

(No Model.)

C. D. SHEPARD.
CENTRIFUGAL LIQUID SEPARATOR.

No. 427,804.

Patented May 13, 1890.

Fig. 1.

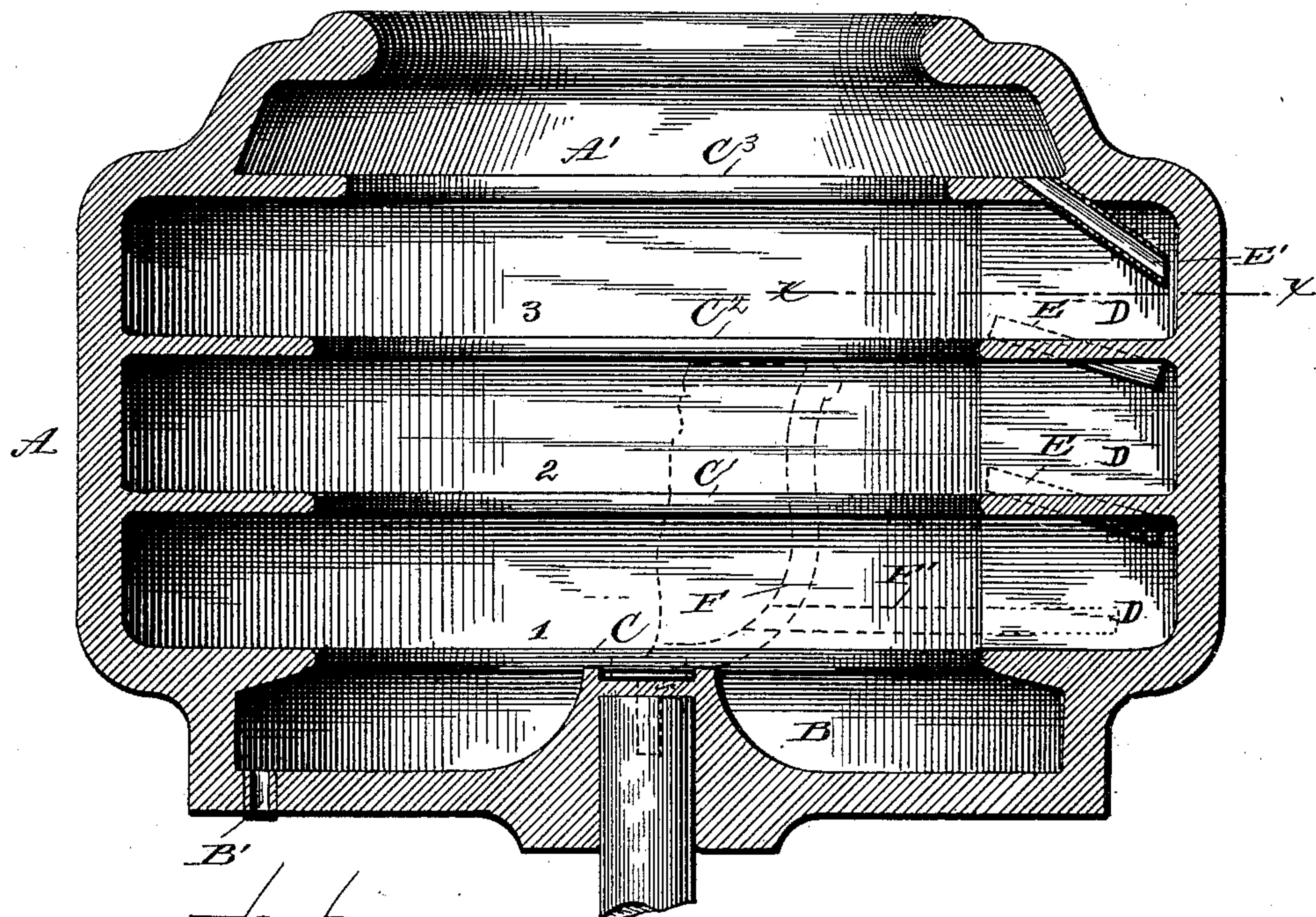


Fig. 2.

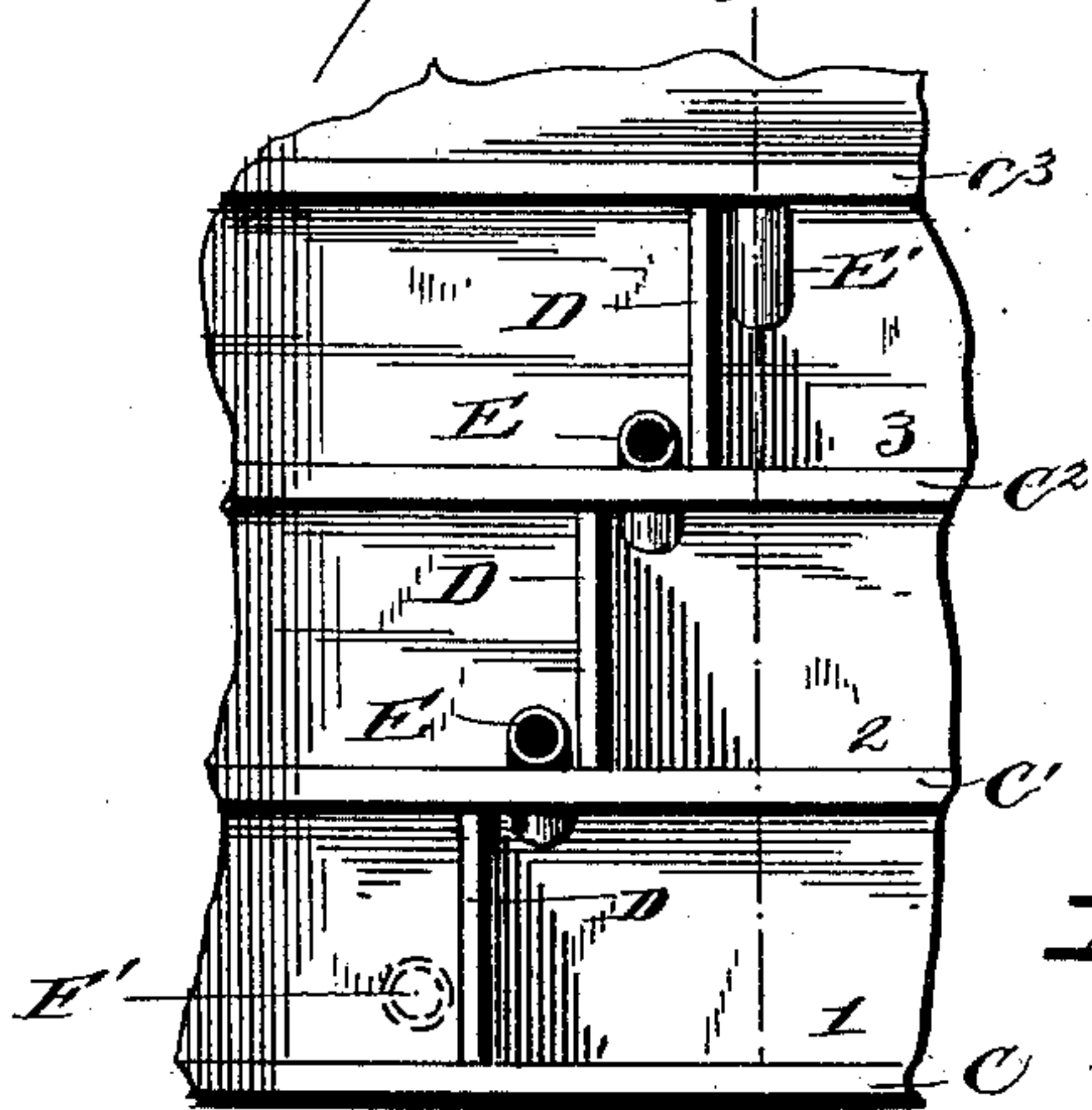


Fig. 3.

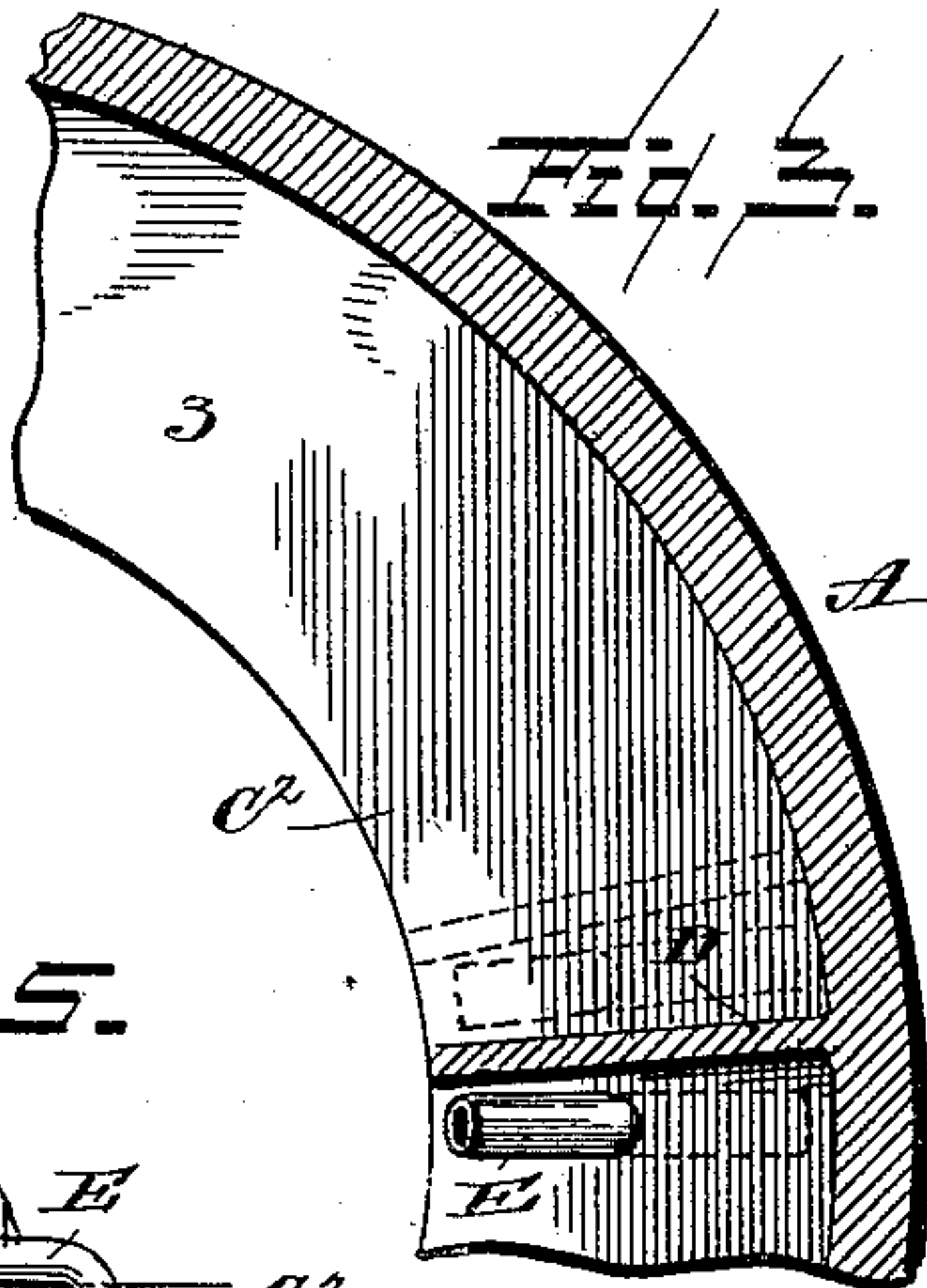


Fig. 4.

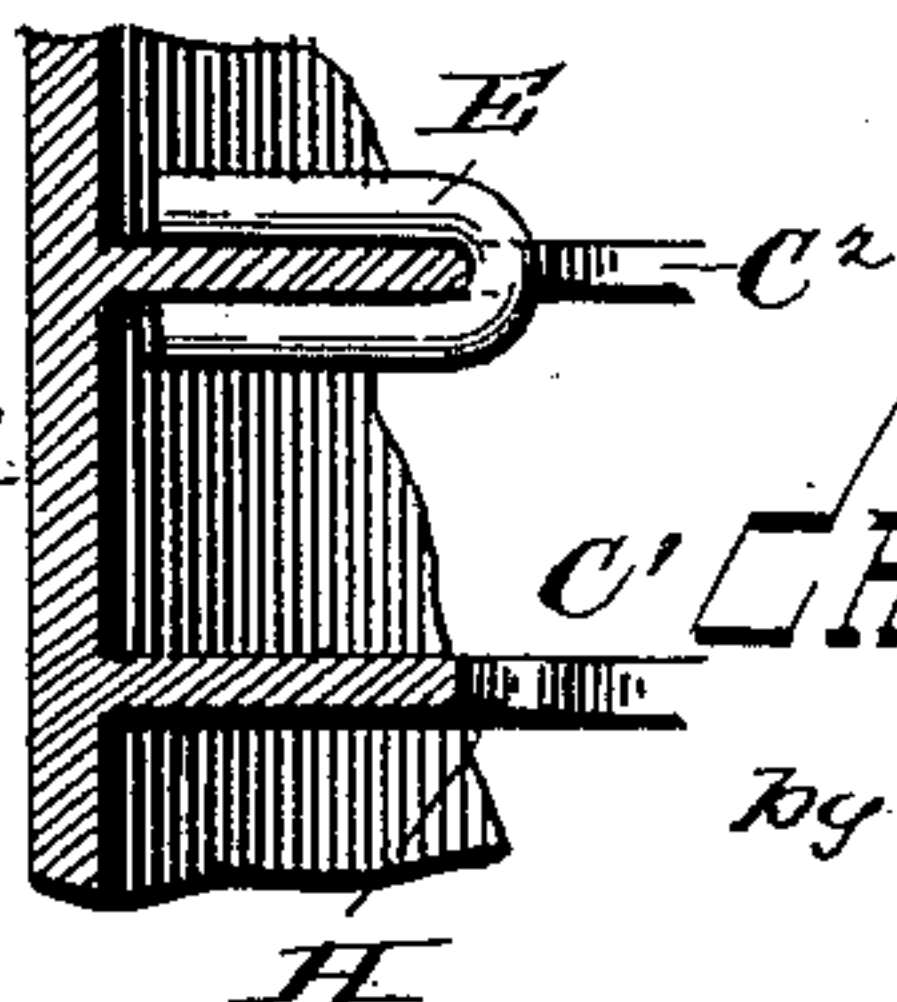
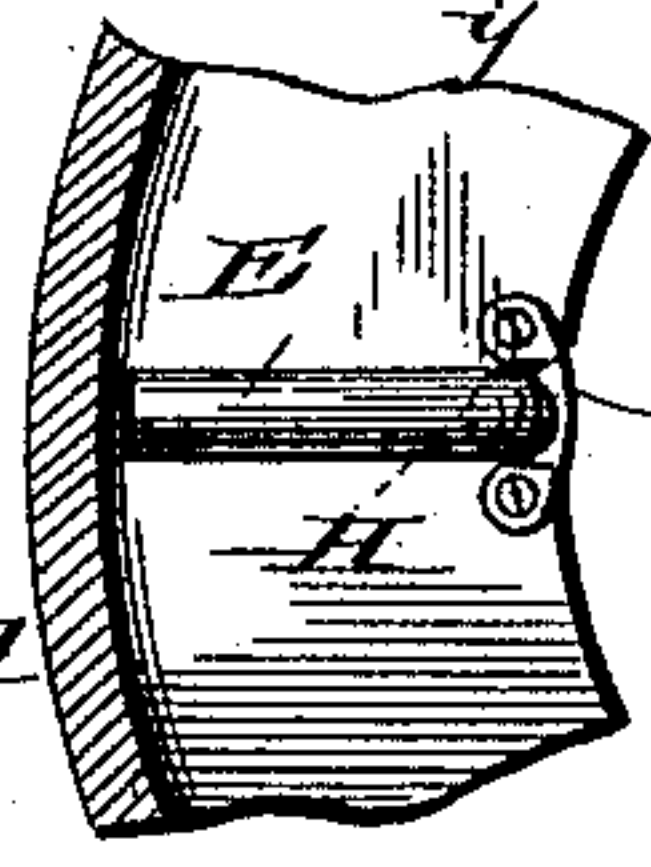


Fig. 5.



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UNITED STATES PATENT OFFICE.

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CENTRIFUGAL LIQUID-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 427,804, dated May 13, 1890.

Application filed October 5, 1887. Serial No. 251,542. (No model.)

To all whom it may concern:

Be it known that I, CHARLES D. SHEPARD, a citizen of the United States, residing at New York, in the county of New York and State
5 of New York, have invented certain new and useful Improvements in Centrifugal Liquid-Separators, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention has relation to centrifugal liquid-separators, which, although hereinafter described in connection with separating cream from milk, are adapted and intended for use for the purpose of separating any liquid into
15 its constituent elements by the action of centrifugal force generated by revolving the bowl of the machine, whereby the lighter of the two constituents is separated from the heavier and naturally assumes an annular body inside of
20 the heavier constituent and nearer the center of the bowl than the latter.

My invention relates more particularly to an arrangement of annular shelves, vertical blades, and conductors, whereby the contin-
25 uous circulation of the liquid from one compartment to another of the bowl and a desired partial obstruction to said circulation are secured, so that the liquid received in one compartment is subjected to centrifugal force
30 during a greater or less number of revolutions of the bowl, and this before the passage of the liquid from one compartment to another. By such an operation each compartment is in and of itself a separating-bowl.

35 I do not, however, broadly claim in this application any device or arrangement of devices in the bowl of a separating-machine for producing the results mentioned, as I have in Letters Patent No. 390,711, granted to me Oc-
40 tober 9, 1888, shown, described, and claimed another construction for the same purpose.

Referring to the drawings, Figure 1 is a central vertical section (on the line Y of Fig. 2) of a bowl for a centrifugal machine embody-
45 ing my invention. Fig. 2 is an elevation of the inner portion of the bowl at which the pipes and blades are arranged. Fig. 3 is a horizontal section of said portion of the bowl,

taken on the line *x* of Fig. 1. Fig. 4 is a horizontal section, and Fig. 5 is a vertical section, 50 of a modification in the form of pipe employed.

Like letters refer to like parts in all the figures.

As my invention relates more particularly 55 to an arrangement of shelves, blades, and circulation-pipes in the separating-bowl, it is apparent that it is entirely independent of any particular means or devices for supplying liquid to the bowl or for delivering the 60 separated constituents thereof from the bowl. I have, however, for the simple purpose of illustrating a completely-operative bowl, shown certain means for the purposes just mentioned, but may substitute therefor any well- 65 known means or form of construction.

A represents the bowl, provided in this instance with an upper annular chamber A', which is free from any obstruction to the operation of any well-known conductor for dis- 70 charging liquid therefrom.

B represents a depending neck formed at the bottom portion of the bowl and provided with an outlet B', for the discharge in this instance of a lighter constituent of the liquid 75 being separated.

C C' C² C³ represent annular shelves or their equivalents formed in the bowl. The lower shelf C, in a bowl not having the depending neck B, constitutes or serves as the 80 bottom of the bowl, in which case it would extend completely across the bowl, instead of having an opening within said neck, as shown in Fig. 1. The several shelves form in this instance compartments 1, 2, and 3, and in 85 each compartment there is a vertical blade D, extending from shelf to shelf and from the front edge thereof to the inner periphery of the bowl, so that each of the blades forms a positive obstruction to the passage of the liq- 90 uid completely around the compartment. The blades D are arranged in steps, so that one is above and at the right of the other.

E E E' represent pipes extending radially and in an inclined manner through the 95 shelves C', C², and C³, the first two terminat-

ing at one end near the periphery of the bowl and at the other near the inner edge of and above the shelf, while the pipe E' extends from about the middle of the compartment 3 and near the periphery of the bowl through the shelf C³, and does not extend so far inward as does each pipe E.

F represents by dotted lines the central position occupied by any well-known form of feed-bowl, which is provided with a feed-pipe F', extending radially between the shelves C C' and terminating near the inner periphery of the bowl.

It is apparent that as the liquid is fed into compartment 1, the pipe F' delivering it at one side of the blade D, said liquid will pass around the bowl and come into contact with the opposite side of said blade. During such travel the liquid has been subjected to the centrifugal force generated by a greater or less number of revolutions of the bowl, whereby its lighter constituent is caused to advance inwardly beyond the heavier constituent, and the latter passes through the pipe E, and is necessarily conducted upwardly into compartment 2, into which it is delivered at a point near the inner edge of the shelf C'. This delivery into compartment 2 will not be practically accomplished until the annular body of the lighter constituent has been crowded by the incoming liquid to the front at or near the inner edges of the shelves C C', so that the compartment acts as an independent bowl.

Upon the entrance of the liquid into compartment 2 its heavier constituent is thrown by centrifugal force to the periphery of the compartment. The lighter constituent is left, by reason of its natural tendency, to form an annular body inside of the heavier, and when it is advanced to the inner edges of the shelves C' C² the upper compartment 3 is filled in like manner. The heavier constituent, being at or near the periphery, is now conducted by the pipe E' into the chamber A', from which it may be discharged by any suitable well-known conductor. The lighter constituent falls by gravity to the edge of the shelf C and is drawn by centrifugal force into the neck B, from whence it is discharged by gravity through the outlet B'.

Longer time may be consumed by the passage of the liquid from one compartment to another by returning the pipe E to a point near the periphery of the bowl in each compartment. This form of pipe is illustrated in Figs. 4 and 5. It being U-shaped, for the purpose of facilitating the cleansing of the same, it may be removable from the shelf and retained thereon by a staple, clip, or plate G, and in order to prevent projection of the U-pipe beyond the edge of the shelf the latter may be notched at its edge, as shown at H. In this form of pipe the liquid is delivered into each compartment at a point where the centrifugal force is greatest, which is an-

other advantage inherent in the use of U-shaped pipes.

Heretofore centrifugal bowls have been formed with inner annular ribs or shelves and with straight pipes projecting through the same and inclined, so as to act on the Archimedean principle and force or pump the contents of the bowl from one shelf upwardly upon the next adjacent shelf. In my construction the pipes are not inclined so as to perform the above-mentioned function, but are arranged in direct radial lines, so as to bring the contents of one shelf of the bowl directly toward the center and upwardly upon the adjacent shelf, and this against the action of centrifugal force. The passage of the liquid through the pipes is materially obstructed by the centrifugal force, and in effect such obstruction is equal to that of each of the compartments of the bowl formed by the vertical blade arranged between two of the shelves thereof. If such a compartment is considered as a locking-chamber, then each of my pipes is an additional locking-chamber. The practical doubling of the separating capacity of a bowl which is accomplished seems to indicate that each of the pipes arranged as described is in fact an additional locking-chamber.

In the construction mentioned above as having heretofore been employed the pipes leading from one compartment of the bowl to the other were straight, as are those employed by me, but were arranged at an angle to a radial line, so that their receiving ends were in advance of their delivering ends, and so that the liquid was pumped, agitated, and fretted for the purpose of more forcibly separating the cream globules. The intended purpose and result of my construction are entirely different and directly opposite to the intention and result of the construction referred to, in that the purpose is not only to retard the flow of the liquid, but to conduct it directly against the lines of centrifugal force, and this without pumping, churning, or fretting the same. It is well known that forcible agitation of the liquid breaks up and destroys the cream globules, thereby rendering the cream unfit for many purposes.

What I claim is—

1. The combination, with a separating-bowl having an annular shelf dividing the same into compartments, of a U-shaped removable pipe extending from near the wall of the bowl in one compartment around the inner edge of the shelf to near the wall of the bowl in the other compartment, substantially as specified.

2. A bowl for a centrifugal separator provided with a series of imperforate annular shelves and a series of single vertical blades arranged in the steps between the shelves at one side only of the bowl, combined with U-shaped pipes embracing the shelves and

extending from near the wall of the bowl
above each shelf around the inner edge of
the shelf to near the wall of the bowl beneath
the shelf, the bend of the pipe being seated
5 in a notch in the edge of the shelf, and a
staple-clip G engaging the pipe at the bend
thereof, substantially as and for the purpose
specified.

In testimony whereof I affix my signature in
presence of two witnesses.

CHARLES D. SHEPARD.

Witnesses:

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W. S. DUVALL.