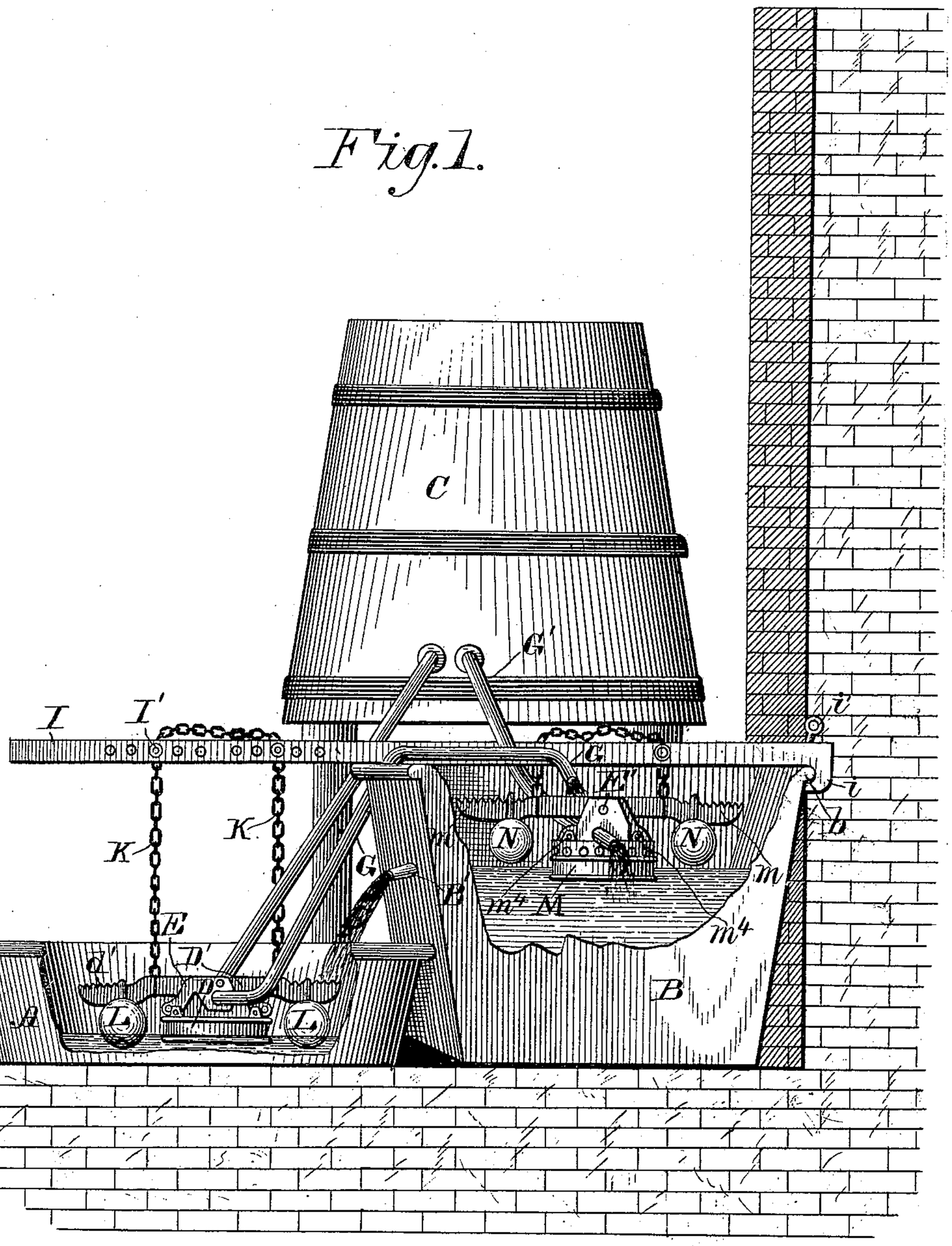
(No Model.) 5 Sheets—Sheet 1.

M. C. BARDEN.

APPARATUS FOR AUTOMATICALLY FEEDING LIQUIDS TO EVAPORATORS.

No. 337,227. Patented Mar. 2, 1886.

Fig. 1.



WITNESSES

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(No Model.) 5 Sheets—Sheet 2.

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APPARATUS FOR AUTOMATICALLY FEEDING LIQUIDS TO EVAPORATORS.

No. 337,227. Patented Mar. 2, 1886.

Fig. 2.

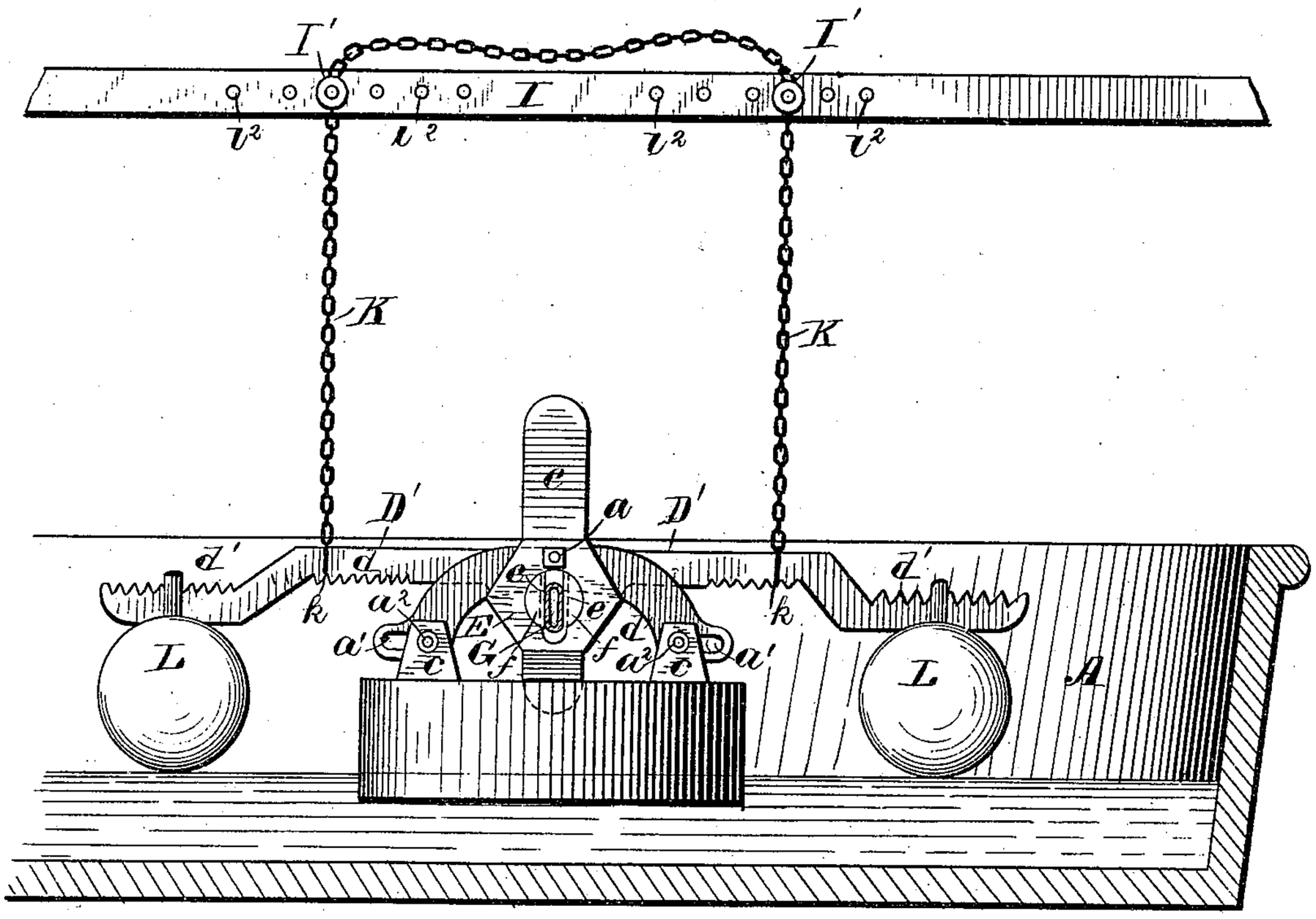
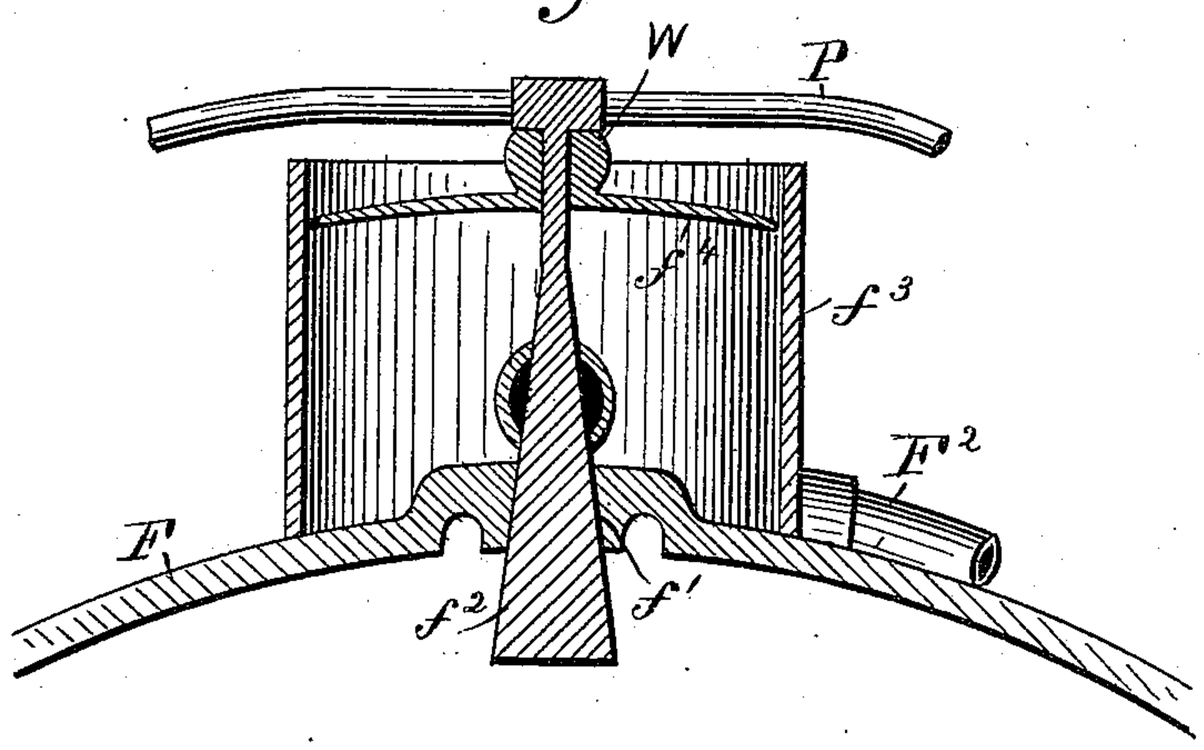


Fig. 7.



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(No Model.) 5 Sheets—Sheet 3.

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APPARATUS FOR AUTOMATICALLY FEEDING LIQUIDS TO EVAPORATORS.

No. 337,227. Patented Mar. 2, 1886.

Fig. 5.

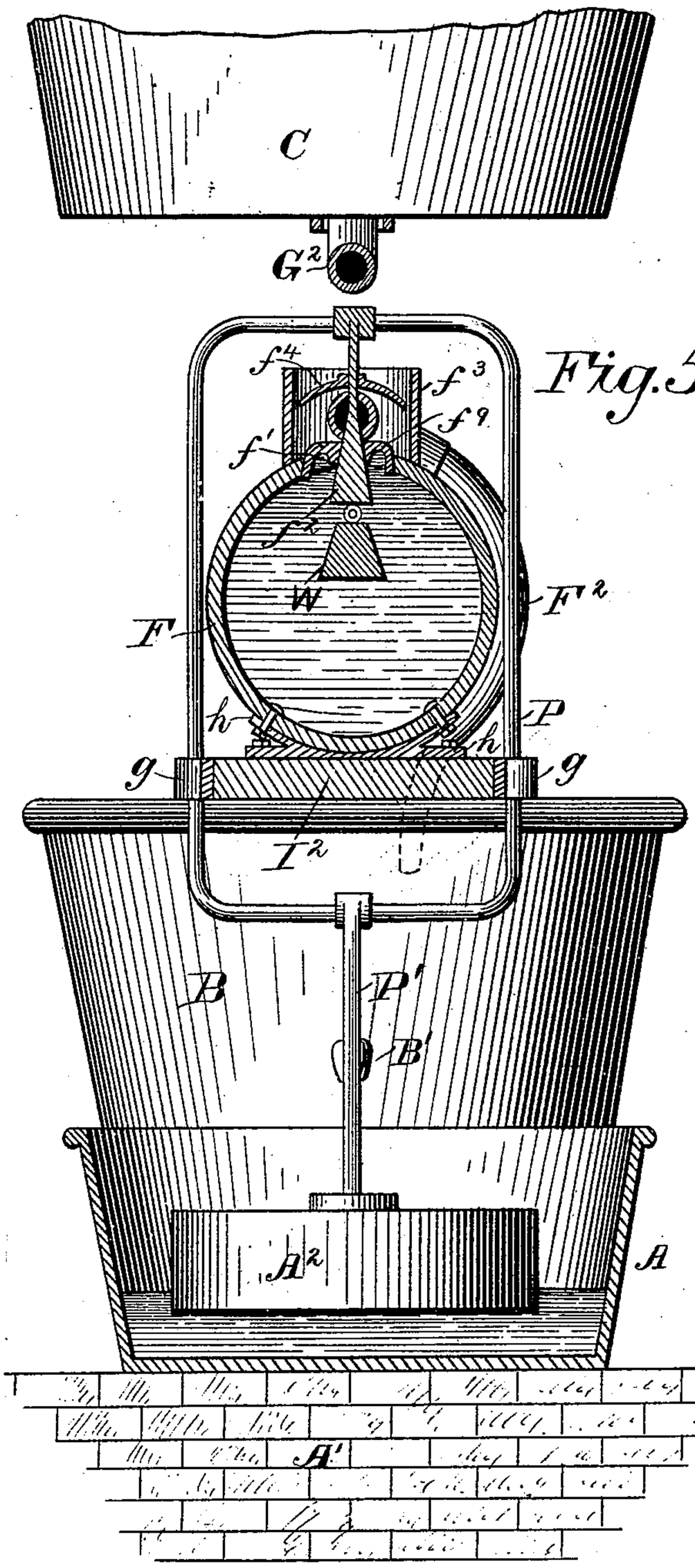


Fig. 6.

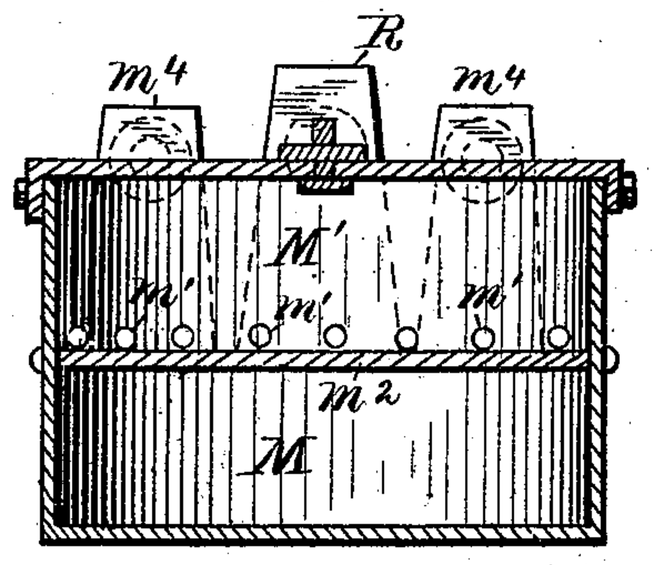
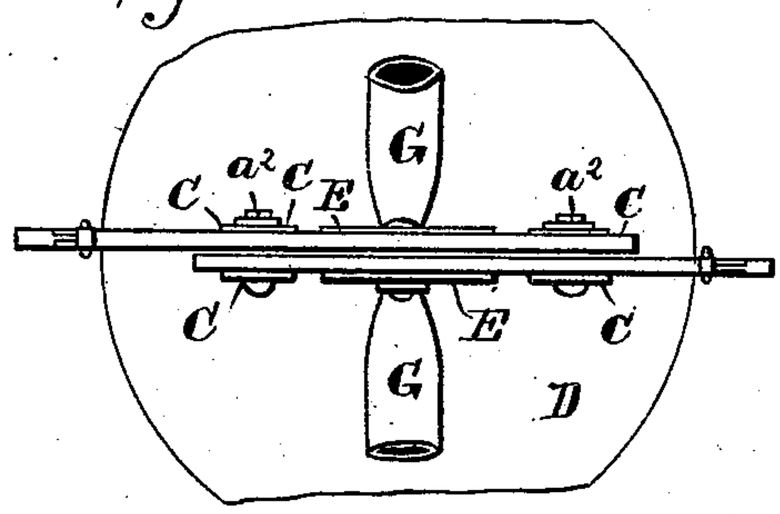


Fig. 3



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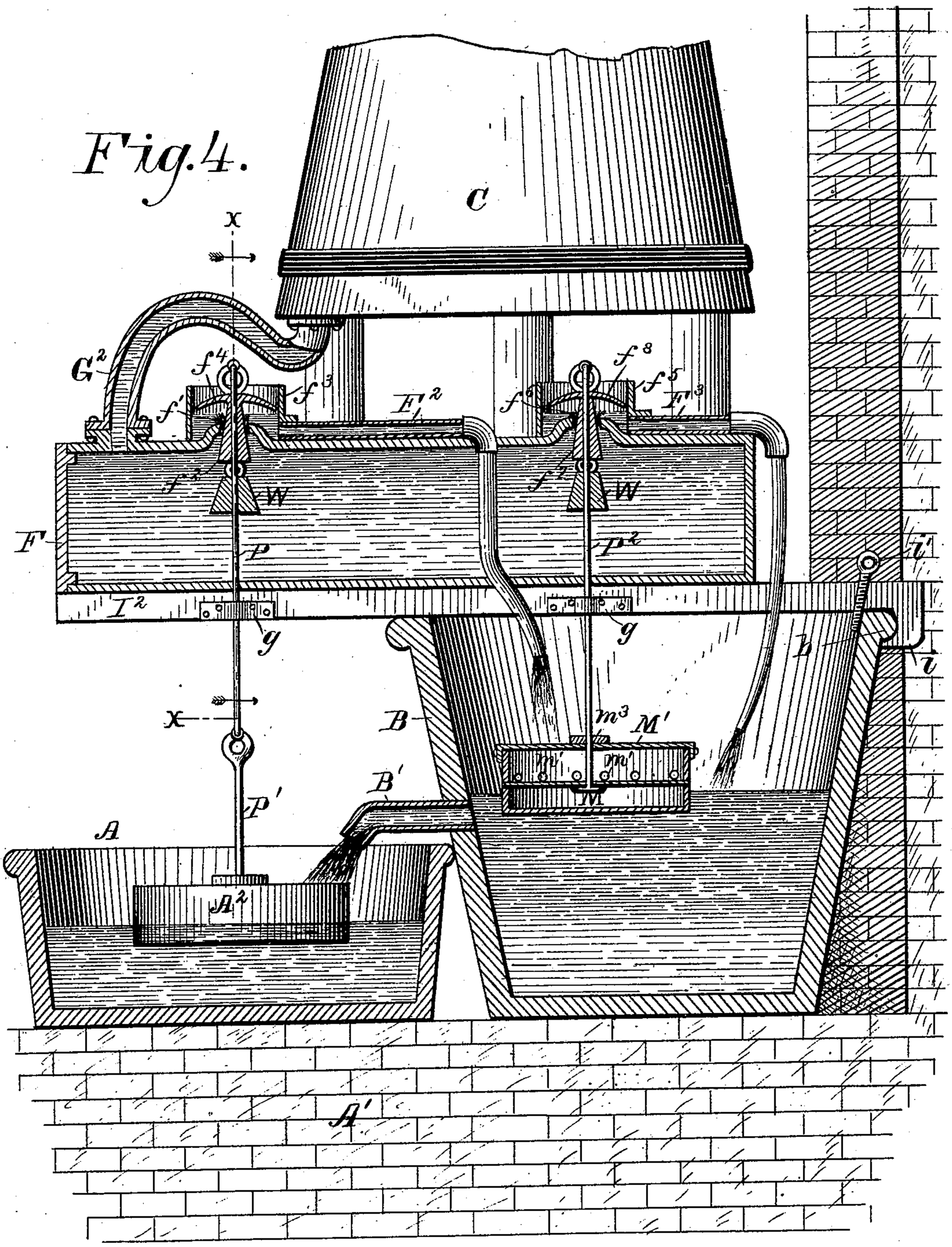
APPARATUS FOR AUTOMATICALLY FEEDING LIQUIDS TO EVAPORATORS.

No. 337,227. Patented Mar. 2, 1886.

Fig. 4.



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APPARATUS FOR AUTOMATICALLY FEEDING LIQUIDS TO EVAPORATORS.

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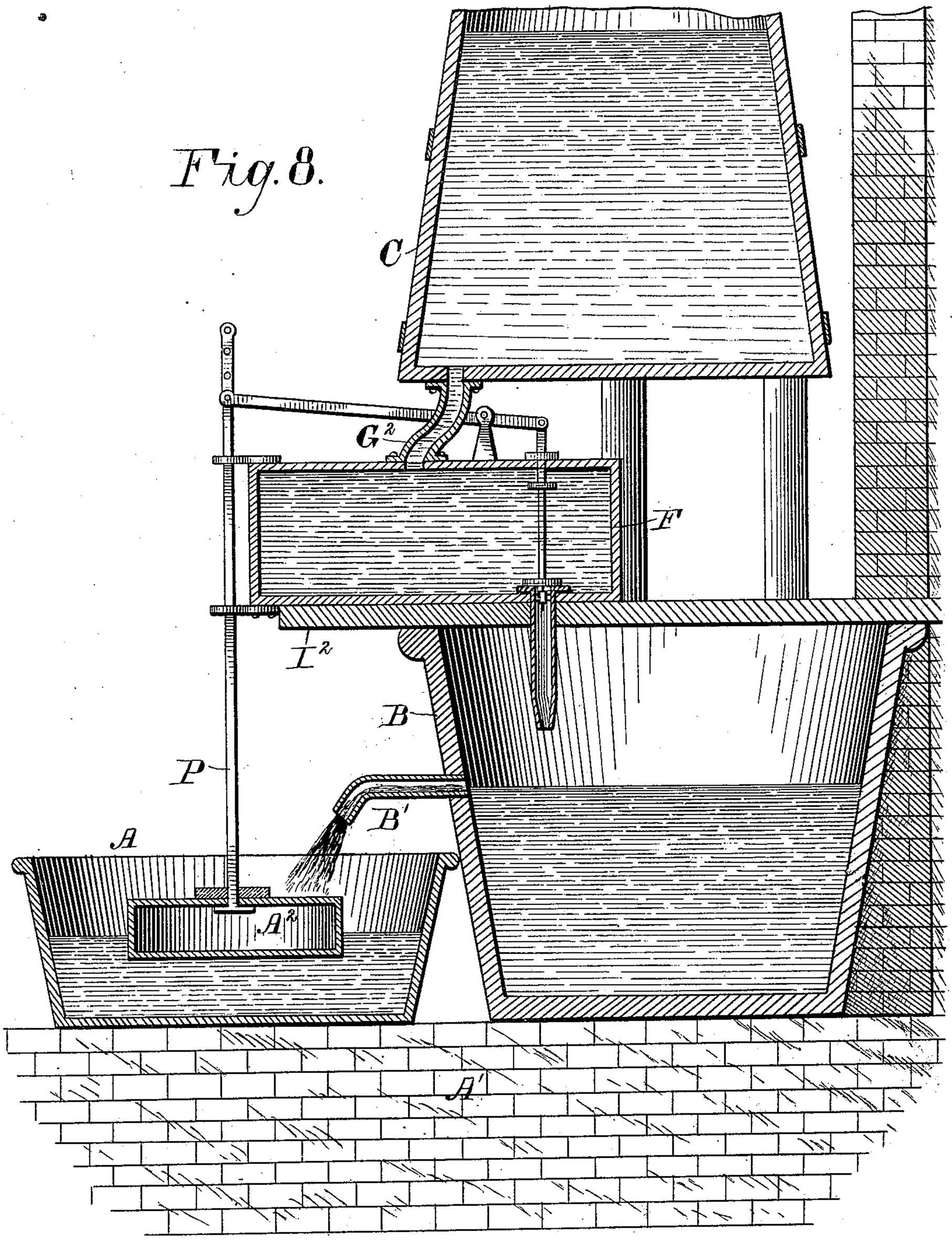
Fig. 8.



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UNITED STATES PATENT OFFICE.

MERRITT C. BARDEN, OF WEST PAWLET, VERMONT.

APPARATUS FOR AUTOMATICALLY FEEDING LIQUIDS TO EVAPORATORS.

SPECIFICATION forming part of Letters Patent No. 337,227, dated March 2, 1886.

Application filed March 18, 1885. Serial No. 159,367. (No model.)

To all whom it may concern:

Be it known that I, MERRITT C. BARDEN, a citizen of the United States, residing at West Pawlet, in the county of Rutland and State of Vermont, have invented certain new and useful Improvements in Apparatus for Automatically Feeding Liquids to Evaporators, of which the following is a specification.

My invention relates to apparatus for the evaporation of liquids holding in solution either crystallizable or amorphous substances, which are to be separated from the solvent or menstruum, and especially to that class of apparatus wherein it is necessary to supply the evaporating-pan at frequent intervals with fresh liquid, in order to prevent the liquor in the pan from thickening too rapidly, and for the purpose of preserving a uniform depth of sirup in the evaporator.

My invention, although applicable to different forms of apparatus, and to the evaporation and separation of any liquid or substance, is more particularly applicable to sugar-evaporators of the kind used in the manufacture of maple sirup and sugar; and it consists in the several features of construction and combinations of parts hereinafter set forth, and specified in the claims.

Referring to the drawings forming part of this application, Figure 1 is a perspective view illustrating one form of apparatus which may be used in practicing my invention. Fig. 2 is a side elevation showing the construction of one of the feeding devices represented in Fig. 1. Fig. 3 is a partial plan view of the float shown in Fig. 2 with its appurtenances. Fig. 4 is a central vertical section, upon an enlarged scale, showing a modification of the apparatus illustrated in Figs. 1, 2, and 3. Fig. 5 is a transverse section taken in the plane *x x*, Fig. 4. Fig. 6 is a detail section showing the construction of the float with its receiver, which is represented in Figs. 1 and 4 as being within the heater. Fig. 7 is a detail section, upon an enlarged scale, taken in the same plane as the cross-section, Fig. 5. Fig. 8 is a central vertical section illustrating a modification of the apparatus shown in Fig. 4.

A in said drawings indicates an evaporating-pan, of any suitable form and dimensions, which may be placed upon an arch, A′, or heated in any suitable manner, whereby evaporation of the fluid placed therein may be effected.

B represents a heater, which is any suitable vessel intermediate between the evaporator A and the storage-reservoir C, in which the fluid is placed in bulk. The heater may be placed where it will receive heat from the arch or from any other source, whereby the temperature of its contents is raised more or less before the fluid passes into the pan A. The heater, being placed within convenient distance from the evaporator, is supplied with a conveyer, B′, through which the fluid, after reaching a certain depth, may pass into the pan. In any arrangement of parts comprising these three elements—viz., an evaporator, a storage-reservoir, and a heater or other intermediate vessel—it is my purpose to feed directly from the reservoir to the heater and to supply the evaporator from the latter, the feed being controlled by the rise and fall of the fluid in the pan. To this end, therefore, I place in the evaporator, resting upon the surface of the liquor or sirup therein, a float, D. (Shown in Fig. 1 and in detail in Figs. 2 and 3.) This float, with the feeding devices connected with it, is substantially the same as that shown in United States Letters Patent granted me the 5th day of September, 1882, No. 263,839; but this form of apparatus constitutes no essential part of my invention, as I may use an automatic feed having an entirely different construction and arrangement of parts, as will be hereinafter described.

The construction and operation of the parts shown in Figs. 2 and 3 are as follows: D′ D′ are lever-arms having pivotal support at the point *a* between two uprights, E E, mounted upon the float D. The arms are curved downward from the point of support, and in the extremity of each is formed a short slot, *a′*, through which passes a bolt or pin, a^2, which is supported by lugs *c c* mounted upon the float, said pins being of such size as to move freely in the slots. Upon each arm D′ is formed a shoulder-piece, *e*, projecting downward and arranged in such a manner that a flexible pipe, G, may be passed between them, said pipe being put through an opening in the uprights E, as shown at *f* in Fig. 2. Upon the outer or free ends of the lever-arms are hung weights L L, which are adjustable within a limited range

toward and from the pivotal point *a*, and the entire apparatus is suspended from a bar or other sustaining device, I, by means of chains K, which hook under the arms D′ at a point intermediate between the pivot *a* and the weights L, and are attached to the bar I by means of pins I′, thereby rendering the feeding apparatus adjustable vertically for a purpose to be explained presently. The lever-arms are notched at *d* and *d′*, to permit the adjustment of the supports K and weights L, and the arrangement should be such that the weights will be a little more than counterbalanced by the gravity of the float and its appurtenances. The apparatus being suspended in the evaporating-pan with the float D resting upon the surface of the liquor or sirup therein, the gradual fall of the fluid-level caused by evaporation will cause the float to descend far enough to open the pipe G by the separation of the shoulder-pieces *e e*, between which it passes. This permits a discharge from the storage-reservoir C, by which the level of the fluid in the pan is restored. When it has reached the point to which the apparatus is adjusted, the float D, with its appurtenances, being sustained in part by the liquid, the weights L will exert sufficient force to compress the flexible pipe G and check the discharge from the reservoir.

In the United States Letters Patent granted to me the 28th day of March, 1882, No. 255,565, and the 5th day of September, 1882, No. 263,839, the float with its attachments is supported by a frame, which sits upon the bottom of the evaporating-pan. I have found in practice that it is better to support the feeding apparatus in such a manner that there shall be no contact between its supports and the bottom of the pan, and in the present case therefore I suspend it from above in the manner shown and described. It will readily be seen, however, that there are many other ways of accomplishing the same result without departing from my invention.

The bar I shown in this application may be attached to any convenient support; but I have shown it as mounted upon a heating-vessel, B, to which it may be fastened by a hook, *i*, formed on the end of the bar and engaging with the flange *b* of the heater, the parts being held in engagement by a pin, *i′*, thrust through the bar and bearing against the inner wall of the vessel. Perforations i^2 are formed in the bar I, to permit a horizontal adjustment of the bolts I′, from which the feeding apparatus is hung.

In Fig. 1 of the drawings I have shown the feeding apparatus just described suspended in the evaporator, but instead of allowing the tube G to discharge directly into the pan A, I carry it through the opening *f* in the uprights E E, and thence upward until its end is within the heater or intermediate vessel, B. Suspended from the bar I and resting upon the fluid in this vessel is a second float, M, having lever-arms *m m*, and weights N, these, as well as the other parts shown, being essentially the same as those already described in connection with the feeding apparatus in the evaporator, with the single exception following. The supply to the heater B is through a pipe, G′, which is opened and closed by mechanism actuated by the rise and fall of the float M, and as the pan A is fed by the overflow from the heater, it is evident that the feed to both vessels must be regulated by the pan-float only, as there is no correspondence between the rise and fall of the fluid-level in the two. The heater-float M therefore must be sunk in order to open the feed-pipe G′, and I accomplish this by the means and in the manner following: Upon the float M is mounted a receiver, M′, (see Figs. 4 and 6,) having an open top, and provided with small drainage apertures *m′*. The open end of the tube G is so arranged that it will discharge directly into this receiver, the volume of the discharge being such that it will, if continued, fill said receiver without regard to the escape through said apertures. The weight of this fluid in the receiver will overcome the buoyancy of the float and sink it, thereby opening the pipe G′, which supplies the heater, the function of the lever-arms *m m* being the same as the arms D′ upon the pan-float D. This discharge through the pipe G′ being directly into the heater, the overflow from the latter through the conveyer B′ will pass directly to the evaporator A, and as the fluid-level in the latter rises the flow through the tube G will cease, being cut off by the rise of the float D, which operates the lever-arms D′. The float M at once begins to buoy up the receiver M′, and as the fluid escapes from the latter through the drainage-openings *m′*, the buoyancy of the float effects the closing of the tube G′, and thereby checks the flow of liquid from the storage-reservoir C to the heater B, and thence to the evaporator A. It will be seen that by this method I provide an automatic feed for both heater and evaporator, whereby the fluid in both vessels may be replenished at proper intervals, the feed being regulated entirely by the pan-float and in accordance with the requirements of the evaporator. By simply raising or lowering the pan-float D by means of the suspending-chains K, the apparatus may be adjusted to feed to any depth required—or, in other words, to keep the fluid-level in the evaporator at any desired point.

A modified form of the apparatus hereinbefore described is shown in Figs. 4 and 5, and in part in Fig. 7, the construction and operation being as follows, A in said figures being the evaporator, B the heater, and C the storage-reservoir. G^2 represents a pipe leading from the reservoir C to a feed-receptacle, F, which may be simply a short section of metal pipe closed at both ends. In the wall of this receptacle is formed a valve-seat, *f′*, within which is placed a cone-shaped plug-valve, f^2, having its stem connected with a yoke, P, which passes around the receptacle F, and is connected below with a rod, P′, which

is rigidly fastened to the pan-float A^2. The yoke P is guided by straps *g*, which are fastened to the edges of a bar, I^2, which supports the pipe or receptacle F, and which is substantially the same in construction as the bar I, (shown in Figs. 1 and 2,) and which may be mounted upon the heater in the same way. Surrounding the valve-seat *f'* is a cylindrical shell, f^3, having a discharge-pipe, F^2, opening from it and leading to a point over the interior of the heater B. Upon the stem of the valve f^2, and within the shell f^3 is mounted a shield, f^4, which nearly covers the open top of the shell, and prevents the fluid which escapes when the valve is opened from being thrown over the top of the shell f^3 and wasted. As the pressure of the fluid from the reservoir C keeps the receptacle F constantly filled, it may be necessary to load the valve f^2 in order to counterbalance said pressure and secure accurate operation of said valve. This may be done by suspending a weight, W, from it, or by loading the valve-stem above the shield f^4, as shown in Fig. 7. Within the heater B, and resting upon the surface of the fluid contained therein, is a float, M, upon which is mounted a receiver, M', constructed in the manner already described, said receiver being filled by the discharge from the pipe F^2. The float M operates a second valve, f^7, having a seat, f^6, which is surrounded by a shell, f^5, these parts corresponding with those already described. Upon the stem of the valve f^7 is mounted a shield, f^8, and the discharge from said valve is carried by a pipe, F^3, directly into the receiver B.

The operation of these parts is as follows: As the fluid in the pan A is diminished by evaporation, the float A^2 will fall, and its weight will unseat the valve f^2, allowing the fluid to escape into the shell f^3, whence it passes through the pipe F^2 into the receiver M'. As the fluid accumulates therein, its weight sinks the float M, thereby opening the valve f^7, and causing a discharge of liquid through the pipe F^3 into the heater B. As the feed continues, the liquid flows through the spout B' into the pan A, and as the fluid-level rises in the latter it lifts the float A^2 and seats the valve f^2, cutting off the escape into the receiver M', whereupon the contents of the latter escape through the drainage openings *m'*, allowing the float M to rise and close the valve f^7. It will be seen that this mode of operation is the same as that described above in connection with Fig. 1. The valve f^7 is operated by a yoke, P^2, which may be connected with the float in any suitable manner, as, for example, by means of cross-bars m^3 mounted upon the receiver. The shield f^4 may be dispensed with, and the top of the shell f^3 may be closed, the valve-stem being carried through the cover to connect with the yoke P. With this construction it is immaterial how great the pressure from the storage-reservoir may be.

In constructing the feeding-receptacle F, (shown in Figs. 4 and 5,) the valve-seat or the cap f^9 in which it is formed may be screwed into the wall; or one end of the pipe F may be made removable, as shown in Fig. 4, to provide for the insertion of the valves. The pipe F may be secured to the bar I^2 by small cradle-blocks *h*. (Shown in Fig. 5.)

When the feeding apparatus shown in Fig. 1 is used, the lever-arms actuated by the heater-float M may be pivoted to uprights R, which are attached to the floor of the receiver M'. The bolts a^2, which pass through the slots in the ends of said arms, may also be secured to lugs m^4, mounted upon the floor m^2, as shown in broken lines in Fig. 6.

Any form of valve may be used instead of a cone or plug valve, and the construction of the several parts may be considerably varied without departing from my invention.

Although I have shown two separate and independent floats with feeding apparatus attached, my invention does not necessarily contemplate the use of more than a single float and cut-off, which must be located in the evaporator, the discharge-tube being arranged to empty into the heater.

By my invention I provide an automatic feed for both the evaporator and the heater by which the fluid-level may be maintained at the same point in both vessels.

Having described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination, with a storage-reservoir, a heater or other intermediate vessel, and an evaporator, of a discharge-pipe leading from the reservoir to the heater, a float resting upon the liquid in the evaporator, and opening and closing the discharge-pipe, a float resting upon the liquid in the heater, and having a receiver mounted upon it provided with drainage-openings, and arranged to receive the flow from the discharge-pipe, a second discharge-pipe opened and closed by the rise and fall of the heater-float, and a communication between the heater and the evaporator, all substantially as and for the purpose described.

2. The combination, with a float having a receiver provided with drainage-openings mounted thereon, of a valve or other shut-off operated by the rise and fall of said float, and mechanism, substantially as described, for discharging fluid from a storage-reservoir, for sinking said float, substantially as and for the purpose described.

3. The combination, with a storage-reservoir, a heater or other intermediate vessel, and an evaporator, of a receptacle communicating with said reservoir, a valve seated in the wall of said receptacle, and opened and closed by the rise and fall of a float resting upon the liquor or sirup in the evaporator, a pipe conveying the discharge from said valve to a receiver mounted upon a float resting upon the fluid in the heater, and having drainage-openings, a valve in the receptacle opened and closed by the sinking and rising of the heater-float,

a pipe which discharges the fluid from the latter valve directly to the heater, and means of communication between the latter and the evaporator, whereby the surplus fluid may pass into the pan, substantially as and for the purpose described.

4. The combination, with a storage-reservoir, of a feeding-pipe, a valve or other shut-off opening and closing said pipe, a sinking and rising float actuating the same, a receiver mounted upon said float and provided with drainage-openings, and automatic mechanism for filling said receiver and sinking the float, substantially as and for the purpose described.

5. The combination, with a fluid-reservoir, an evaporator, and a heater intermediate of the two, of a receptacle between the heater and the reservoir and communicating with the latter, pipes leading from said receptacle to the heater, valves opening and closing said pipes, a float in the evaporator operating one of said valves, and a float in the heater operating the other, said heater having an overflow-pipe communicating with the evaporator, whereby the fall of the fluid in either vessel will give a fresh supply from the reservoir to the heater, and thence to the evaporator, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MERRITT C. BARDEN.

Witnesses:
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HENRY B. BARDEN.