

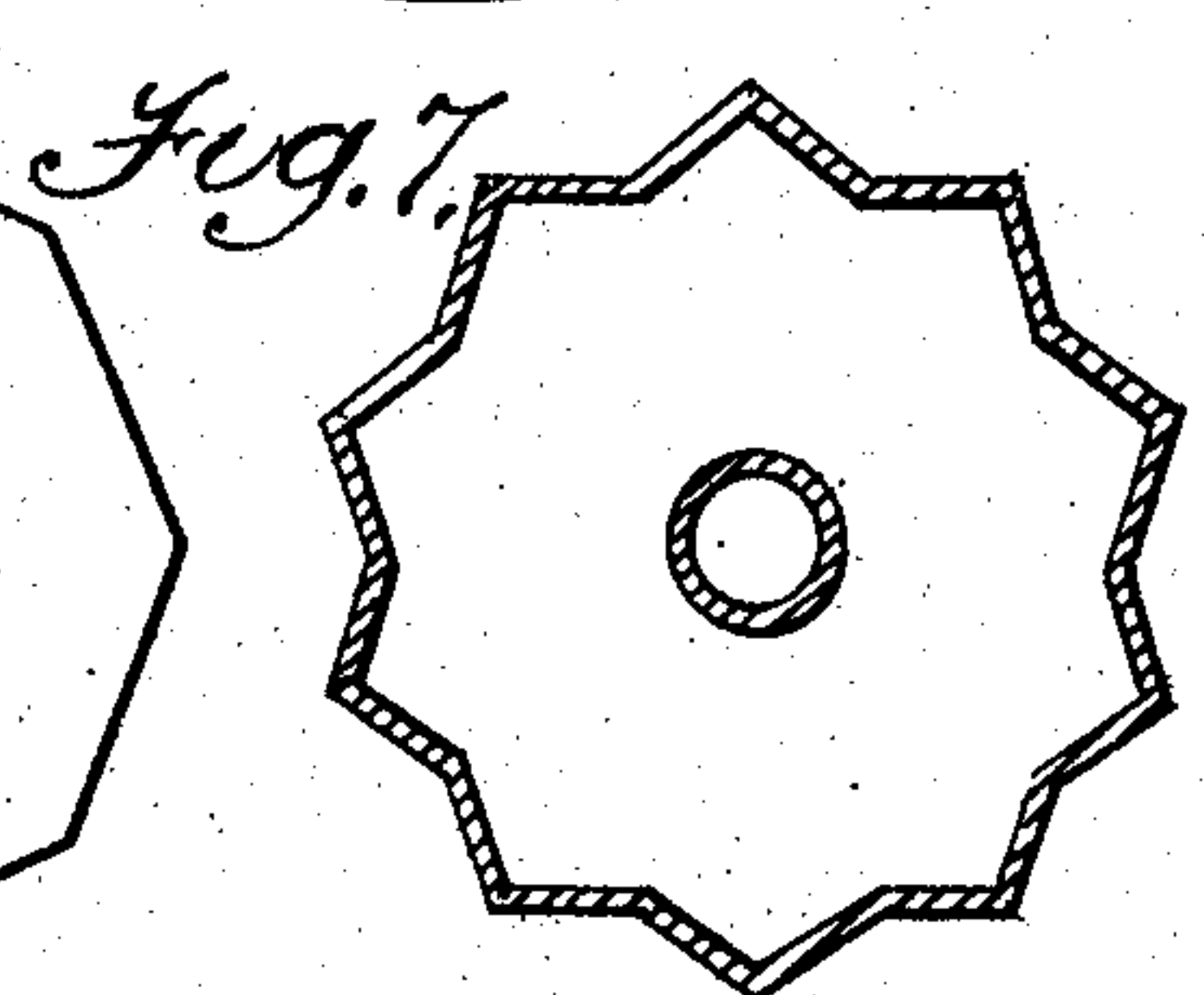
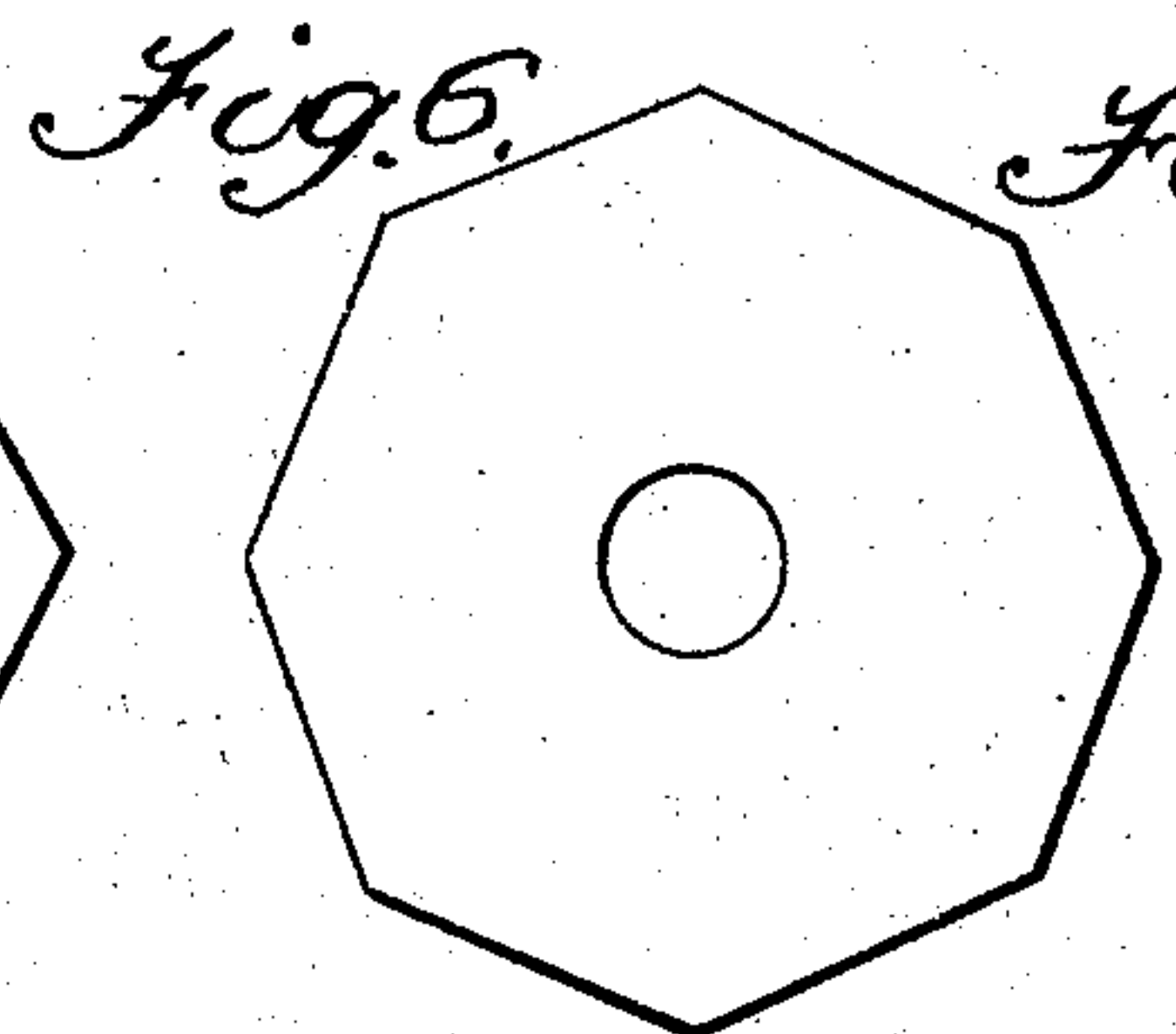
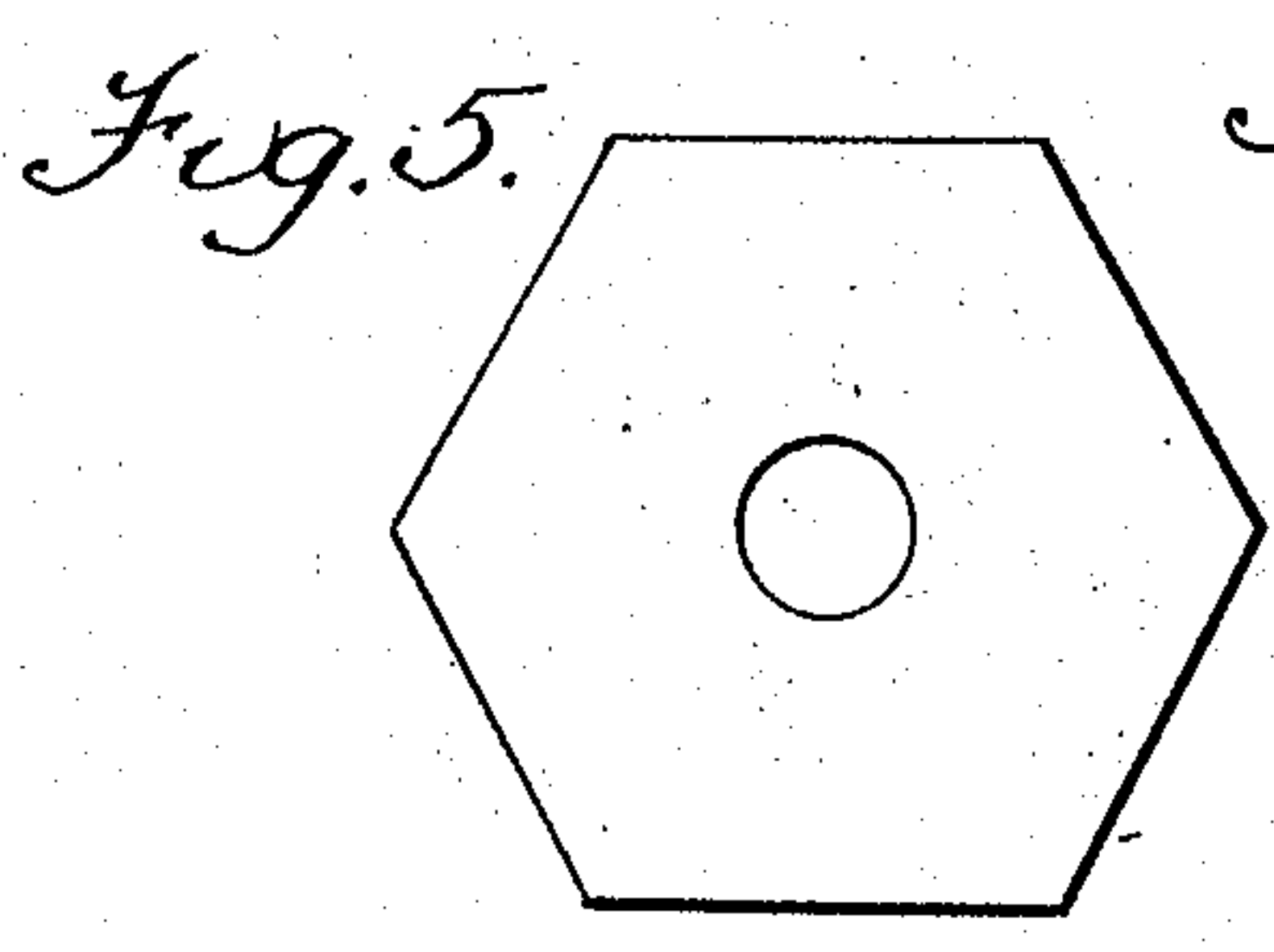
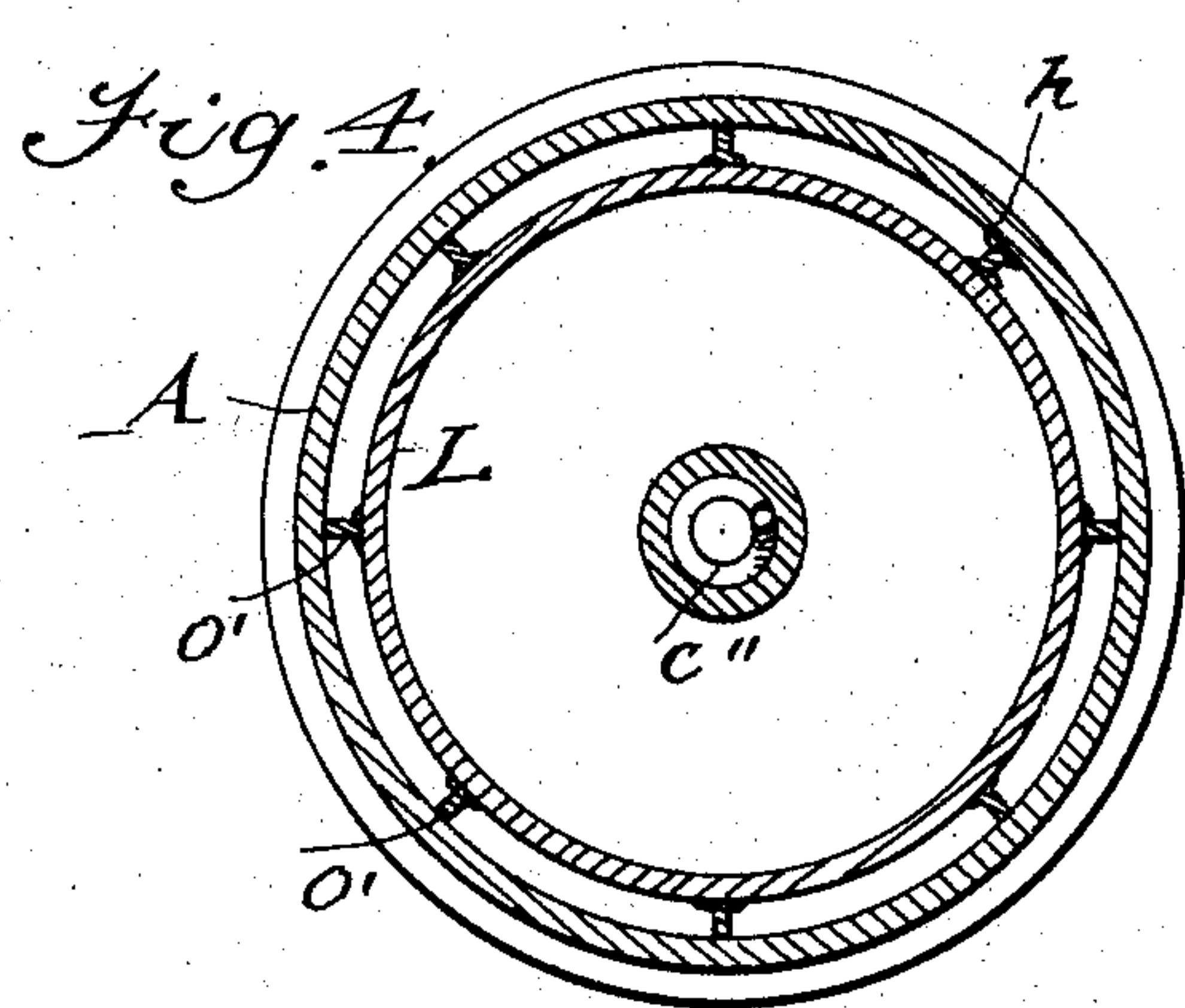
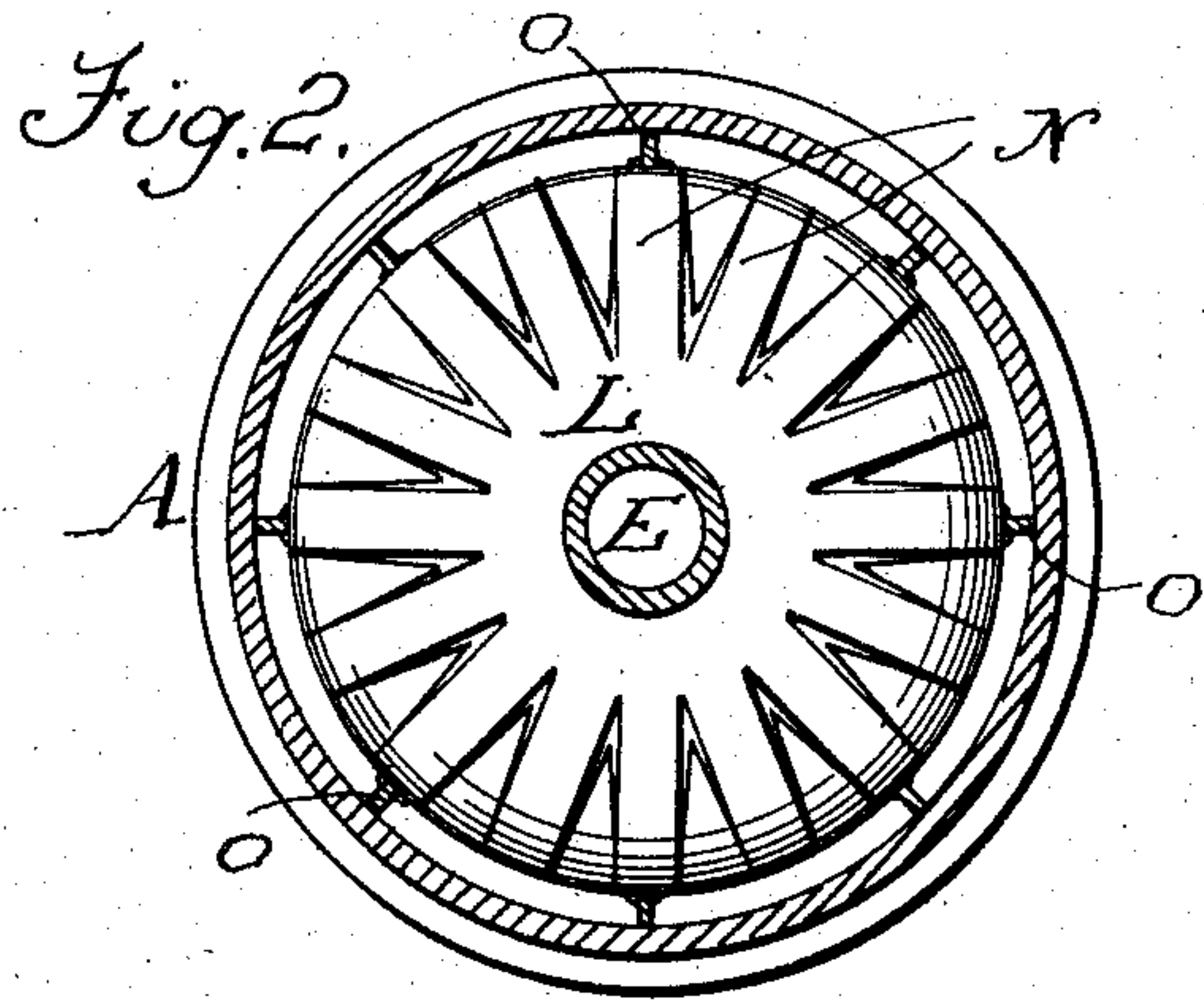
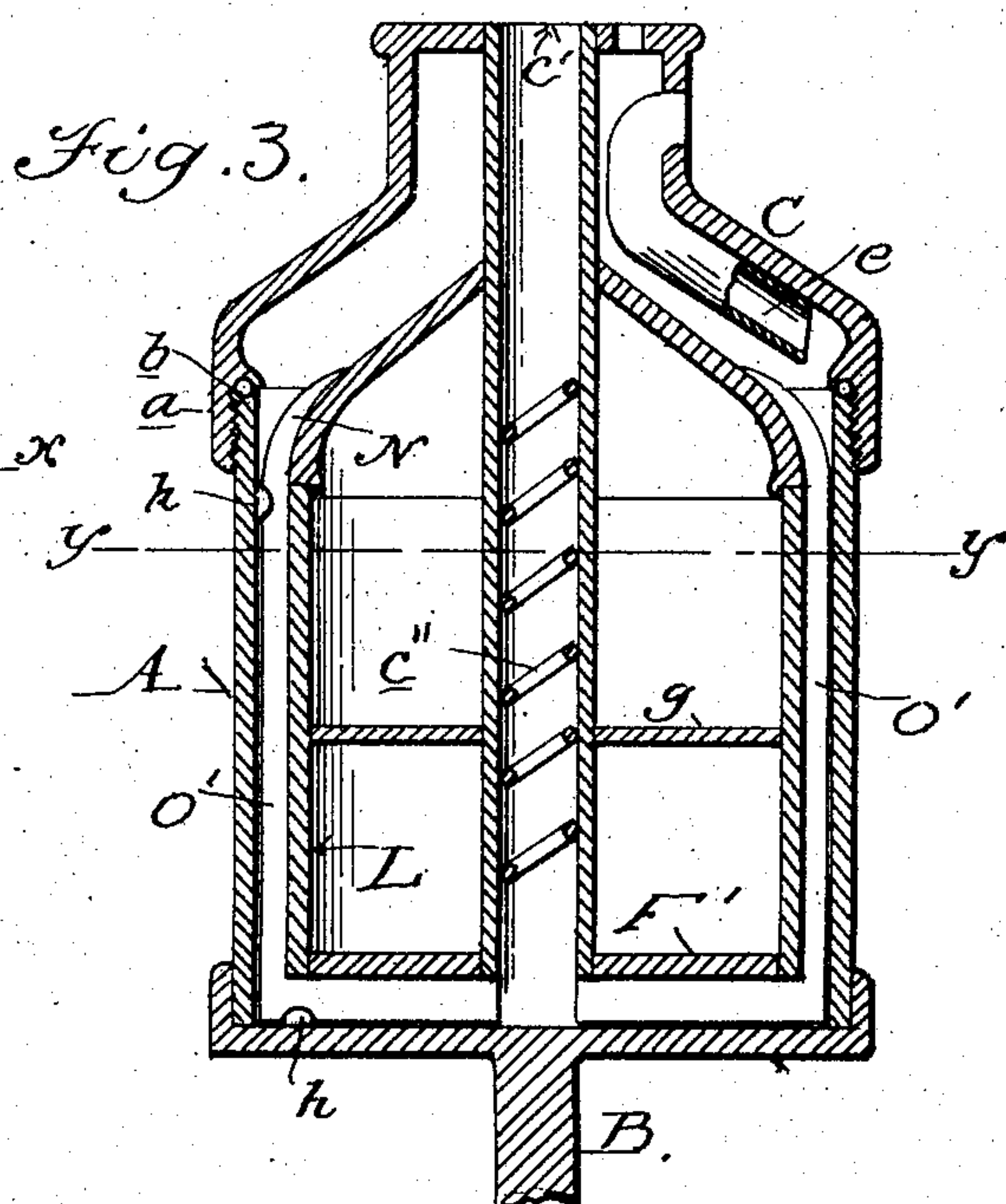
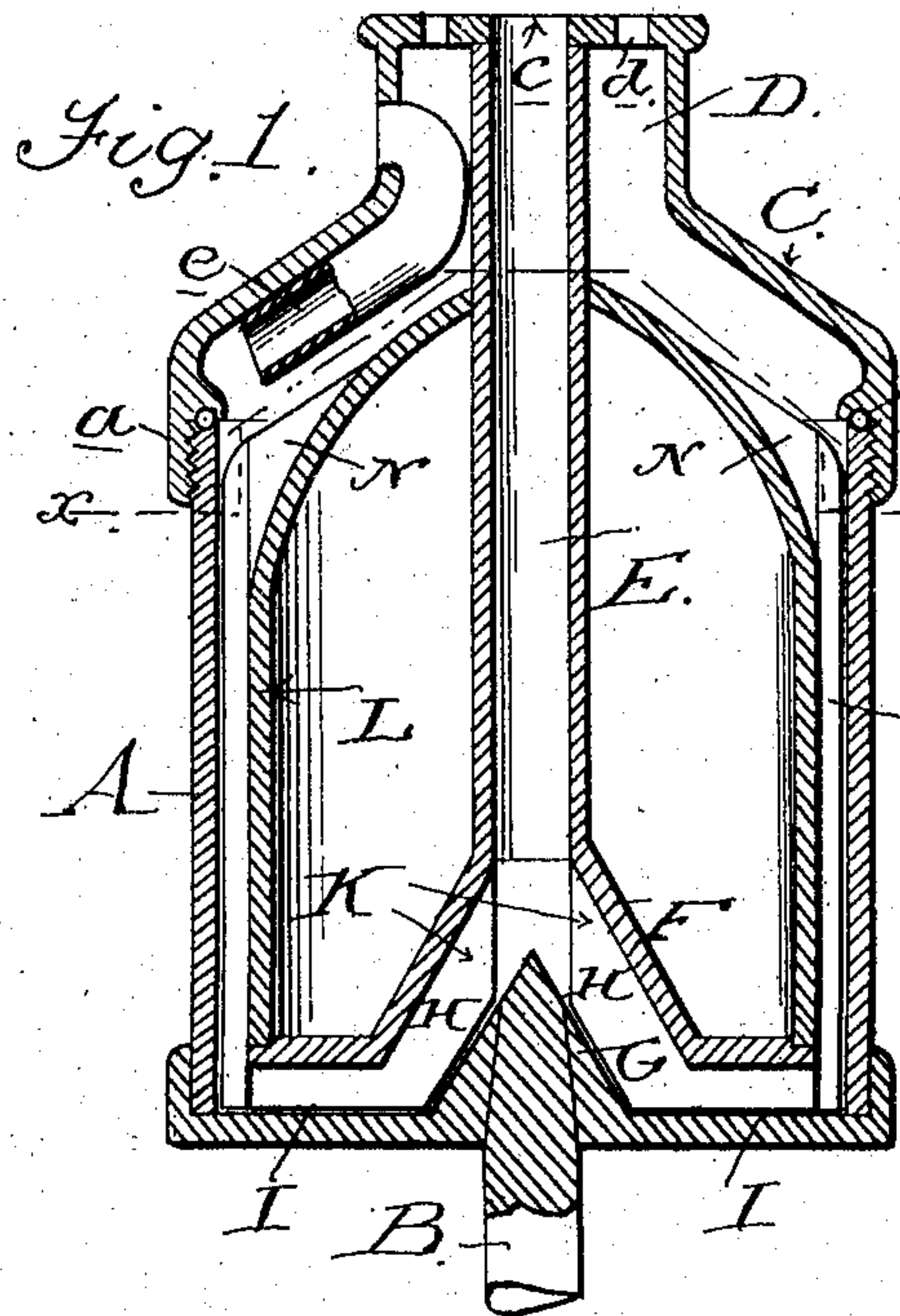
No. 780,444.

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C. J. PIHL.

CENTRIFUGAL SEPARATOR.

APPLICATION FILED JULY 8, 1901. RENEWED JUNE 23, 1904.



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CENTRIFUGAL SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 780,444, dated January 17, 1905.

Application filed July 8, 1901. Renewed June 23, 1904. Serial No. 213,821.

To all whom it may concern:

Be it known that I, CARL J. PIHL, a citizen of the United States, residing at Cambridgeport, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Centrifugal Separators, of which the following is a specification.

My invention relates to certain new and useful improvements in that class of devices commonly known as "centrifugal" separators for separating liquids by centrifugal action; and my invention consists of the parts and the constructions and combinations of parts which I will hereinafter fully describe and claim.

In the accompanying drawings, in which similar letters of reference indicate corresponding parts, Figure 1 is a vertical sectional view of a centrifugal separator embodying my invention. Fig. 2 is a horizontal sectional view of the same on the line xx of Fig. 1. Fig. 3 is a view similar to Fig. 1 and showing a centrifugal of modified construction. Fig. 4 is a horizontal sectional view of Fig. 3 on the line yy . Figs. 5, 6, and 7 show modified forms of the inner vessel.

In the said drawings Figs. 1 and 2 the cylindrical bowl A is of the usual or any well-known and appropriate construction. It is supported upon a vertical shaft B, which is to be rotated at high speed by any of the methods usually employed for the purpose or by any mechanism which will give to the bowl the highly-rapid motion necessary to effect the separation of liquids in these centrifugal machines. Surmounting the bowl is the cover C, which, as shown, has a cone shape, with a flange a depending from and surrounding its lower edge and internally threaded to engage a threaded portion on the upper edge of the bowl. The cover also has a packing at b to insure a tight joint between said cover and bowl. The cover is also formed with the usual contracted neck D, which is centrally pierced to form a liquid-passage c , communicating with a feed tube or passage E, leading to a point near the bottom of the bowl. Into the feed-passage c the liquid—say whole or

fresh milk—is poured, after which the milk flows down the passage E and into the bottom of the bowl. The aforesaid neck is also formed or provided with an exit or passage d in its top near the central vertical line of the bowl, through which the separated cream is discharged, and a passage or tube e for the blue or skim milk, the last-named passage being arranged in a well-known manner—namely, lying parallel with and close to the inner inclined wall of the conical portion of the cover—having its inlet end near the top of the vertical wall of the bowl and its outlet end discharging laterally through the neck portion of the cover.

The feed-tube E lies vertically at the axis of the bowl and extends downward from the feed-inlet to a point near the bottom of the bowl, where it is connected to or formed with a cone-shaped plate F, having a horizontal flange bounding its outer edge, and the bottom of the bowl is formed with a centrally-disposed cone G, entering the cone-shaped plate F, but separated from the latter to form the downwardly-diverging passages H, from which lateral branches I lead horizontally outwardly toward the inner sides of the bowl, whereby the whole or fresh milk is delivered from the feed-tube to said bowl in horizontal planes. On the bottom of the cone-shaped plate F are formed or secured wings K, which operate in the divergent passages H and the horizontal branches I thereof and tend to throw the fresh milk outwardly into the bowl by the centrifugal force exerted by the machine. The outer edge of the cone-shaped plate F is fixed to the lower edge or bottom of a drum L, whose walls and entire surface are imperforate and whose upper end is cone-shaped, the outer walls of this latter portion being inclined or convex and connecting the vertical walls of the drum with the outer walls of the feed-tube, and the walls of this upper cone portion of the drum are separated from the walls of the cover to form the upper separating-passage. The vertical outer walls of the drum are parallel with and relatively close to the wall of the bowl, whereby a narrow ver-

tical passage is formed between the solid imperforate walls of the bowl and drum through which the milk will flow in a comparatively thin sheet or layer, and as the separation of the cream from the blue milk occurs the cream follows the wall of the drum and the blue milk follows the wall of the bowl, the separated products working upwardly in this position and the cream being delivered through the cream-outlet *d* and the blue milk being delivered through the tube or passage *e*, placed to receive it. It will also be observed that the cone-shaped upper portion of the drum is provided with radial wings *N*, the spaces between which are V-shaped in horizontal section and which in vertical section increase in depth from the lower points near the junction of the convex walls with the vertical walls of the bowl to the central portion of said wings and then decrease in depth from this central point toward the feed-tube. The periphery of the drum is also provided with radial wings *O*, which are parallel with the walls of the bowl and drum and whose outer edges operate against or close to the walls of the bowl. It will thus be apparent that the whole or fresh milk will be delivered through the feed-tube and will be discharged into the bottom of the bowl and will thence be caused to flow upwardly in a narrow stream or thin sheet between the solid or imperforate walls of the drum and bowl and be discharged as separated products, the cream emerging through one outlet and the blue milk through another outlet.

In Fig. 3 the construction is like what is shown in Fig. 1, except that the disk *F'* on the lower end of the feed-tube is a plain flat disk instead of being cone-shaped, and the upper ends of the radial wings *O'* have their outer edges curving toward and merging into the convex walls of the top of the drum. The feed-tube *E'* in Fig. 3 is also shown as having a wire *e''* spirally wrapped about its interior to form a spiral passage which facilitates the inflow of fresh milk.

In Figs. 1 to 4 the drums are shown as hollow, and to strengthen them I may use the internal diaphragms *g*, as shown in Fig. 3, and to assist in holding the wings on the drum in proper relative position I may also use lugs *h* on the bowl fitting the wings. I do not, however, limit my invention to hollow drums, as solid drums may be used, if desired, and such solid drums may be of any desired form in cross-section. They may be hexagonal, as in Fig. 5, octagonal, as in Fig. 6, or polygonal, as in Fig. 7, or otherwise shaped in cross-section; but in any event their walls are imperforate, and the liquid flows in a thin sheet between said walls and the wall of the bowl. In either instance the liquid will start in its upward course from the bottom of the bowl,

and the cream will follow the imperforate wall of the drum in a straight upward direction without penetrating other surfaces or describing a circuitous course and will be held by this wall and delivered upwardly in a thin sheet separated from the lamina of blue milk and be finally discharged separated from the blue milk.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a centrifugal separator the combination of a rotatable bowl, an imperforate wall proximate to the inner wall of the bowl and separated therefrom to form a narrow uninterrupted vertical passage in the field of greatest centrifugal force, through which passage the liquid flows in a thin sheet-like form whereby the particles are required to travel but a short radial distance in separating, a feed-inlet, and separate outlets for separated constituents.

2. In a centrifugal separator, the combination of a rotatable bowl, an inner wall proximate to the wall of the bowl and separated therefrom to form a narrow uninterrupted vertical passage in the field of greatest centrifugal force, through which passage the liquid flows in an uninterrupted stream of slight radial depth whereby the particles are required to travel but a short distance horizontally to separate, a central feed-inlet, vertical wings between the separating-walls, and separate outlets for separated constituents.

3. In a centrifugal liquid-separator, the combination of a bowl, an inner body having imperforate walls and having radial wings between it and the wall of the bowl, and separated from the latter to form a narrow passage through which the liquid flows in a thin sheet-like form, a feed-tube passing centrally through said body, wings between the bottom of the said body and the bottom wall of the bowl, and separate outlets for the separated liquids.

4. In a centrifugal liquid-separator the combination of a bowl, an inner body having imperforate walls and vertically-extending radial wings, said body having its outer wall separated from the inner wall of the bowl to form a narrow vertical passage through which the liquid is caused to flow in a thin sheet-like form, wings beneath the body, a central feed-tube discharging beneath the body, and separate outlets for the separated products.

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

CARL J. PIHL.

Witnesses:

WILLIAM AGGE,
LUCIUS A. BROWN.