

C. E. BALL.
AMALGAMATOR.

No. 253,255.

Patented Feb. 7, 1882.

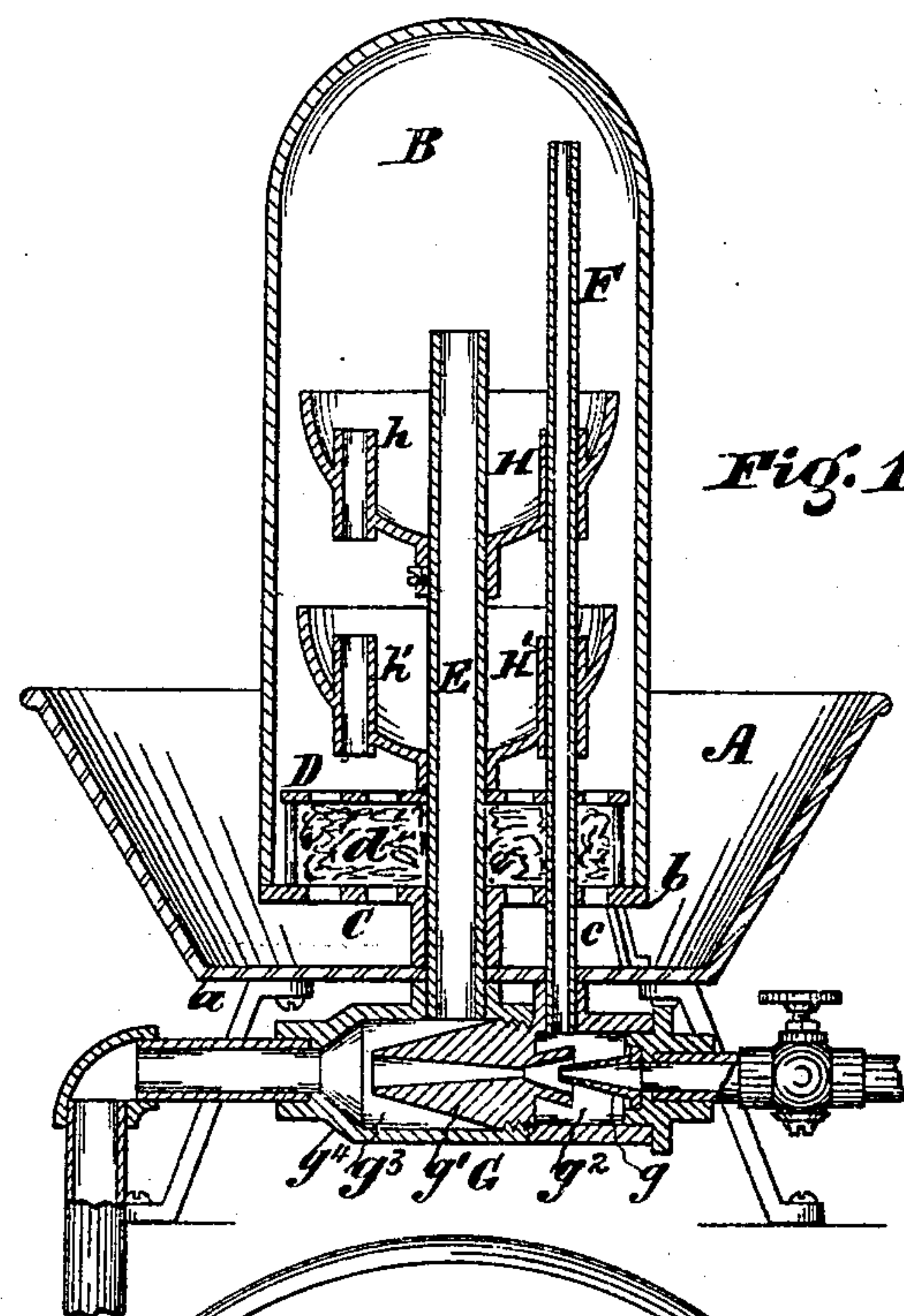


Fig. 1

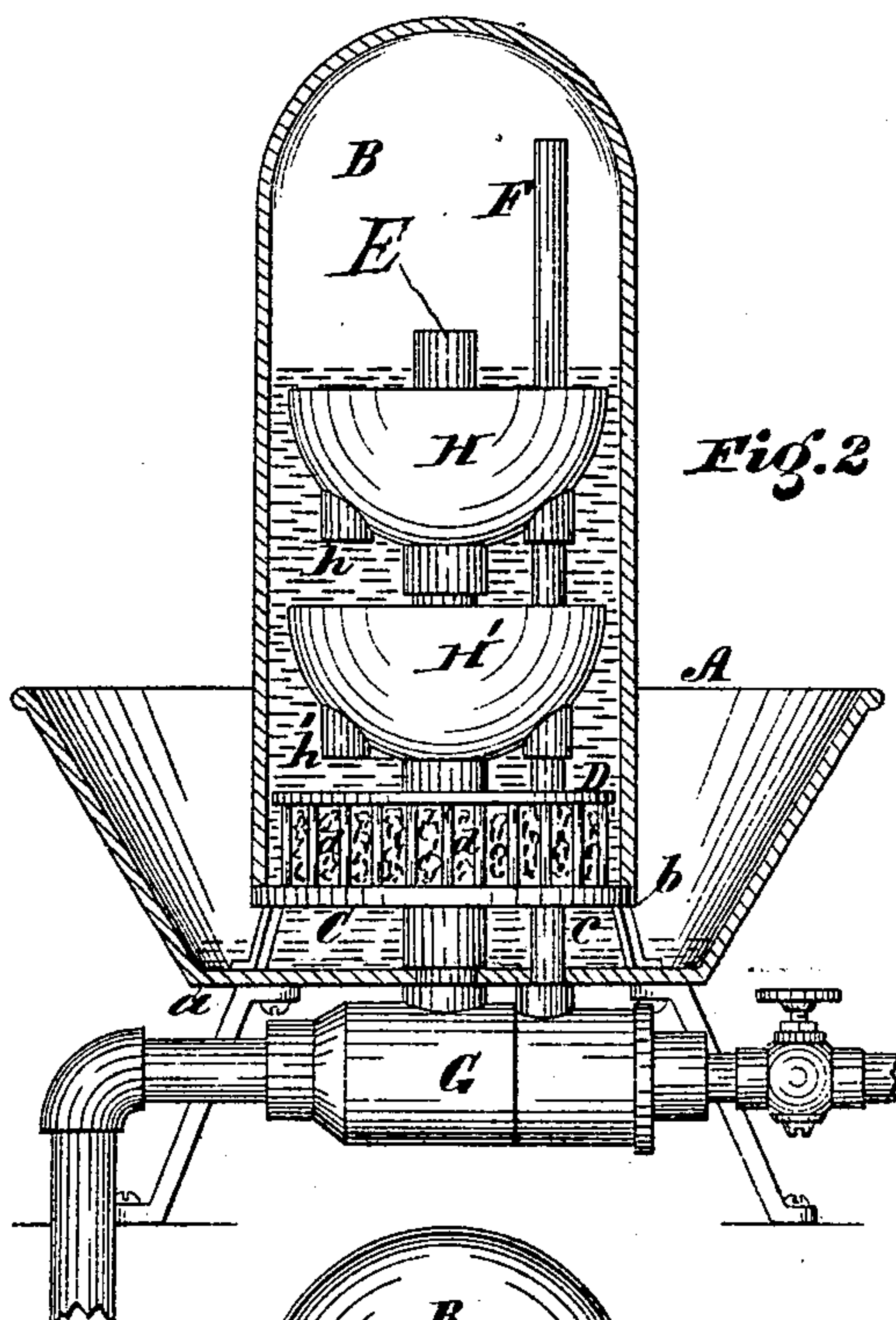


Fig. 2

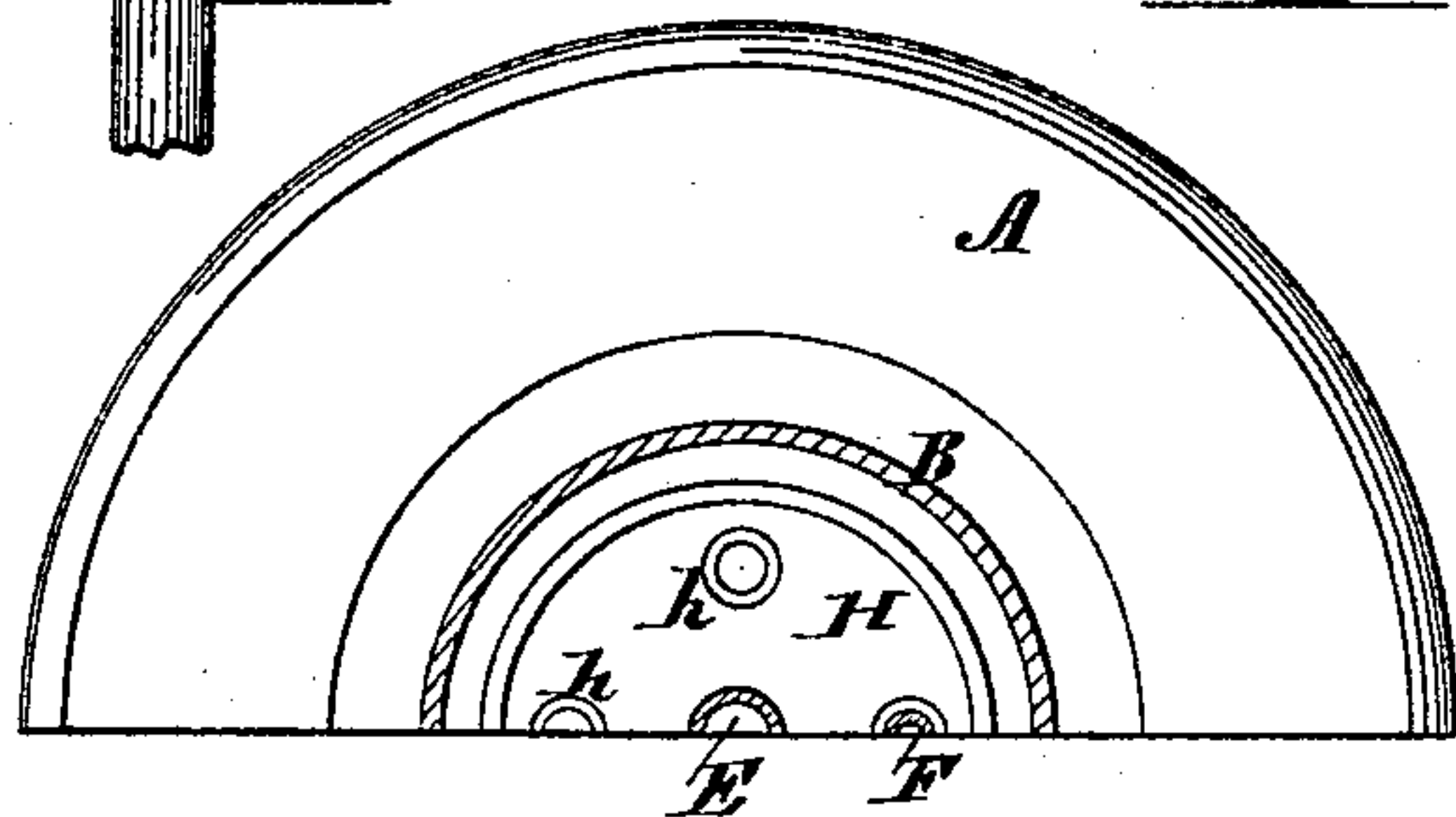


Fig. 3

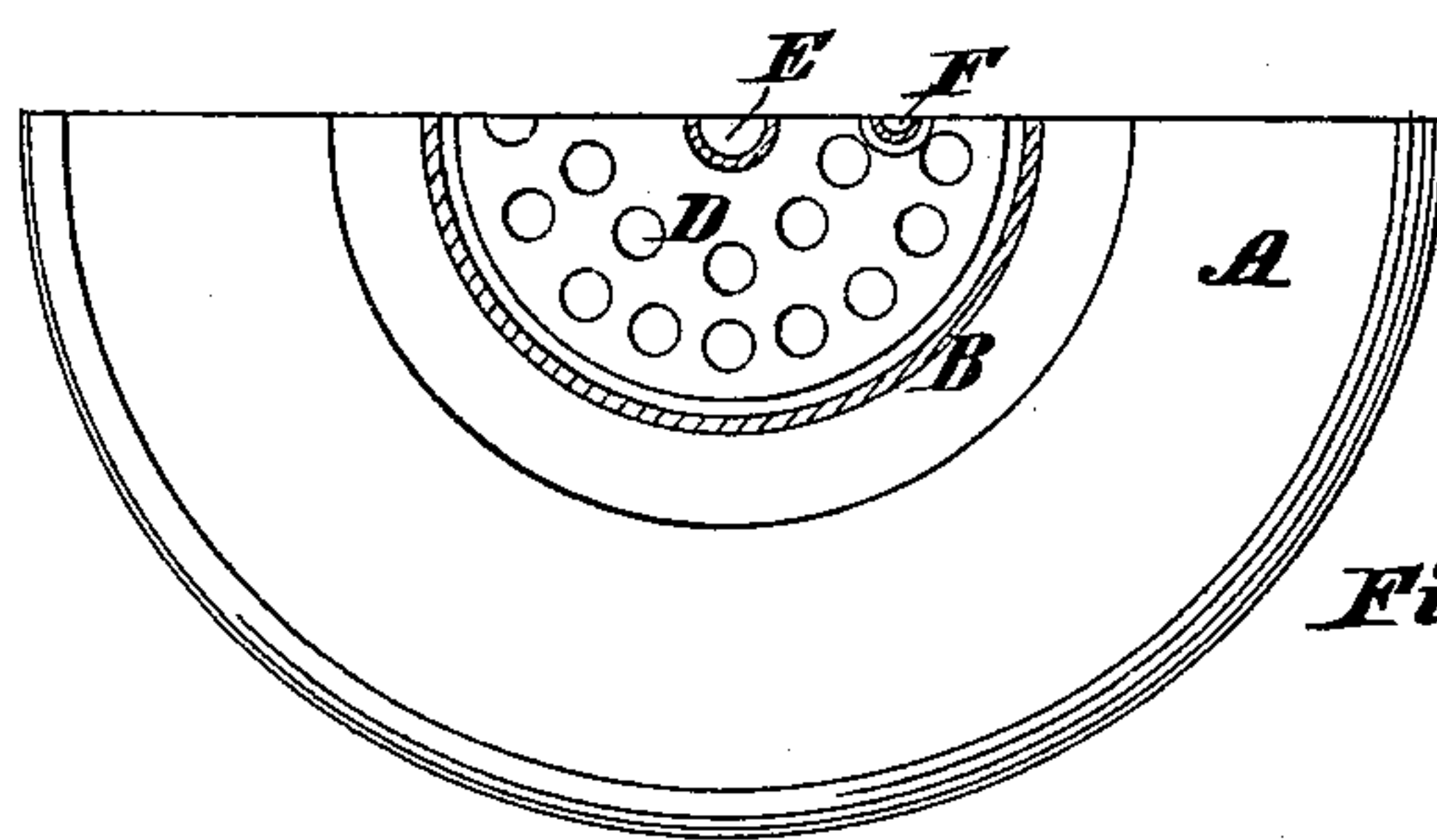


Fig. 4

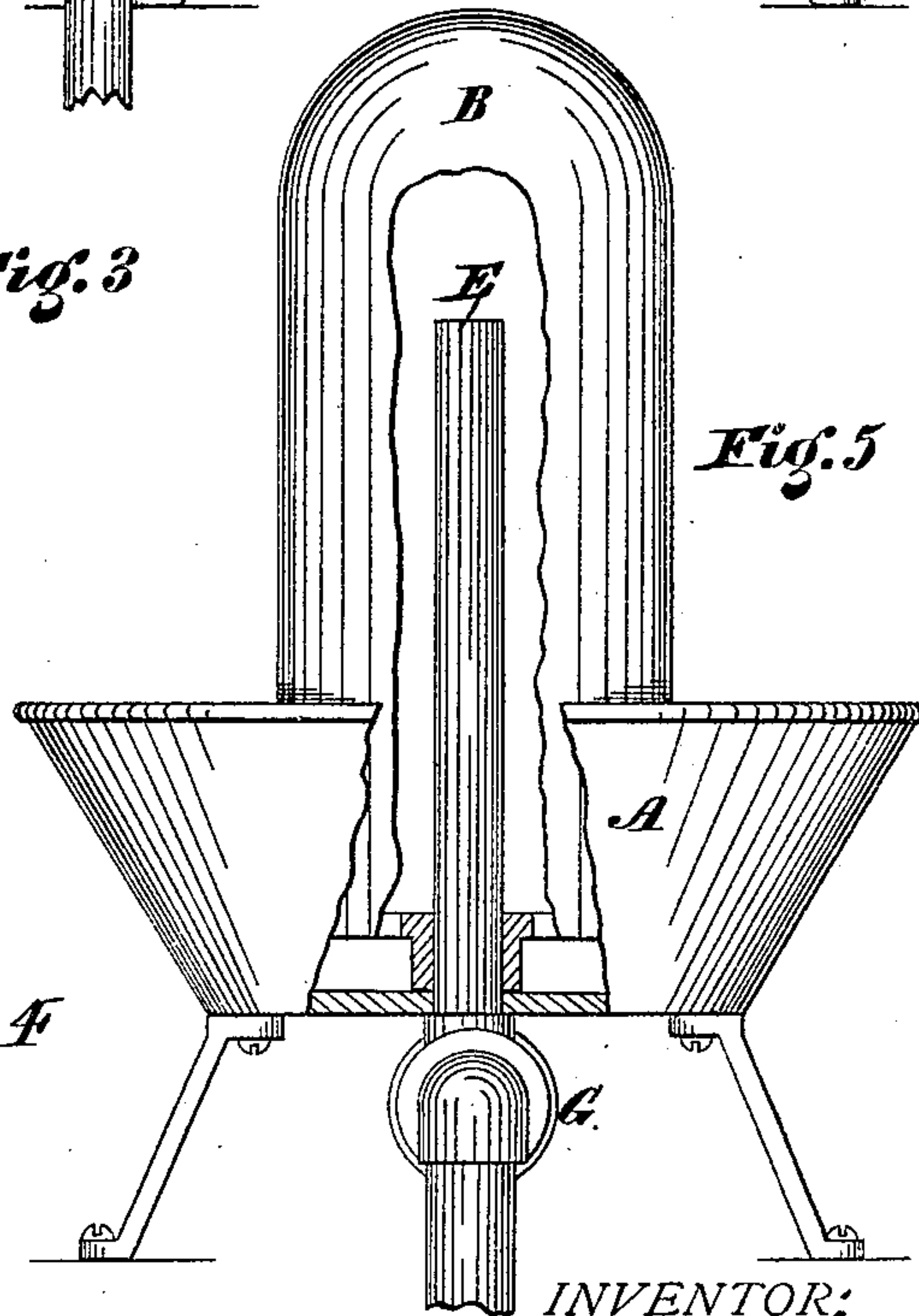


Fig. 5

WITNESSES:

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AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 253,255, dated February 7, 1882.

Application filed December 13, 1879.

To all whom it may concern:

Be it known that I, CHARLES E. BALL, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Amalgamators; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, and in which—

Figure 1 is a vertical section. Fig. 2 is a vertical section of the exterior parts and an elevation of the interior portions of the same. Figs. 3 and 4 are sectional plans, and Fig. 5 is an elevation of a modification of my invention, partly in section.

My invention has relation to that class of amalgamators in which the flow of material through the apparatus is caused by pressure of atmosphere without—that is to say, by the maintenance of a vacuum within the apparatus and above the mercury.

My invention consists in the novel construction, combination, and arrangement of elements as hereinafter described and claimed.

In the annexed drawings, A indicates a hopper, tank, bowl, or other vessel of any suitable form adapted to hold a body of mercury and to act as a receiver or feeding-chamber for ore.

B is a cylinder whose lower end is open, and which rests on a stand, C, or is otherwise suitably so supported above the bottom *a* of the tank A that a clear space, *c*, is left between the edge *b* of said cylinder and said bottom.

Within the cylinder B and preferably at its lower end is a body of fibrous or filamentary packing, *d*, held there by any suitable means.

I prefer to use the material known in the upholstery business as “excelsior,” and to retain it in position by packing it into or using it as a filling for a cage, D, composed of perforated heads (one of which may be the stand C) and uniting-rods.

E represents the discharge-pipe, whose upper or inlet end is above the plane or surface of a body of mercury held suspended by suction or exhaust in the cylinder B. Said pipe E passes through the bottom *a* of the tank A, and communicates with ejector G. F is an-

other pipe, of considerably less diameter than the pipe E, and terminating within the cylinder B some distance above the top of said pipe E.

H H' are cups or annular troughs surrounding the pipe E, and designed to be tightly fitted at their junction therewith. Each of said troughs is formed or provided with several hollow stems, *h h'*, whose upper ends terminate a short distance below the edges of their respective troughs.

The ejector G has a central steam-jet, *g*, and a surrounding nozzle, *g'*, which projects some distance beyond said jet and forms two annular chambers, *g² g³*, one between the jet and the nozzle, the other between the latter and the shell, casing, or body *g⁴*. The pipe E communicates with the outer annular chamber, *g³*, and the pipe F with the inner chamber, *g²*.

The operation is as follows: Mercury is first supplied to the tank A in sufficient quantity so as to fill the cylinder B when lifted thereinto by suction or exhaust to a line some inches below the top of pipe E. The ejector G is now set working and ore in the form of pulp supplied to the tank A. The air within the cylinder B is immediately exhausted through pipe F (or pipes E and F) and the mercury lifted up into said cylinder, a small portion of the mercury in the form of a thin sheet remaining spread upon the bottom *a*. The ore fed into the tank then ascends through the mercury, the precious metals being detained and amalgamated in the passage, while the waste accumulates on the surface of the mercury, and, rising over the top of pipe E, falls into the same, being drawn therethrough by the action of the ejector and by gravity. The pipe F, through the medium of the ejector, serves to constantly maintain a vacuum in the upper portion of the cylinder B, and thereby produces a suspension of the mercury and the passage of the ore through such mercury; but as the capacity of the discharge-pipe E is designed to be great enough to carry off the waste as fast as the ore is fed to the amalgamator, such waste can never rise as high as top of pipe F, can therefore never pass through the same, and will never come into contact with the steam-jet *g* in ejector G. Hence I avoid cutting such jet, as must necessarily oc-

cur where the waste is carried out through the same pipe as is used for exhausting air, or, in other words, where waste is permitted to enter the chamber immediately surrounding the steam-jet. While the mass of mercury in the tank A is lifted by the exhaust into the cylinder B some portion will still remain in said tank, leaving a thin sheet spread over the bottom *a*, which thus serves as an amalgamating-plate. The mercury in the lower part of cylinder B is displaced to a considerable extent by the filling *d*, and compels the ore, in passing upwardly through the same, to be diverted from a straight line, and hence retarded in its ascent, thus affording a longer period for amalgamation to be effected than a direct passage allows. Any other fibrous or filamentary material may be substituted for excelsior; but I prefer the latter, for the reason that when the amalgam is retorted to recover the mercury the excelsior is consumed, hence requiring no cleaning such as would be necessary if a non-combustible substance were employed. The ore in its ascent will pass mostly through the stems *h h'*, so that such amalgam (at least if the ore be gold ore) as is formed above the stems *h h'* will drop into the troughs *H H'*, displacing free or unamalgamated mercury, which latter drips over the edges of said trough and falls toward the lower part of the cylinder, or at least mingles with the surrounding mercury.

The packing, the troughs, and the separate air-pipe may be dispensed with, producing an apparatus of the simpler construction, (shown in Fig. 5;) but I prefer to employ these parts for the advantages derived from them.

While I have spoken of the pipe *F* as the air-exhaust pipe, I do not wish to be understood as even suggesting that no exhaust takes place in pipe *E*. Some exhaust does take place, assisting the descent of the waste through said pipe *E*; but as the pipe *F* communicates directly with the chamber *g²*, into which the steam from jet *g* is directly delivered, there is a superior energy exerted through said pipe *F*. At the same time, as the pipe *E* terminates below the top of pipe *F* and is of sufficient capacity to carry off all waste, the latter can never rise high enough to enter pipe *F*. Hence, too, there will always be a void or vacuum space in the upper portion of cylinder *B*.

I have spoken of the cylinder *B*, but any other appropriate form may be substituted for the cylindrical one shown. I have also specified it as having a closed upper end, the dis-

charge being downwardly and through the bottom of the receiving or feeding tank; but, if desired, the discharge-pipe (which at the same time may be the exhaust-pipe) may pass out of the top of said cylinder and project downwardly into said cylinder below said top. By lower open end to cylinder *B* is meant any construction which will permit the ore and mercury to pass into it from tank *A*. Hence a perforated bottom, or even a tight bottom with openings in the walls and around and above said bottom, would be substantially the same.

I am aware that a siphon has been used in connection with an amalgamating-vessel for the purpose of creating an exhaust in the latter. I do not therefore wish to be understood as claiming broadly the employment of suction or exhaust, nor in apparatus combining with an amalgamating-chamber and a mercury-trough a device to elevate the mercury and cause the ore to travel through the same by such suction. My invention in its broadest sense is limited to the use, in connection with the trough and amalgamating-chamber, of a steam-ejector whereby I am enabled to withdraw the waste through the suction device without in any way interfering with the continuity of the operation.

What I claim as my invention is—

1. In combination with an amalgamating-vessel, *B*, a fibrous or filamentary packing located at the base or mouth of said vessel, substantially as and for the purposes set forth.

2. The combination, in an amalgamator or with an amalgamating-chamber, of a waste-pipe, an exhaust-pipe terminating above said waste-pipe, and an ejector common to both said pipes, and to which both said pipes independently lead, substantially as and for the purpose set forth.

3. In combination with the waste-pipe *E*, exhaust-pipe *F*, and an amalgamating-vessel, *B*, the ejector *G*, having steam-jet *g*, and nozzle *g'*, forming two separate annular chambers, *g²* *g³*, substantially as shown and described.

4. In combination with an amalgamating-vessel, *B*, one or more cups or troughs, *H*, with hollow stems *h*, substantially as and for the purpose set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 12th day of December, 1879.

CHAS. E. BALL.

Witnesses:

SAML. J. VAN STAVOREN,
CHAS. F. VAN HORN.