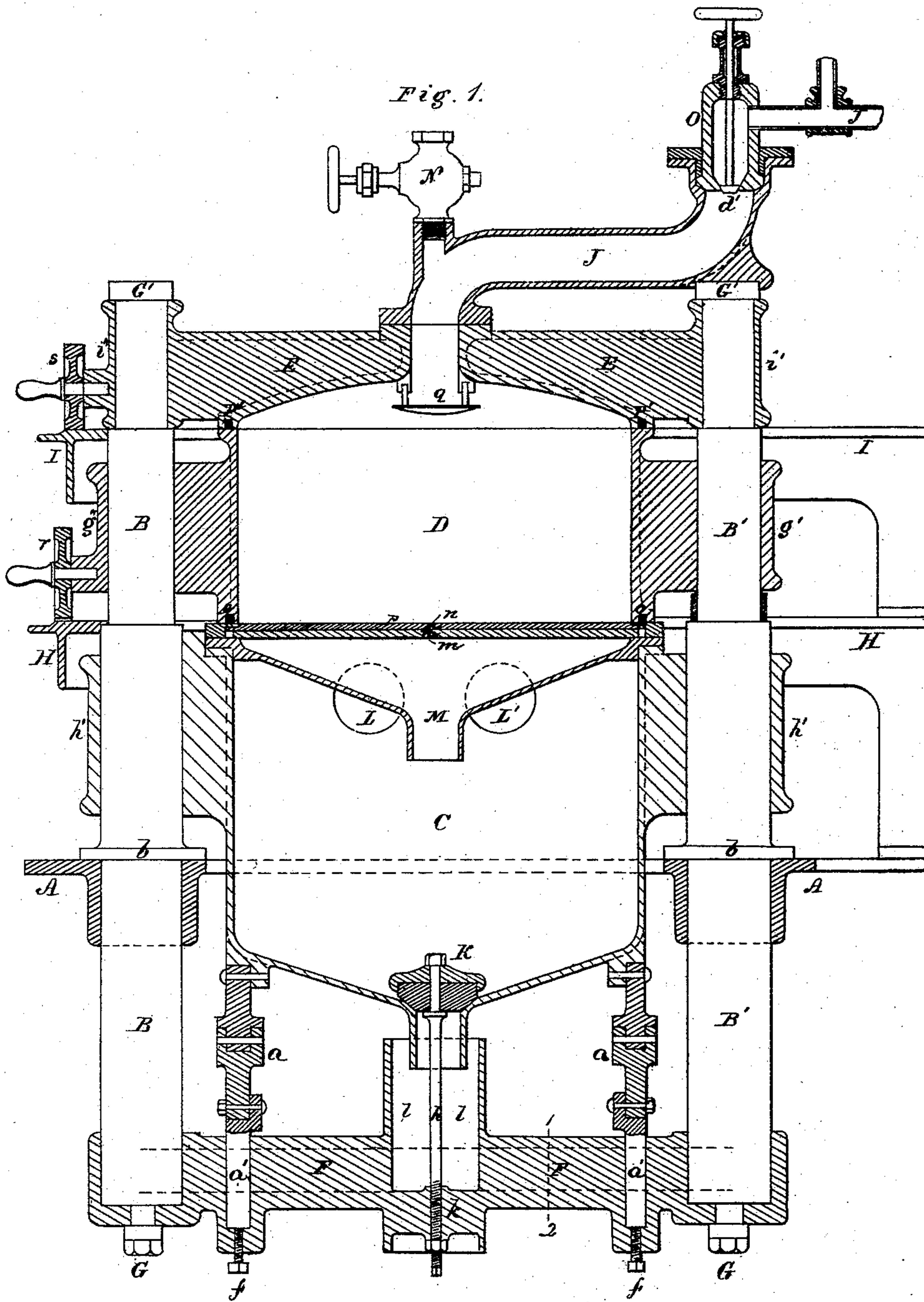


S. S. HEPWORTH.

Apparatus for Draining and Filtering Sugar.

No. 156,058.

Patented Oct. 20, 1874.



Witnesses.

Inventor.

Frederick R. Curtis
Albert F. Waterhouse

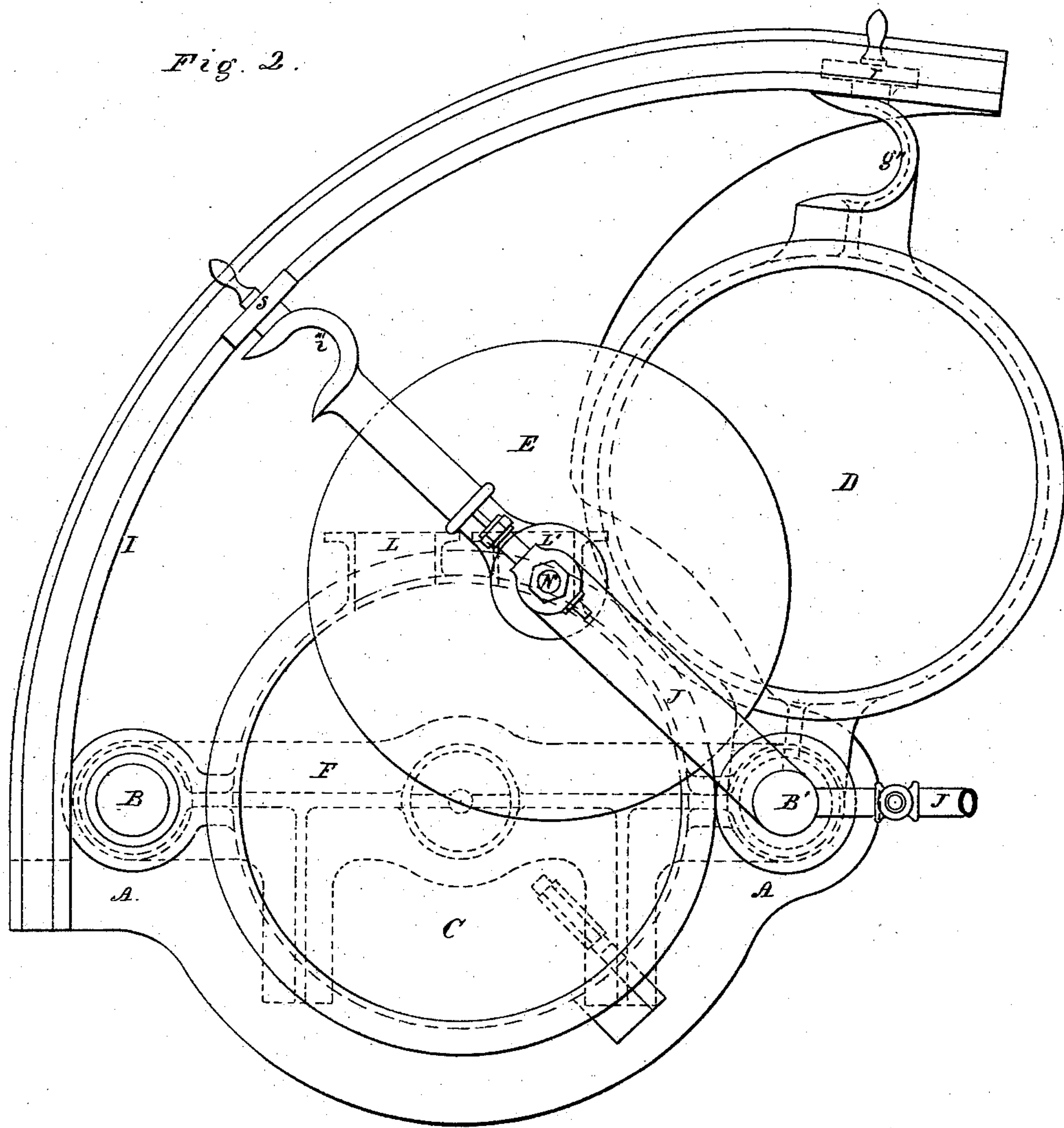
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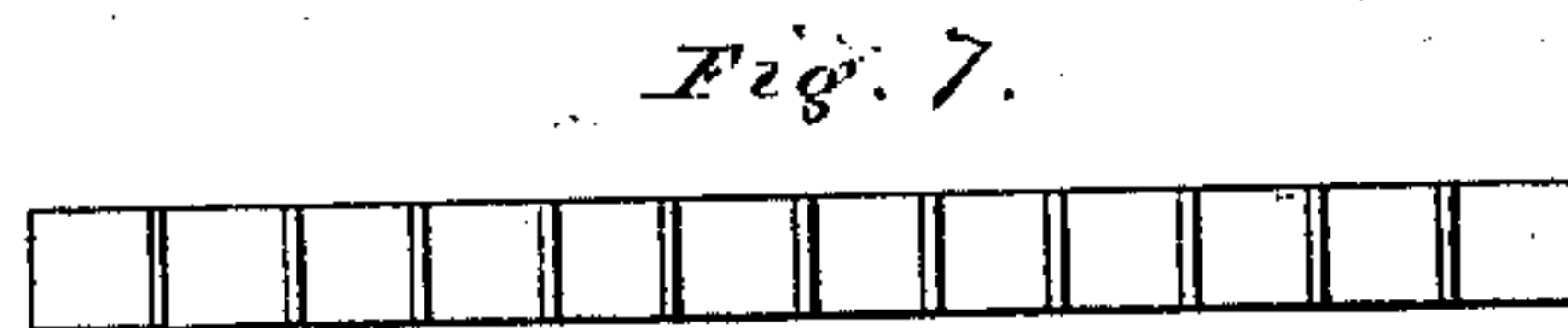
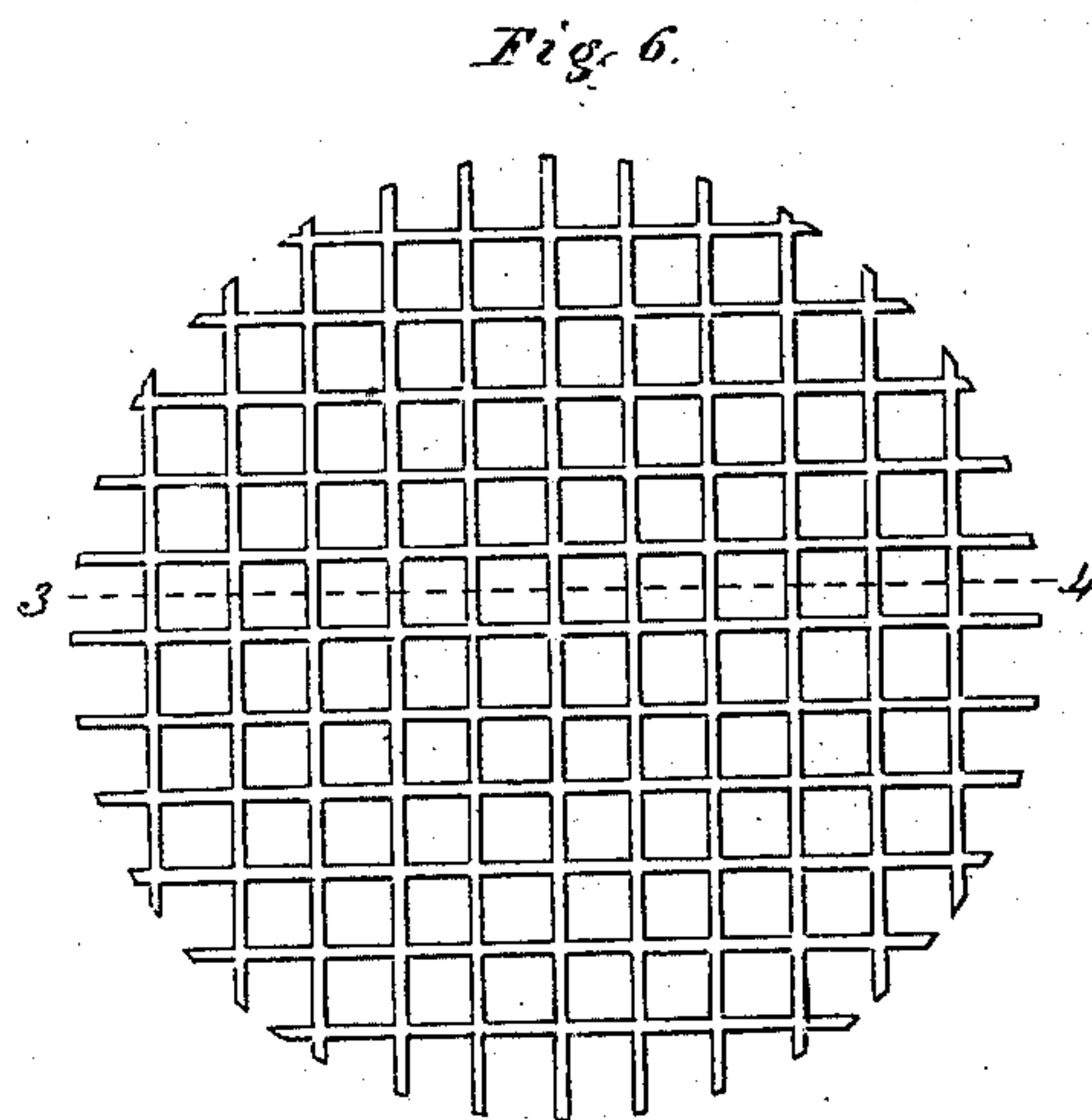
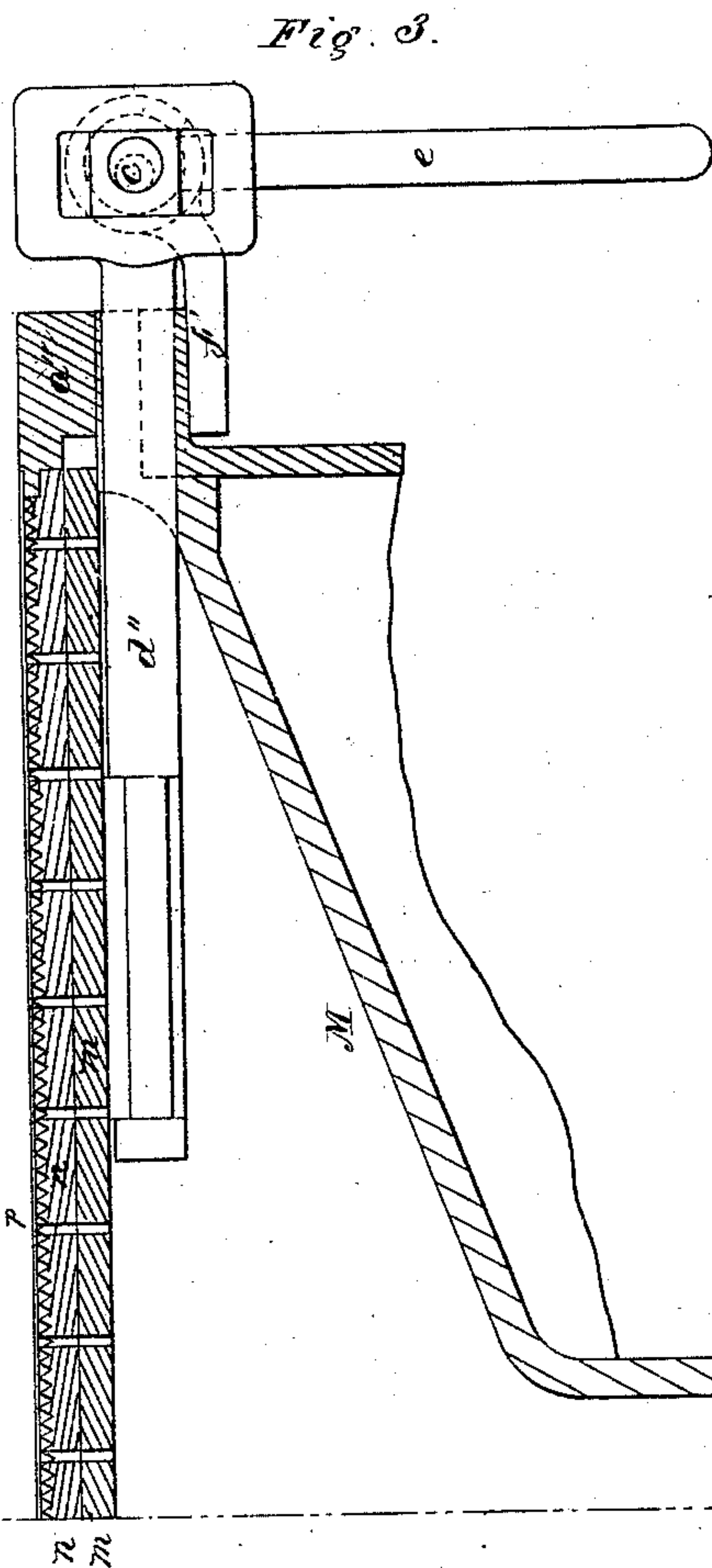
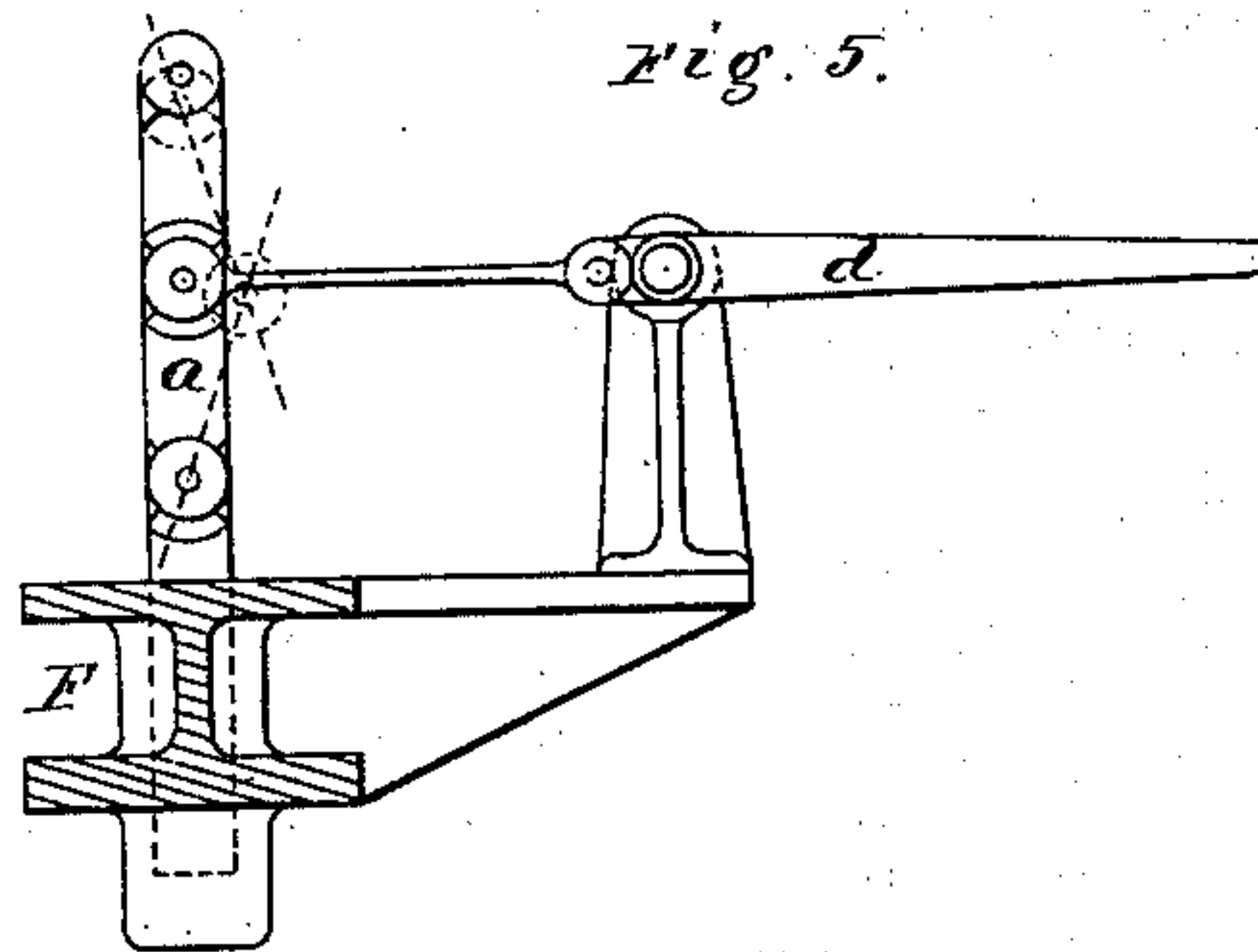
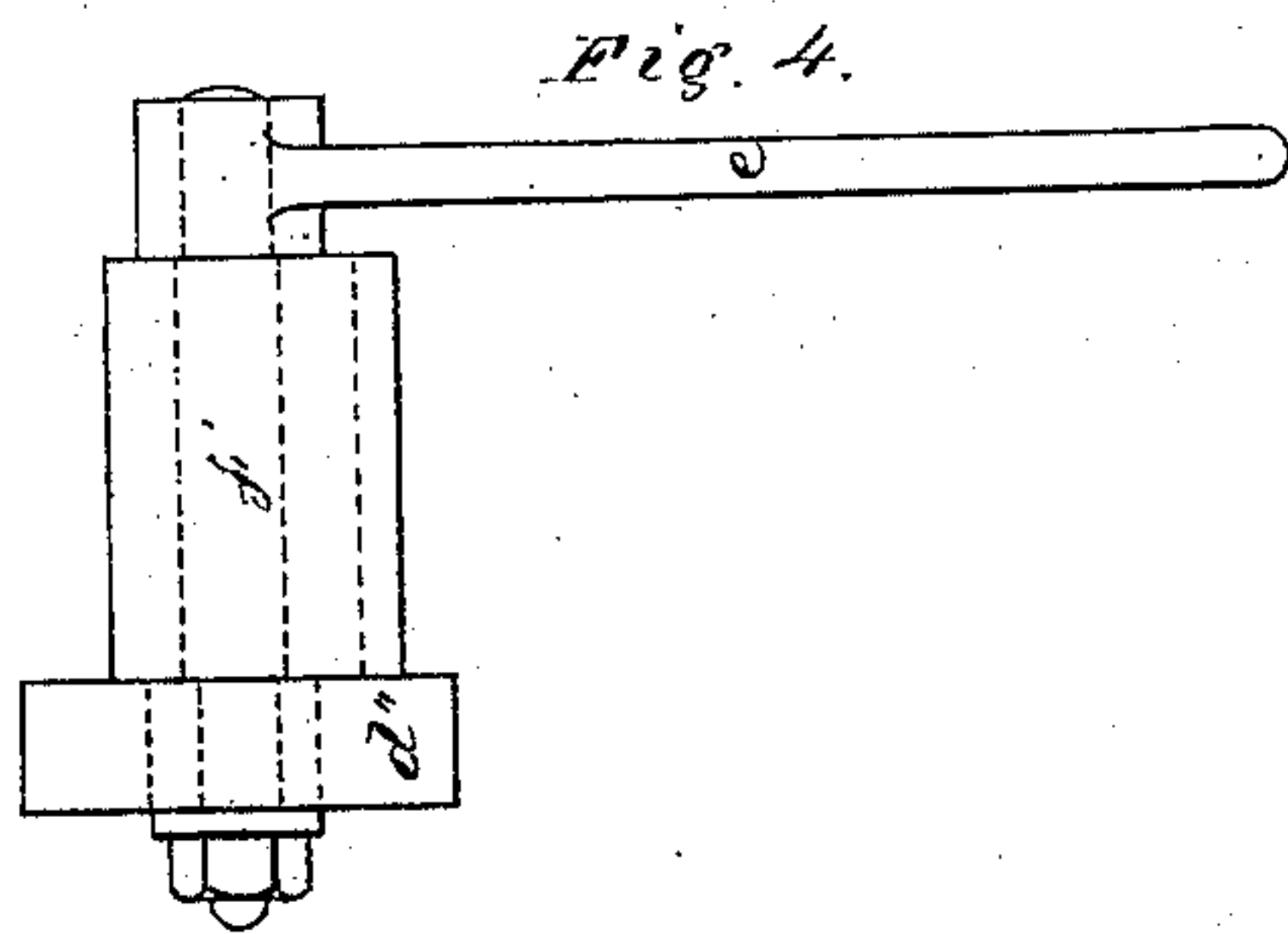
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UNITED STATES PATENT OFFICE.

SAMUEL S. HEPWORTH, OF NEW YORK, N. Y.

IMPROVEMENT IN APPARATUS FOR DRAINING AND FILTERING SUGAR.

Specification forming part of Letters Patent No. **156,058**, dated October 20, 1874; application filed June 2, 1874.

To all whom it may concern:

Be it known that I, SAMUEL S. HEPWORTH, of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Machinery for Draining and Filtering Sugar and other substances; and I do hereby declare that the following is a full, clear, and exact description thereof, whereby a person skilled in the art can make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Like letters in the figures indicate the same parts.

My invention relates to that class of machines in which the draining and purging of sugar, expelling a liquid from a solid substance in which it is contained, or forcing liquids through filtering medium, are performed by pneumatic pressure.

The object of my invention is to accomplish the above operations successfully and to produce sugar of any required degree of whiteness more rapidly than is at present done, and of a variety of forms, such as square, triangular, or hexagonal prisms directly in the machine without subsequent cutting.

My invention consists in the combination and arrangement of the several parts of the machine that will be hereinafter described. It also consists in several important and novel special devices not heretofore known or used, but which are essential to the successful operation of the machine, all of which will be hereinafter described.

In the accompanying drawings, on three sheets, Figure 1 is a vertical section of my improved machine in its closed or working position. Fig. 2 is a top view of the apparatus when open or in the position for discharging its contents. Fig. 3 is a half-section through the funnel M, Fig. 1, upon an enlarged scale, so as to show the working parts more clearly. Fig. 4 is an end view of the devices for moving the plates *m* and *n*, Fig. 3, one upon the other. Fig. 5 is a cross-section upon the line 1 2, Fig. 1, looking to the right. Fig. 6 is a plan of one of the forms of subdivisions for the production of sugar in blocks. Fig. 7 is a vertical section of the same through the line 3 4.

A is the bed-plate of the machine. It is secured to the floor or foundation on which the machine rests. B and B' are two columns for supporting the several parts of the machine. They are securely attached to the bed-plate A by means of the flanges *b*. C is a receiver for the liquid drained from the chamber D. This receiver has a movement up and down upon the columns B B' by means of the sockets *h* *h'* attached to its sides. Motion is communicated to it by means of the toggle-joints *a* *a*. (See Figs. 1 and 5.) These are operated by the handle *d*. The lower ends of the toggles are attached to adjustable bolts *a'* for raising or lowering them, so that when they are in the position shown in Fig. 5, the receiver will be at the exact height required. These bolts are adjusted by means of the screws *f*. The receiver C has a central discharge-opening in the bottom, situated directly over the pipe *l*. This opening is closed by the valve K, the stem *h* of which is screwed into a cross-bar, *k*, in the pipe *l*. It is adjusted to such a height that it is closed when the receiver C is at its highest position, but is opened by the lowering of the receiver. The valve K may also be placed in any other part of the bottom of the receiver and be operated by hand. F is a rigid cross-beam, attached to the columns B B' for sustaining the toggles *a* and the valve K. At the top of the receiver C is the funnel M and the plates *m* *n* *p*, an enlarged section of which is shown in Fig. 3. The funnel M is firmly attached to and forms part of the receiver C. The graduating-plates *m* and *n* are each provided with a large number of holes about one-quarter of an inch in diameter, arranged in parallel rows at equal distances apart, so that they exactly correspond in the two plates. The upper plate, *n*, is fixed in the rim *a''*, which is firmly bolted to the receiver. The lower plate, *m*, has a small horizontal motion, while held closely in contact with the plate *n* by a suitable bearing around its circumference. Motion is communicated to this plate by means of the lever *e*, (see Figs. 3 and 4,) which turns the eccentric *c* and draws the graduating-bar *d''* back and forth. This bar is attached at its inner end to the plate *m*. An arm, *f'*, bolted to the receiver C supports the axis of the lever *e*.

By means of this arrangement the apertures through the two plates can be graduated to any desired size for the purpose of regulating the flow of the liquid or air through these plates. The plate *n* has upon its upper surface a series of channels or grooves, as shown in Fig. 3. These may be arranged in concentric circles or in equidistant parallel lines. Resting upon the plate *n* is a perforated brass plate or very fine wire cloth, *p*. It is let in flush with the top surface of the ring *a''*, and is firmly secured to it and to the plate *n*. The perforations in this plate are of a sufficient fineness to prevent the passage of sugar crystals. *D* is a chamber, (shown in the drawing of a cylindrical form,) open at the top and bottom and swinging upon the column *B'* by means of the socket *g'*, as shown in Fig. 2. The socket *g''* embraces the column *B*, but is open upon one side to permit the cylinder to swing to one side. There is a groove in the bottom edge of this cylinder for the rubber packing *o* to form a water-tight joint between the cylinder and the receiver *C*. At the outer side of the socket *g''* there is a wheel or roller, *r*, which runs upon the rail *H*, for the purpose of supporting the weight of that side of the cylinder *D* when it is opened. The socket *g'* rests upon a shoulder on the column *B'*, and supports that side of the cylinder when open. When closed, the cylinder has a small vertical motion to close the joint between it and the cover *E*. The rail *H* is bolted to the bed-plate *A*, and forms part of the frame of the machine. *E* is the cover. It swings upon the column *B'* by means of the socket *i'*, and is supported when closed by the socket *i''*, which is open upon one side in the same manner as the socket *g''* of the chamber *D*, to allow the cover to swing open to the position shown in Fig. 2. The socket *i'* rests upon a shoulder on the column *B'* to sustain it in position. The socket *i''* is provided with a roller, *s*, which runs upon the rail *I*, and supports that side of the cover when open. The rail *I* rests upon and is secured to the rail *H*. Upon the under side of the cover *E* there is a groove for the rubber packing *p'*, to form a water-tight joint between the cylinder and the cover. At the top of columns *B* *B'* there are caps *G' G'*, forming part of the bolts *G G*, which pass up through the columns, and receive the tensile strain between the caps which hold the cover in place and the cross-bar *F*, which latter supports the toggles *a*. The inlet-pipe *J* is bolted to the cover *E*, and has a joint or socket directly over the center of the column *B'*, so that the cover and pipe can swing off to one side together, as shown in Fig. 2, while the vessel *O* above the socket remains fixed in its position. The joint below the vessel *O* is made water-tight by grinding or otherwise. *d'* is a valve in the bottom of the vessel *O*, for admitting the fluid contained in it to the cylinder *D*. The fluid can be atomized or driven into spray by opening the valve a small distance, so as to leave only a thin annular opening. Air is also admitted

to the apparatus through this valve. Upon the under side of the cover *E* there is a deflecting-plate, *q*, opposite the outlet of the pipe *J*, and attached to the cover by bolts. This plate is for the purpose of diffusing the air or fluid over the entire surface of the material contained in the chamber *D*. *N* is a valve, screwed into the cover. This valve is for the purpose of admitting air when the apparatus is acting by means of exhaustion, or it serves as a relief-valve when acting by compressed air after the draining or purging has been completed. *L L'* are openings from the receiver *C*, one of which, *L*, is supplied with a valve, to be used as an outlet when compressed air is used in the machine, and the other, *L'*, is connected to the exhaust-pump, to be used when the apparatus is acting by means of exhaustion.

If but one of these methods is used in the same machine, but one opening is necessary.

The apparatus described is intended to be operated by atmospheric pressure, either by compressing the air into a reservoir or by exhausting it from the receiver *C*.

When the compressed air is used it is admitted from the reservoir through the pipe *J*, the valve *N* being closed and the pipe *L* open for the escape of air from the receiver *C*. When the exhaust-pump is used to draw the air from the receiver, the valve *L* is closed and the valve *N* is opened to admit the pressure of the atmosphere from above.

As the mode of operating this machine is substantially the same for all the various purposes to which it may be applied, I will describe its operation for the draining or purging of sugar only, which is as follows:

The chamber *D* is placed over the receiver *C*, and the latter is raised by means of the toggles *a a* sufficiently to close the joint between it and *D*. The chamber *D* is then filled, or partially filled, with the mixture of crystals and sirup as it comes from the vacuum-pan. The cover *E* is then closed over the cylinder, and the joints of the whole apparatus pressed tight together by moving the toggles to the position shown in Fig. 5. Air is then admitted from the reservoir through the pipe *J* to the top of the cylinder or chamber, when the sirup is carried down through the sugar-crystals into the receiver *C*.

In order to effect a perfect drainage, and economize the use of the air, the graduating-plates *m* and *n* must be so adjusted, by partially closing the orifices through them, that the pressure will be retained in the chamber *D* until the sirup is entirely expelled from the sugar. The air is thus compelled to pass slowly through the whole mass, and is not allowed to blow rapidly through the part of the sugar that may be first or most easily purged.

The sugar can be washed by admitting water or other liquid from the vessel *O*, atomized or disintegrated by passing through the thin aperture around the valve *d'* under pressure.

In order to dry the sugar, warm air, or a

combination of air and steam, can be introduced through the pipe J, and passed through the sugar after it has been drained and washed.

When it is desired to form sugar in blocks, a series of subdivisions, similar to those shown in Figs. 6 and 7, are placed in the bottom of the cylinder, and filled somewhat above the tops of the subdivisions with the mixture of crystallized sugar and sirup. Any number of layers of these subdivisions can be placed in the cylinder until it is full, placing a perforated plate between the layers as each one is filled. The operation of draining, washing, and drying is then performed, as before described.

The machine is emptied by placing the cylinder and cover in the position shown in Fig. 2. The contents are then allowed to fall out upon the floor, or into some proper receptacle provided for that purpose. Before disconnecting the apparatus for discharging the contents, the valve N must be opened to relieve the pressure. The receiver can then be lowered by means of the toggles, and the cylinder and cover swung out to one side, as shown in Fig. 2.

The lowering of the receiver C opens the valve K, and the sirup which has accumulated above it passes out through the pipe *l* to a proper receptacle.

There are some obvious modifications of the arrangements of the parts of my improved machine which it will be unnecessary to describe. Thus the cover E and chamber D may be made to move off laterally, in place of swinging, and may be of any desired form, such as square or octagonal. Neither is it necessary that the receiver should be stationary and the upper parts move. Either one of the devices C, D, or E can be fixed, and the others move away from it laterally, for the purpose of discharging the sugar.

What I claim as my invention is—

1. A pneumatic draining-machine, consisting essentially of a laterally-moving cover, E, a laterally and vertically moving chamber, D, and a vertically-moving receiver, C, the working joints between which parts are closed or opened by raising or lowering the receiver, substantially as herein described.

2. The combination of the laterally-moving chamber D with the receiver C and the cover E, substantially as herein described.

3. The combination of the valve K, attached to the fixed frame of the machine, with the vertically-moving receiver C, substantially as herein described.

4. The combination of the toggles *a* with the receiver C, for giving a vertical motion to the receiver for the purpose of opening and closing the horizontal joints between the receiver, the cylinder, and the cover, and operating the valve K, substantially as herein described.

5. The combination of the funnel M with the receiver C and the cylinder D, substantially as herein described.

6. The rails H and I, in combination with the chamber D and the cover E, with their rollers, substantially as herein described.

7. The graduating-plates *m* and *n*, for regulating the flow from the chamber D, substantially as herein described.

8. The combination of the plates *m* and *n* with the strainer *p* and the chamber D, substantially as and for the purposes herein set forth.

9. The deflector *q*, in combination with the entrance-pipe J and the chamber D, substantially as and for the purpose herein set forth.

10. The construction of the vessel O, with its valve *d'*, and its arrangement in the air-pipe J, whereby the current of air is blown through it and expels the contained liquid, substantially as herein described.

11. The combination of the vessel O with the pipe J, the cover E, and the deflector *q*, substantially as and for the purpose herein set forth.

12. A pneumatic draining-machine, composed of a cover, E, a draining device, *m n p*, and a chamber or vessel, D, which moves laterally from between the cover and the draining apparatus beneath, for the purpose of discharging the sugar, substantially as herein described.

13. The combination of the interior molds or forms with a pneumatic draining-machine, substantially of the form herein described.

SAMUEL SHAW HEPWORTH.

Witnesses:

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