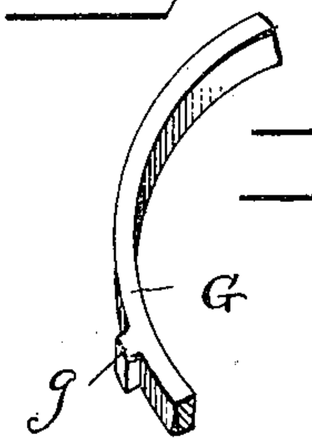
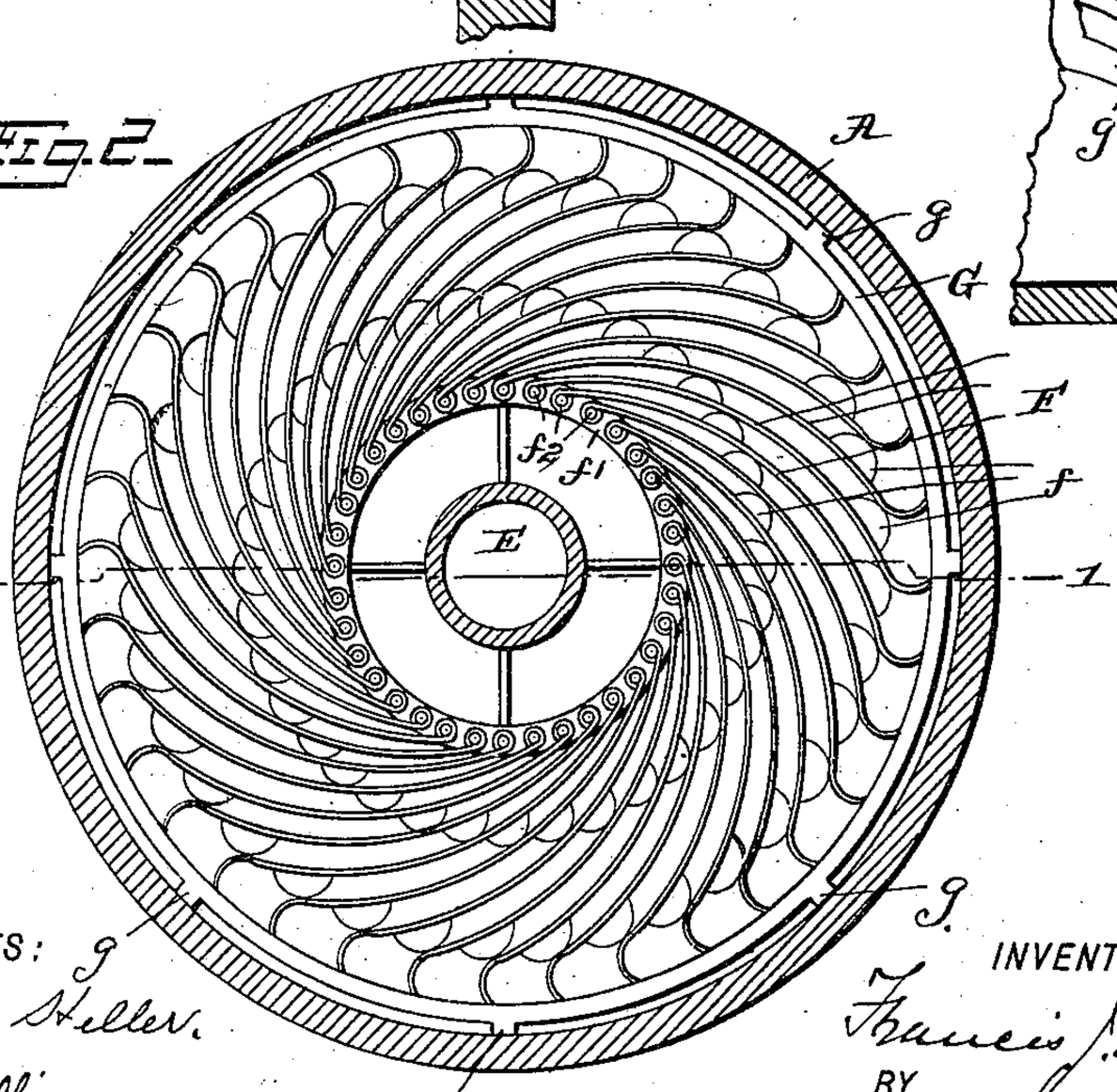


Fig. 2.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 5.

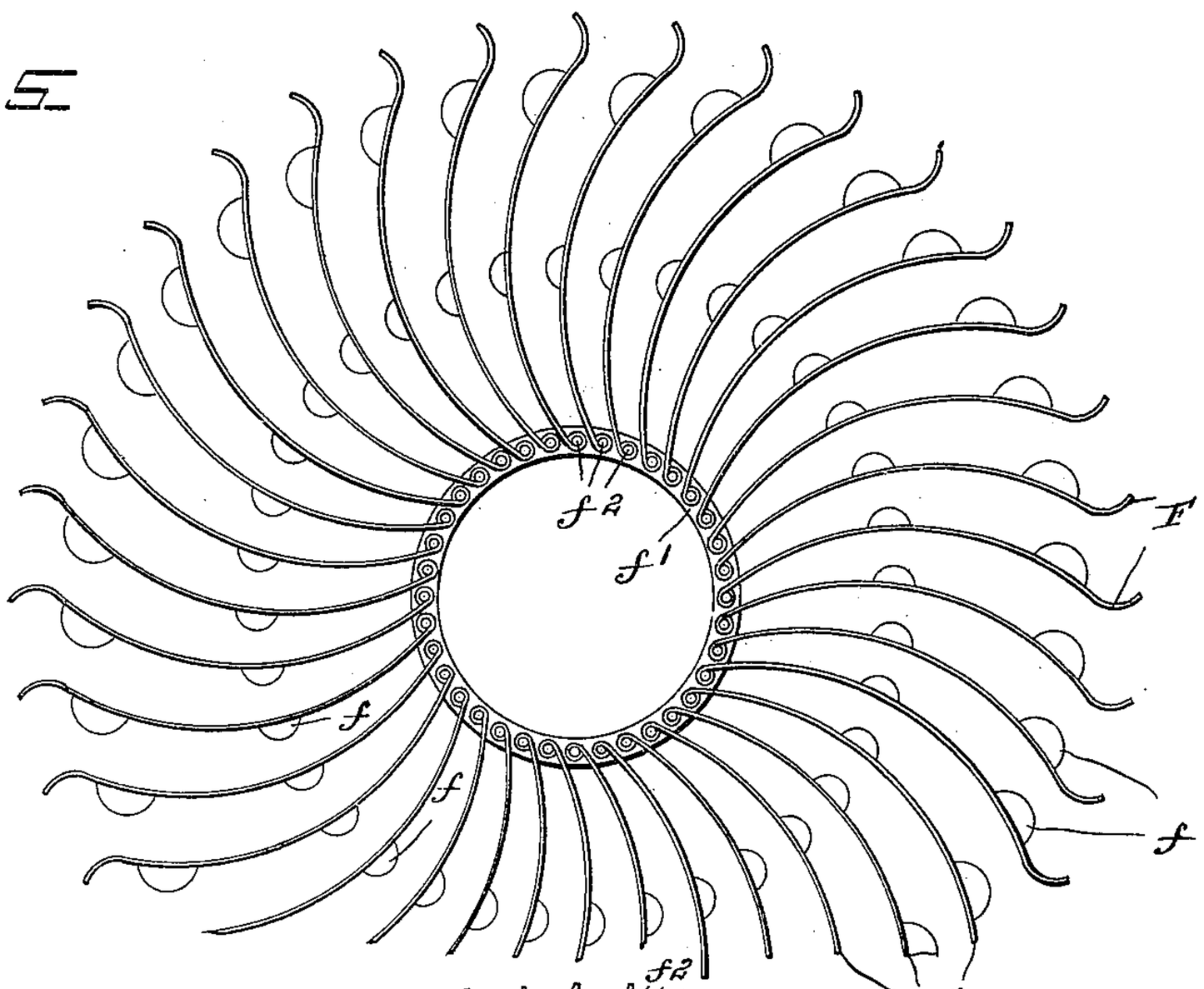
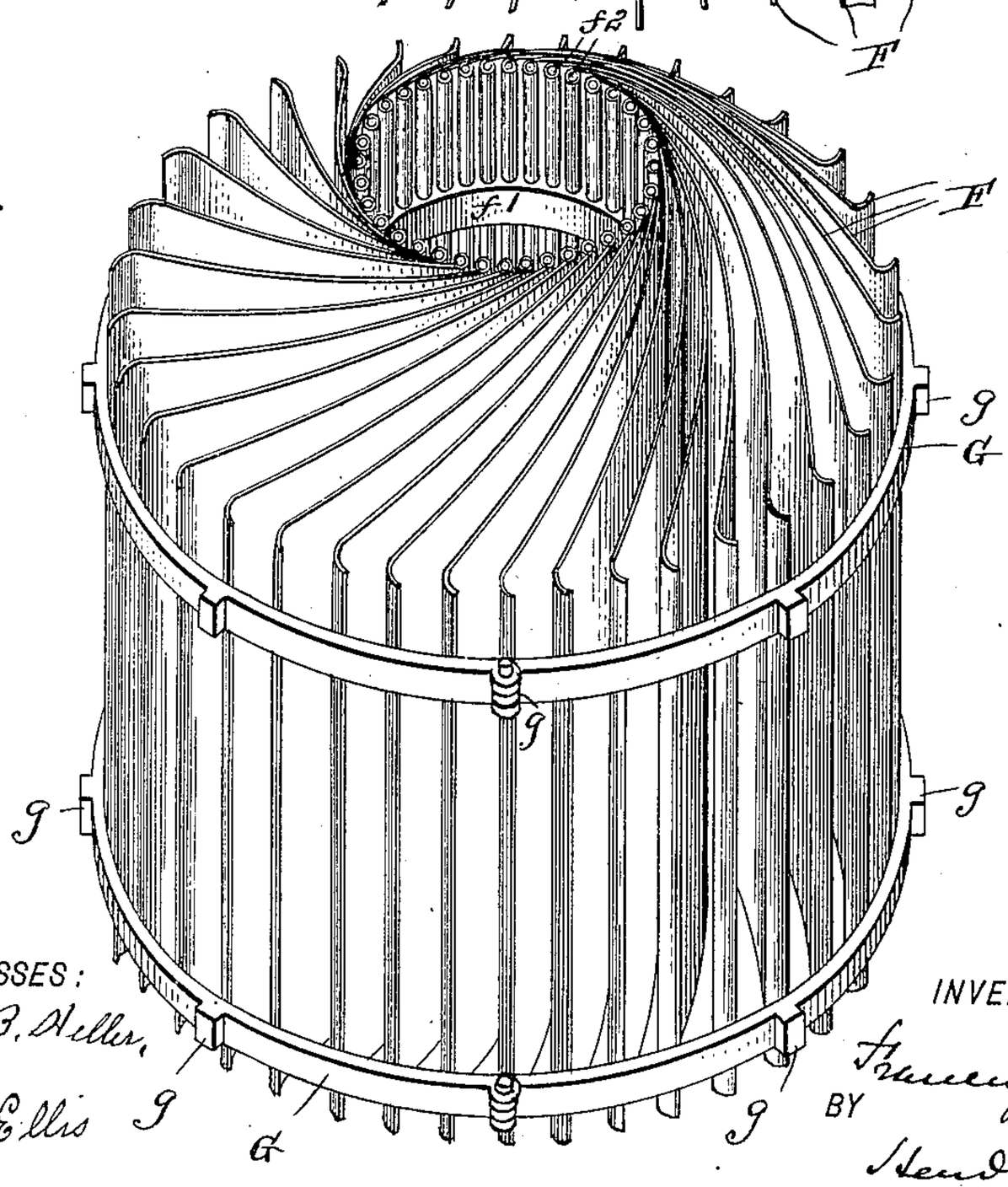


Fig. 6.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 7.

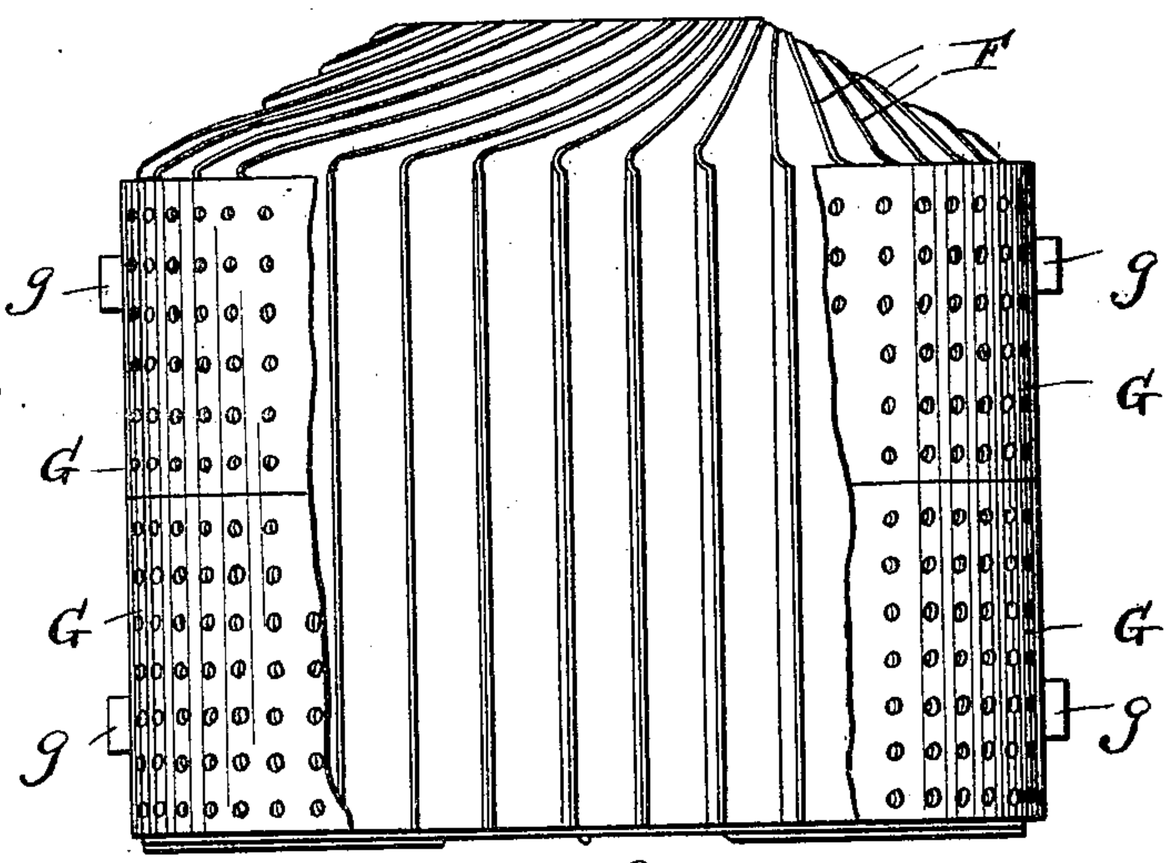

Fig. 8.

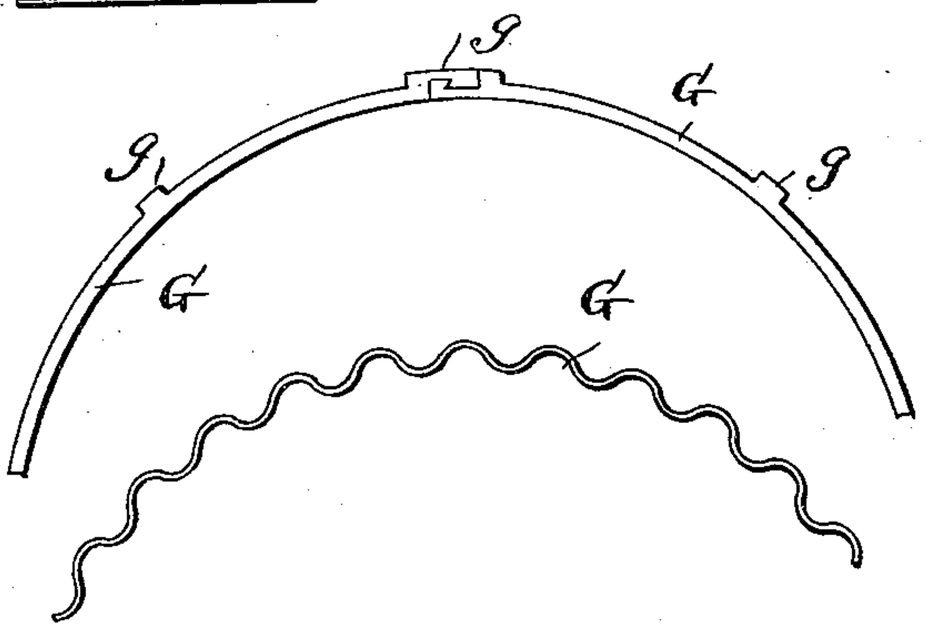

Fig. 9.

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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL LIQUID-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 661,943, dated November 20, 1900.

Application filed September 19, 1898. Serial No. 691,294. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS J. AREND, a citizen of the United States, residing at New York, county of New York, and State of New York, have invented a new and useful Improvement in Centrifugal Liquid-Separators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to that class of centrifugal liquid-separators in which blades or disks are used which intersect the radial line of the bowl and are used to increase the separating capacity and the efficiency or closeness of the separation. In this class of devices upright curved division plates or blades have been used which were hinged together or to a common ring, so that they could be unfolded for cleaning purposes. Where such upright division-plates loosely connected with each other have been used, they were so placed in the bowl that under the action of centrifugal force these blades would swing or spread on their loose or movable connection until their outer edges contacted with the peripheral wall of the bowl within what may be technically termed the "peripheral" skim-milk space or passage-way. I have discovered that this latter action is disadvantageous in that when the blades contact with the peripheral wall of the bowl there is left an insufficient space for the skim-milk, which space rapidly clogs up after a few minutes' use with the dirt and fibrous matters contained in the milk. As soon as this occurs the skim-milk zone is gradually contracted inwardly, and the skim-milk instead of going to the peripheral spaces between the ends of the blades goes upward between the blades and the efficiency of separation commences to deteriorate, and as the operation continues the deterioration increases. Again, mechanically such construction is faulty. The blades should be made of a curve of about a quarter or more of a circle to give them practicable separation-surface. They must also fit quite closely together for nearly their full length, allowing for spacing projections keeping them from actually touching each other when in position in the bowl. If the blades be made sufficiently loose to permit of their spreading out against the peripheral wall of the bowl under the action of centrifugal force, it is difficult to make them fit closely enough to insure practical efficiency of separation. If they are made to fit closely enough to insure efficient separation, the handling necessary in ordinary use—putting in and taking out, cleaning, and the like—will soon get them into such condition that it is impossible to compress them sufficiently to get the device in the bowl or out of the bowl when once in. The greatest cause of these troubles is intending or allowing the blades when in the bowl to be acted upon by centrifugal force.

The object of my invention is to provide a construction whereby blades loosely or movably connected together and intersecting the radial line of the bowl may be used, so as to have the advantage of convenient cleaning and yet maintain their contact or position with reference to each other and enable their being readily inserted in and removed from the bowl. Speaking generally, I accomplish this by encircling the exterior of the blades with a band or series of bands provided with projections which prevent their contacting directly with the inner peripheral wall of the bowl. These bands may be placed around the blades before inserting in the bowl or may be attached to or made a part of the interior of the bowl. In the latter case the blades are placed within these bands.

I will now describe the embodiment of my invention illustrated in the accompanying drawings, in which—

Figure 1 is a sectional view on the line 1 1, Fig. 2. Fig. 2 is a plan view. Fig. 3 is a detail perspective of part of one of the bands. Fig. 4 is a detail perspective view of part of the interior of the bowl with one of the bands. Fig. 5 is a plan view of the blades removed from the bowl and open. Fig. 6 is a perspective view of the blades removed from the bowl with removable band. Fig. 7 is a partial side elevation of a modified form of band. Fig. 8 is a partial plan view of a split-ring band. Fig. 9 is a plan view of a modified form of the band shown in Fig. 7.

A is the shell of the bowl, B the top and B′ the neck. The bowl shown is used for the separation of cream from milk.

C is the skim-milk pipe, leading to the skim-milk outlet *c*, and D is the cream-outlet.

E is the inlet feed-pipe.

F is a series of upright plates or blades intersecting the radial line of the bowl, preferably having projections *f* to maintain proper space between them. These blades are hinged at their inner ends to rings *f′* by vertical pivot-pins f^2, so that they are loosely or movably connected with each other and may be unfolded, as shown in Fig. 5. I do not intend to limit myself to any particular way of loosely or movably connecting the inner ends of these blades with each other to enable them to be opened out, as this may be accomplished in many ways.

G represents bands or rings provided with projections *g*. These bands encircle or surround the exterior of the blades and are of such size in diameter as to compress the blades the proper amount to bring them into correct position with reference to each other. The projections *g* provide a free space between the bands G and blades and the inner peripheral wall of the bowl.

I do not intend to limit myself to any particular form of band or ring nor to any particular form of projection on the ring or other means of creating sufficient flow-passages for the skim-milk. The band may be a continuous ring slipped over the blades before insertion in the bowl, as shown in Figs. 2 and 1, or its end may be drawn and clamped together around the blades, as shown in Fig. 6, or it may be a split ring, as shown in Fig. 8, in which case the bands may be secured around the exterior of the blades and open to release them, or the band may also be placed in the bowl, as shown in Fig. 4, by securing it to the bowl through the projections shown. The bands may be of metal or other suitable material. The bands may fill the space between the blades and the wall of the bowl and be provided with holes or perforations affording flow-passages, as shown in Fig. 7, or the bands may be otherwise made irregular in shape, so as to afford flow-passages along their inner or outer surfaces, or both, as shown in Fig. 9. As may be seen, with this improved construction the blades may still be readily separated for convenient cleaning purposes, and yet are compressed in action to the desired amount and are prevented from expanding, thus enabling the separation to be carried on effectively and the device kept in practicably usable condition.

As may be seen, the broad idea of my invention is the use of blades loosely connected together at their inner ends, which intersect the radial line of the bowl, but which are prevented from contacting with the peripheral wall of the bowl.

When the words "loosely" or "movably" are used in the specification, they are intended to mean capable of independent movement and not rigidly immovably connected.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. The combination with the bowl of a centrifugal liquid-separator, of a division contrivance consisting of a series of upright division-plates, loosely connected with each other at their inner ends and intersecting the radial line of the bowl, and means to prevent the outer ends of the blades contacting with the wall of the bowl.

2. The combination with the bowl of a centrifugal liquid-separator, of a division contrivance consisting of a series of upright division-plates, loosely connected with each other at their inner ends, intersecting the radial line of the bowl, means to support the outer ends of said blades and prevent the same from contacting with the wall of the bowl.

3. The combination with the bowl of a centrifugal liquid-separator, of a division contrivance consisting of a series of upright division-plates, loosely connected with each other at their inner ends, intersecting the radial line of the bowl, and one or more bands independent of and surrounding the outer portion of said blades.

4. The combination with the bowl of a centrifugal liquid-separator, of a division contrivance consisting of a series of upright division-plates, loosely connected with each other at their inner ends, intersecting the radial line of the bowl, and a band or bands provided with projections surrounding the outer portion of said blades.

5. The combination with the bowl of a centrifugal liquid-separator, of a division contrivance consisting of upright division-plates, loosely connected with each other at their inner ends, intersecting the radial line of the bowl, a band or bands provided with projections surrounding the outer portion of said blades, said band being connected to the bowl.

In testimony of which invention I have hereunto set my hand at New York, N. Y., this 12th day of September, 1898.

FRANCIS J. AREND.

Witnesses:
FRANK PORIE,
R. H. HEEP.