

No. 618,861.

Patented Feb. 7, 1899.

J. GEORGE & C. M. SHORTLE.

PROCESS OF AND APPARATUS FOR MANUFACTURING SHEET GLASS.

(Application filed Nov. 9, 1897.)

(No Model.)

2 Sheets—Sheet 1.

FIG. 1.

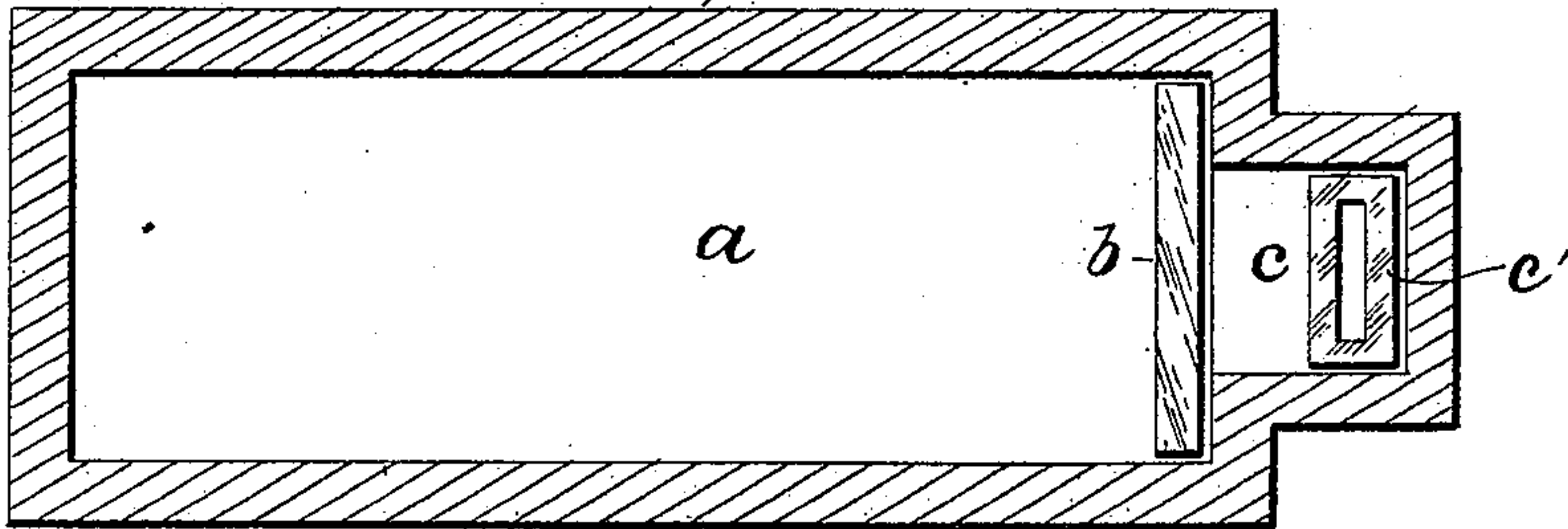


FIG. 2.

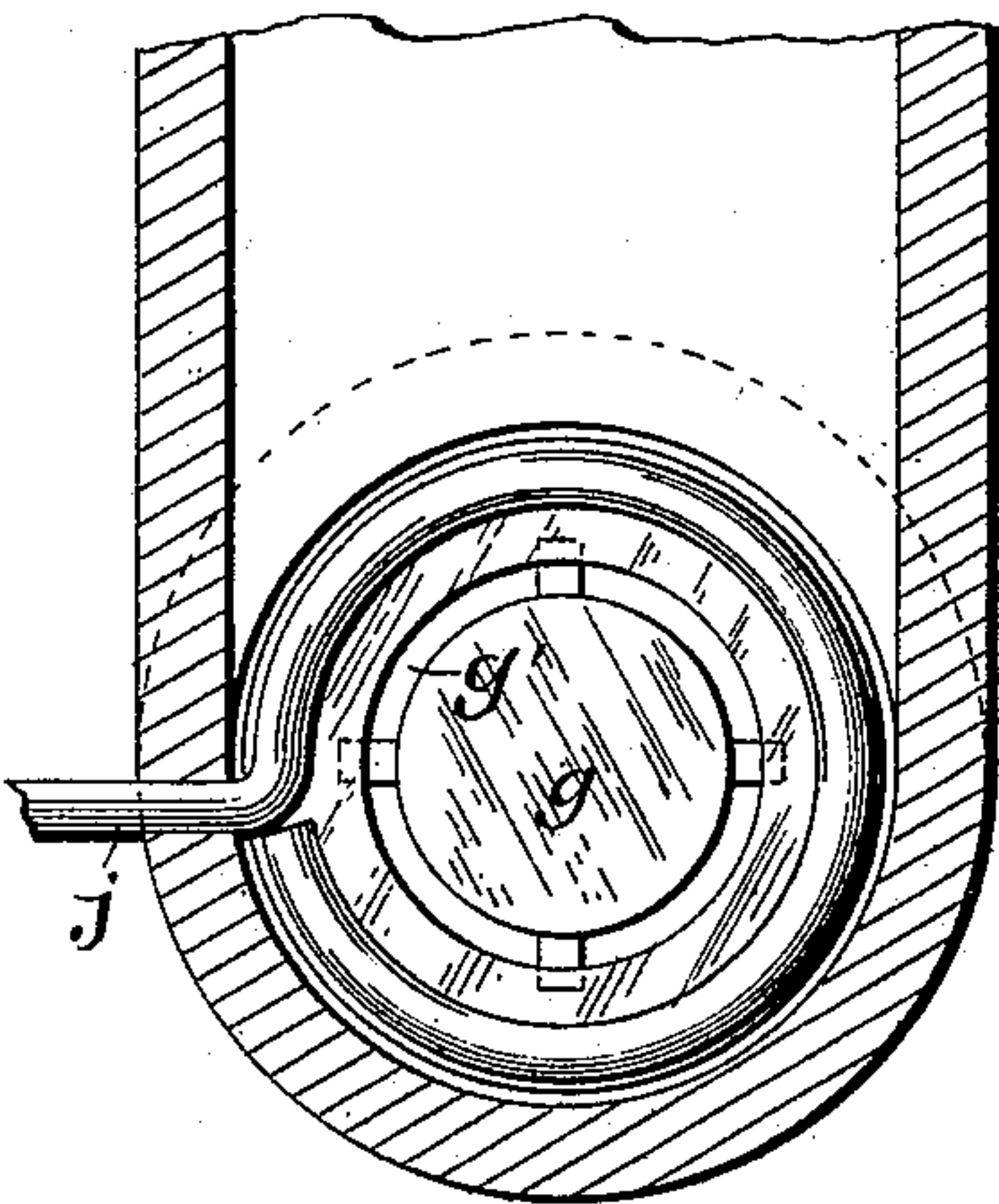
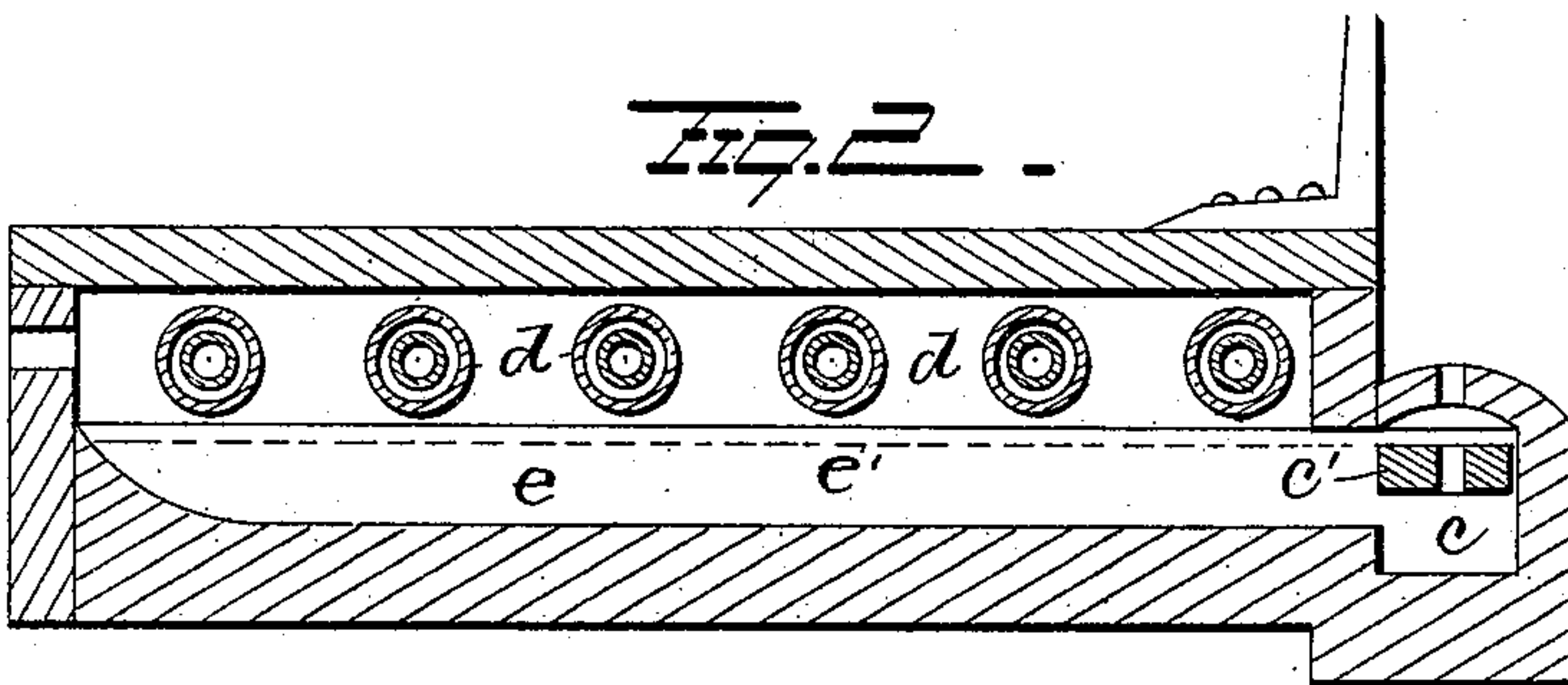


FIG. 4.

FIG. 5.

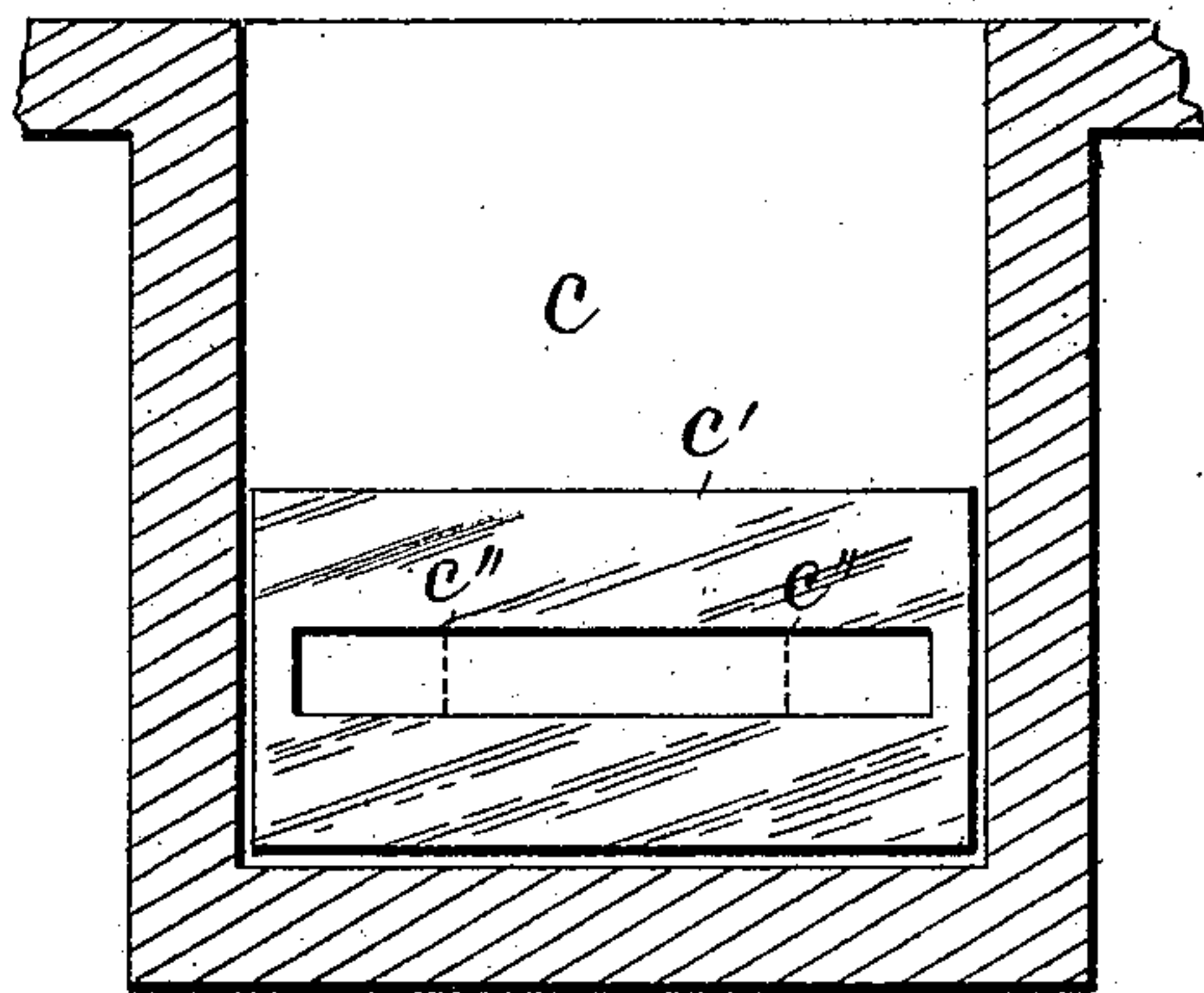
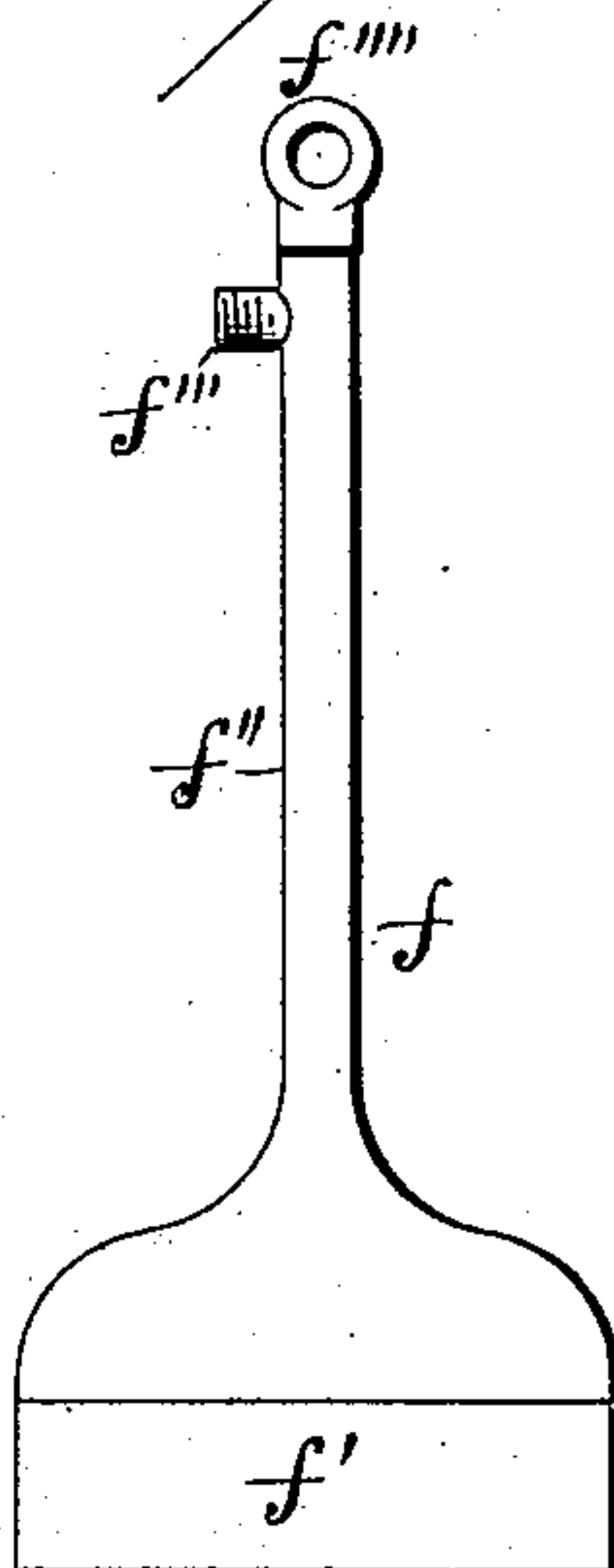


FIG. 3.

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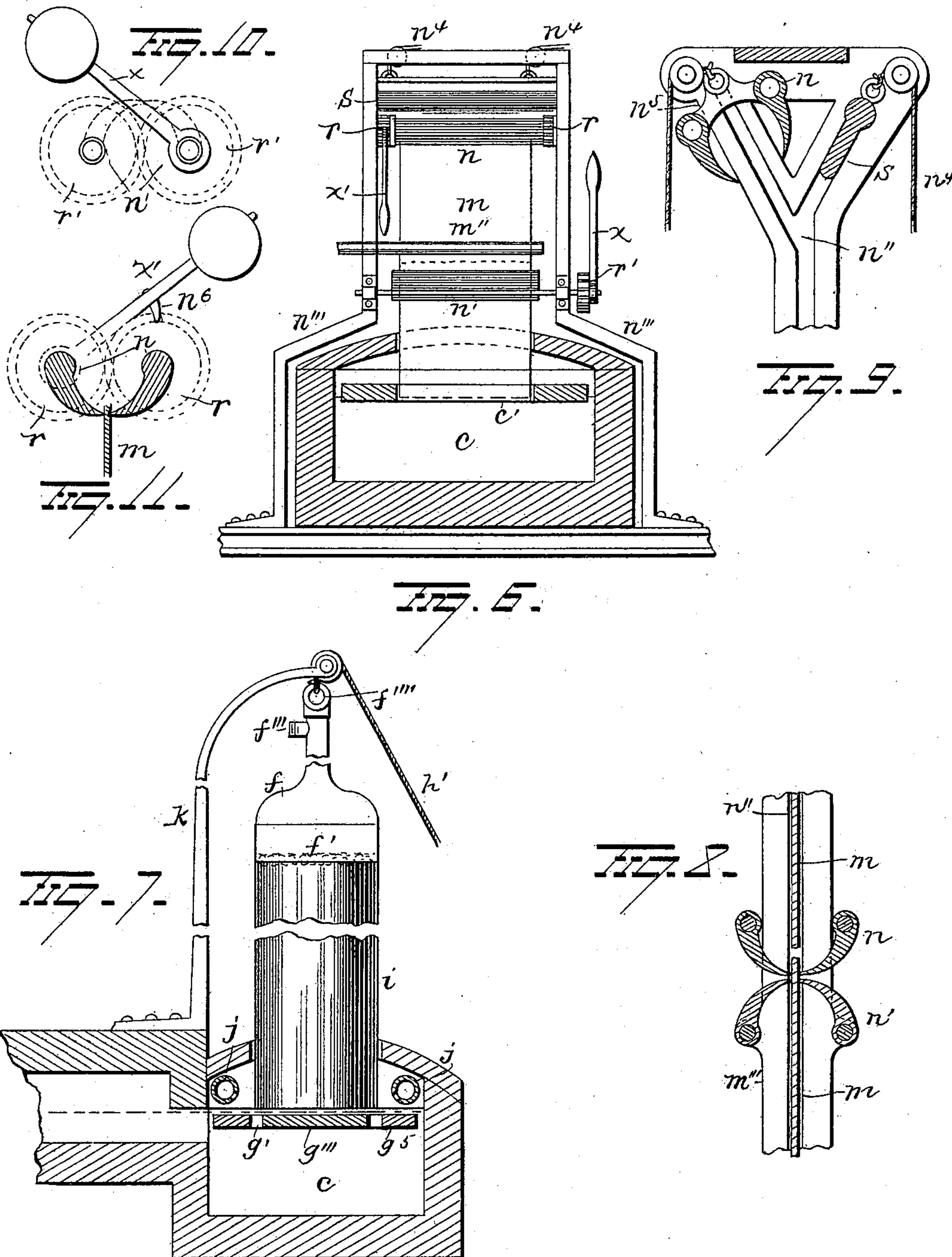
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PROCESS OF AND APPARATUS FOR MANUFACTURING SHEET GLASS.

(Application filed Nov. 9, 1897.)

(No Model.)

2 Sheets—Sheet 2.



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# UNITED STATES PATENT OFFICE.

JAPHUS GEORGE, OF ITHACA, AND CHRISTOPHER MICHAEL SHORTLE, OF  
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PROCESS OF AND APPARATUS FOR MANUFACTURING SHEET-GLASS.

SPECIFICATION forming part of Letters Patent No. 618,861, dated February 7, 1899.

Application filed November 9, 1897. Serial No. 657,978. (No model.)

*To all whom it may concern:*

Be it known that we, JAPHUS GEORGE, a resident of Ithaca, Tompkins county, and CHRISTOPHER MICHAEL SHORTLE, a resident of Bernhard's Bay, Oswego county, New York, citizens of the United States, have invented a new Process of and Apparatus for the Manufacture of Sheet-Glass, of which the following is a specification, reference being had to the accompanying drawings.

Our invention consists in the drawing out of a suitable tank or receptacle which holds a suitable quantity of molten glass the glass in sheets without the usual blowing of the glass; and our invention and the mechanical means by which we accomplish the just-stated manufacture will be apparent as we describe and claim our invention.

In the accompanying drawings, Figure 1 is a transverse section of a melting-tank such as used for natural or artificial gas with our draft-tank attachment at its right-hand end. Fig. 2 is a perpendicular section of the same. Fig. 3 is an enlarged view of our tank attachment. Fig. 4 is a modification of our draft-tank suited to the drawing of the glass out into cylinders. Fig. 5 is a view of the implement by which we draw out the cylinders. Fig. 6 is an elevation of our draft-tank in section and of the means by which we draw out the glass in sheets. Fig. 7 is a view of our instrument with a cylinder attached to it; Figs. 8, 9, 10, and 11, detail views of our clamps for sheet-drawing.

In the drawings, *a* represents the long natural-gas melting-tank, which has at its right-hand end the artificial-stone float *b*, which prevents any unmelted portions of the materials or "batch" from entering the draft-tank *c*, and *d d* indicate the twyer-shaped pipes that admit the natural gas over the tank *e*, which tank part when full has the melted glass up to the level of the broken line *e*. In the draft-tank *c* is the slotted float *c'*, the slot being long when extra large sheets are made or short when the usual sheet of sixty inches is made, as indicated by the dotted lines *c''* across the slot. The lifting up of the sheets of glass is done by clamps described farther on; but it may be desired to make cylinders in the usual form by the

principles and mechanism described. This is indicated in Figs. 4, 5, and 7, in which *f* is the tool by which we draw up the glass. This tool is made of the round bell-shaped base *f'*, the lower edge of which enters the glass in the tank, above which the base portion narrows to the pipe part *f''*, extending up to the air-entrance *f'''*, to which a rubber tube conveying air at any suitable degree of pressure is attached to fill the emerging cylinder, and above the pipe part *f''* the lifting-ring *f''''* is located. The mode of the use of this tool is indicated in Fig. 7 to be that the edge *f'* enters the opening in the arch of the tank *c* and the ring-slot *g'* of the round float *g*, and by the cord *h'* in a pulley on the top of the metallic frame *h* lifts the cylinder *i* upward out of the slot in the float *g*. As the diameter of the usual cylinder is some fourteen inches, the size requisite of the tank in making cylinders is quite small, being only some twenty-four inches in its internal diameter. Hence the tank *c* is either made to suit it in size or two or three cylinder devices are used side by side.

In Figs. 4 and 7 near the floats are the pipes *j*, that convey cool air to near the surface of the float *g*, the blast out of these pipes through small apertures cooling the emerging glass close down to the float. This enables us to make sheets or cylinders of any desired thickness and to continue as long as desirable the draft upward of the sheets or cylinders. When the sheets or cylinders have been drawn out the desired lengths—as, for example, the sheets to the height of eighty-eight inches—it is requisite to cut off the upward forty-four inches. This is done by heating the sheet *m* along the line *m'* by the gas blast-pipe *m''*, so that it is easily cut by a knife or other means, the clamp *n* holding the upper portion of the sheet *m* and the clamp *n'* the lower portion while the division is made. As soon as this is done the upper part of the sheet is removed out of the way, and the clamp *n* is lowered, as shown in Fig. 8, and made to seize the upper edge of the lower part of the sheet and elevate it. By the repetition of this use of these clamps the drawing up and the division of the ascending sheet into separate parts, such as sixty inches by forty-four,



is continued as long as is desirable. The commencement of the process is by the use of the plate, which descends, and its lower edge enters the molten glass, which, as is well known, adheres to iron edges, pipes, &c., and by this plate-bar the first elevation is made, and after that the clamps are used, as described. In making cylinders while the high lift just described of the sheet might be used it seems more desirable that the elevation of the cylinder be only some five or six feet and that for each cylinder the edge of the tool *f* be entered into the molten glass.

The upper part of Fig. 6 while it indicates the general use of the bar *S* and clamps *n n'* does not admit full details of the bar *S* or clamps *n n'*, they being indicated fully in Figs. 8, 9, 10, and 11, and by what has been said it is apparent that the starting-bar *S* and the clamp *n* need to be capable of separation clear of each other. To accomplish this, it will be seen that in Fig. 9 the upper end of the ways *n''* of the frame *n'''* bifurcate and that when the chain or cord *n<sup>4</sup>* is drawn sufficiently the bar *S* will enter the right-hand fork of the ways. This puts the bar *S* out of the way while not in use. A similar entrance of the bed-plate *n<sup>5</sup>*, to which the two bars of the clamp *n* are journaled, draws the clamp *n* out of the way of the bar *S* when desirable. The jaws of the clamp *n* are provided with intermeshing pinions *r*, and the jaws of the clamp *n'* are provided with intermeshing pinions *r'*. The weighted lever *x* of the clamp *n'*, which is immovably fast to the frame *n'''*, is indicated in Fig. 10. The weighted lever *x'* of the clamp *n* is more unstable in its grasp. Hence the tooth *n<sup>6</sup>* catches in the cogs of the clamp *n*. Gas-tubes for heating and cool-air tubes are used at any desirable places or at *m'* and at the bar *S* to cool or to heat near the bar *S* for the division of the sheet. The bearing edges of the clamps may be plain or tooth-shaped.

Various changes might be made in the details of construction of our invention without departing from the spirit thereof or limiting its scope, and hence we do not wish to limit ourselves to the precise details herein shown and described.

What we claim in the above-described process and mechanical means for its use is—

1. The herein-described process consisting in drawing from a molten mass of glass, a

body of glass, cooling said body as it leaves the molten mass, heating said body at a point between its ends and then dividing said body at the heated point, substantially as set forth.

2. In an apparatus for drawing glass, the combination with a receptacle for molten glass, of a frame, two independently-operating clamps mounted in said frame over the receptacle, said clamps being disposed one above the other and means for moving the upper clamp vertically, substantially as set forth.

3. The combination with a tank for molten glass, and means for drawing a glass body from a molten mass in said tank, of two independent clamps adapted to engage the glass body at different elevations and a gas-pipe having jets adapted to direct heat against the glass body at a point between the clamps, substantially as set forth.

4. The combination with a tank for molten glass and means for drawing a glass body therefrom, of a clamp comprising two jaws adapted to receive the glass body between them, intermeshing pinions secured to said jaws and a weighted lever secured to one of said jaws, substantially as set forth.

5. The combination with a tank for molten glass and means for drawing a glass body therefrom, of a clamp comprising jaws adapted to receive the glass body between them, intermeshing pinions secured to said jaws, a weighted lever secured to one of said jaws and a tooth projecting from said lever and adapted to engage one of said pinions, substantially as set forth.

6. The combination with a tank for molten glass and a framework over the same having a bifurcated upper end, of a starting-bar for drawing a glass body from the molten glass in said tank, said starting-bar mounted to move vertically in said framework and enter one of the members of the bifurcated upper end thereof, and a clamp to receive the glass body, said clamp also mounted to move vertically in said framework and adapted to enter the other member of the bifurcated end thereof, substantially as set forth.

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