

No. 677,330.

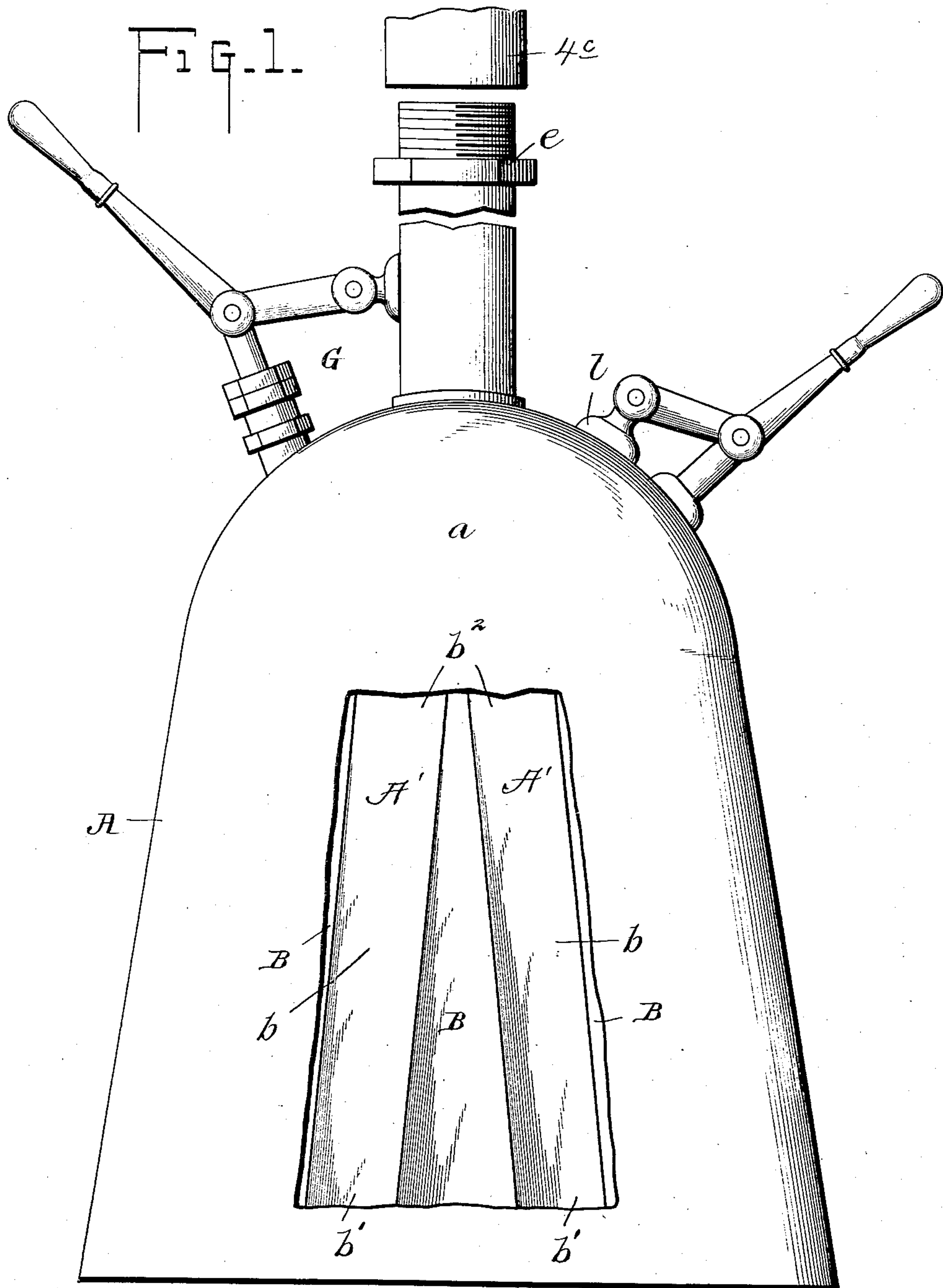
Patented June 25, 1901.

C. H. VALENTINE.
PULP MOLDING DEVICE.

(Application filed June 9, 1900.)

(No Model.)

5 Sheets—Sheet 1.



ATTEST-

Harry L. Amer.
George M. Anderson

INVENTOR-

Caleb H. Valentine.

By E. W. Anderson -
his Atty

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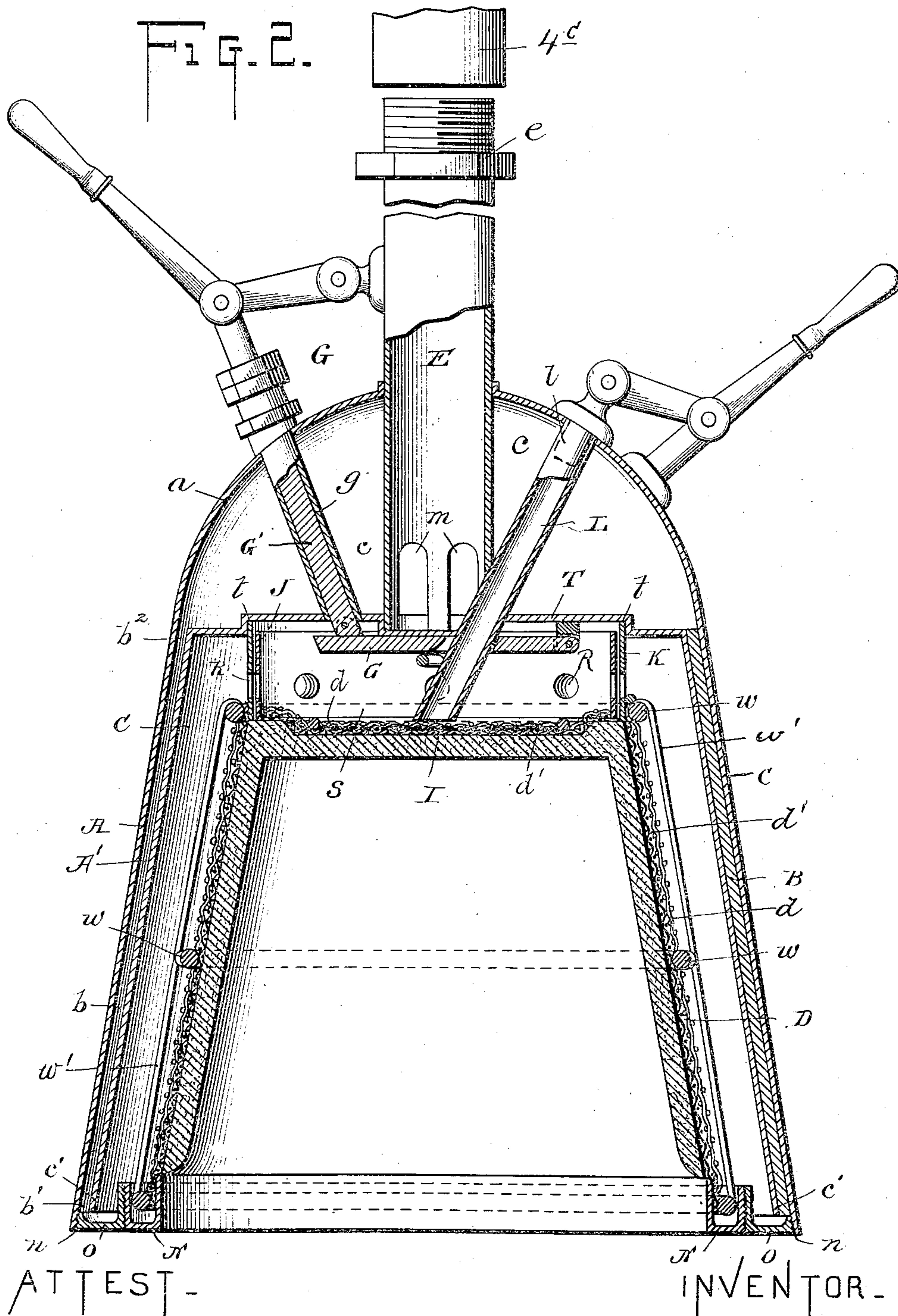
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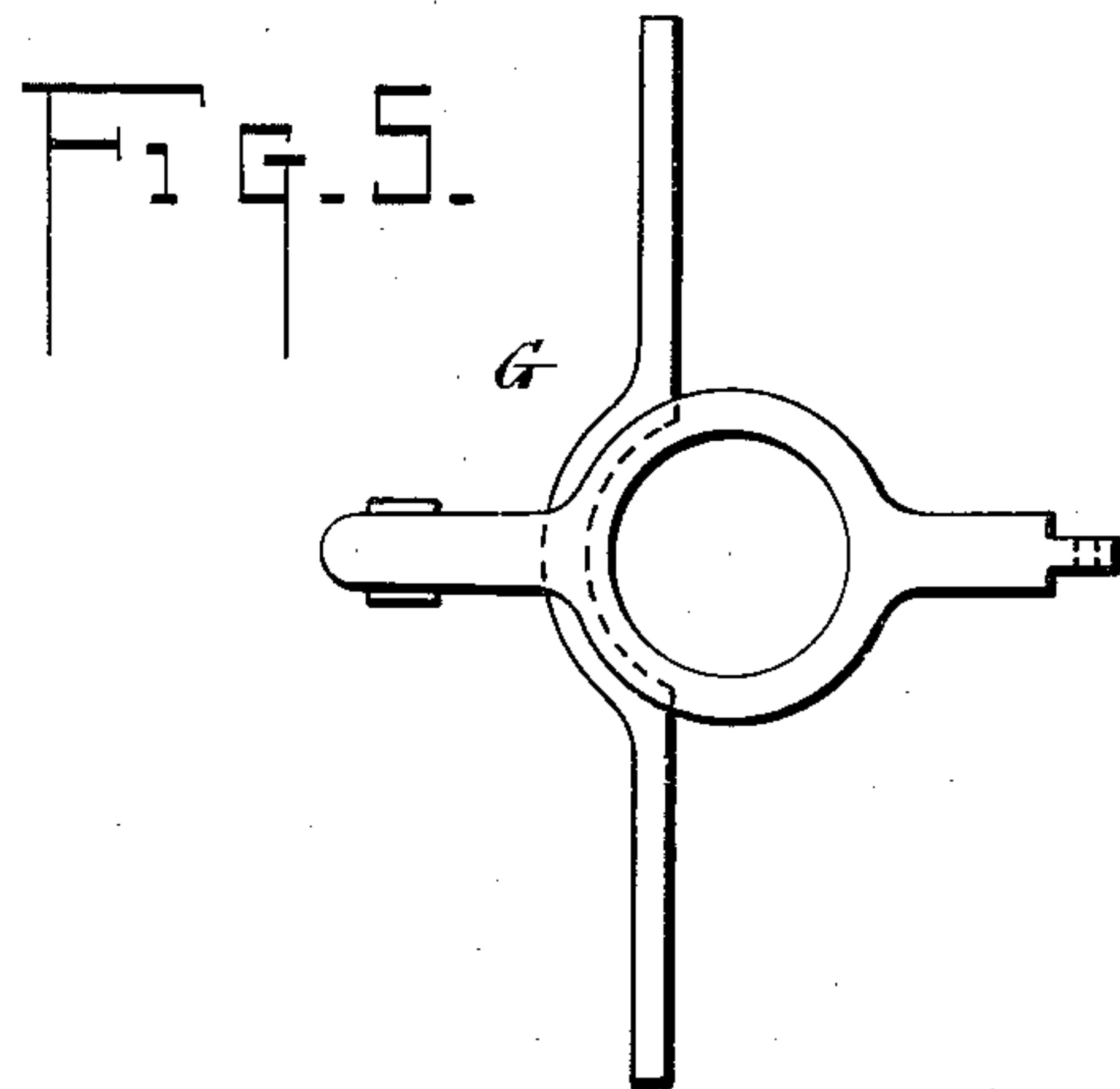
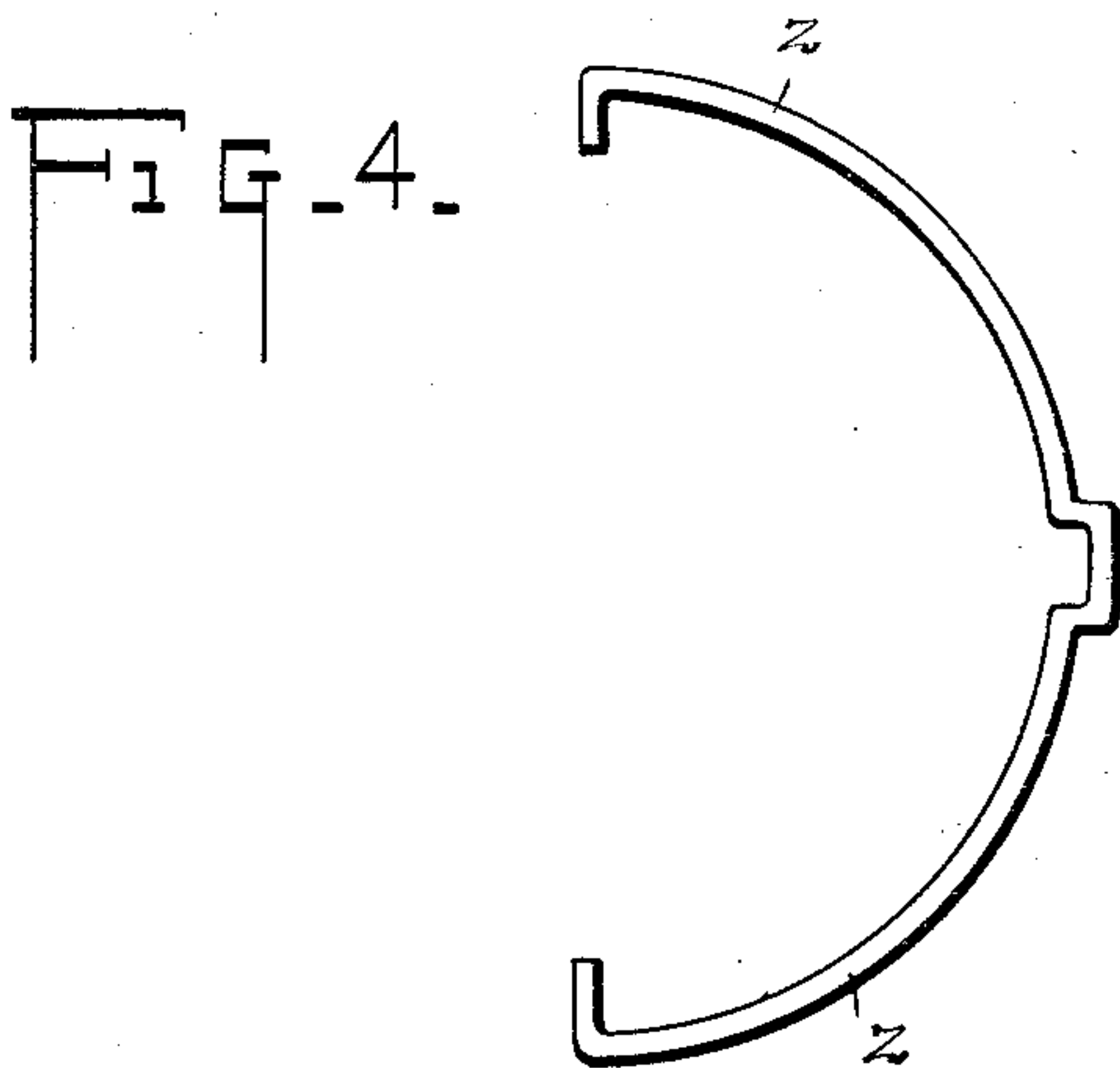
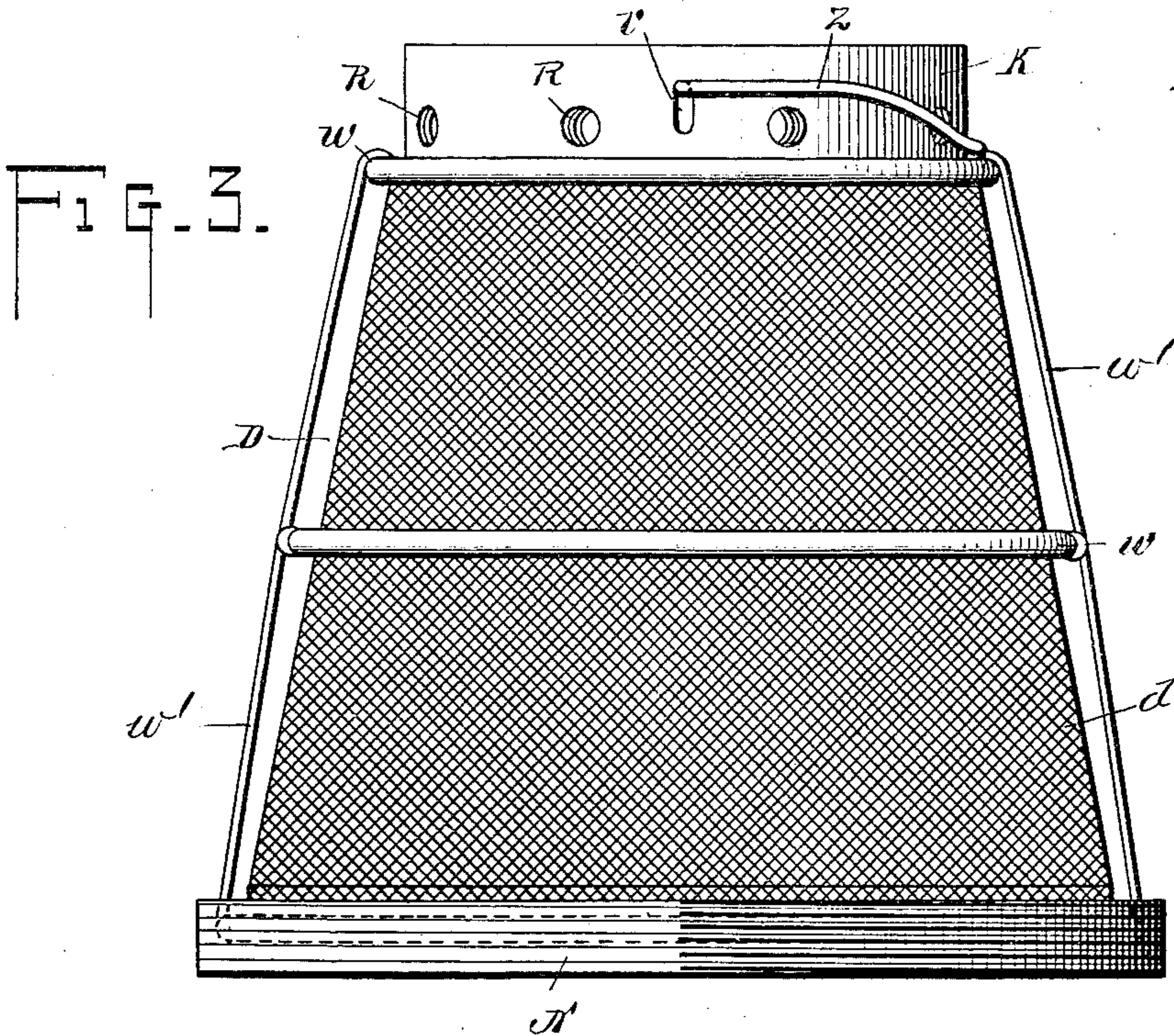
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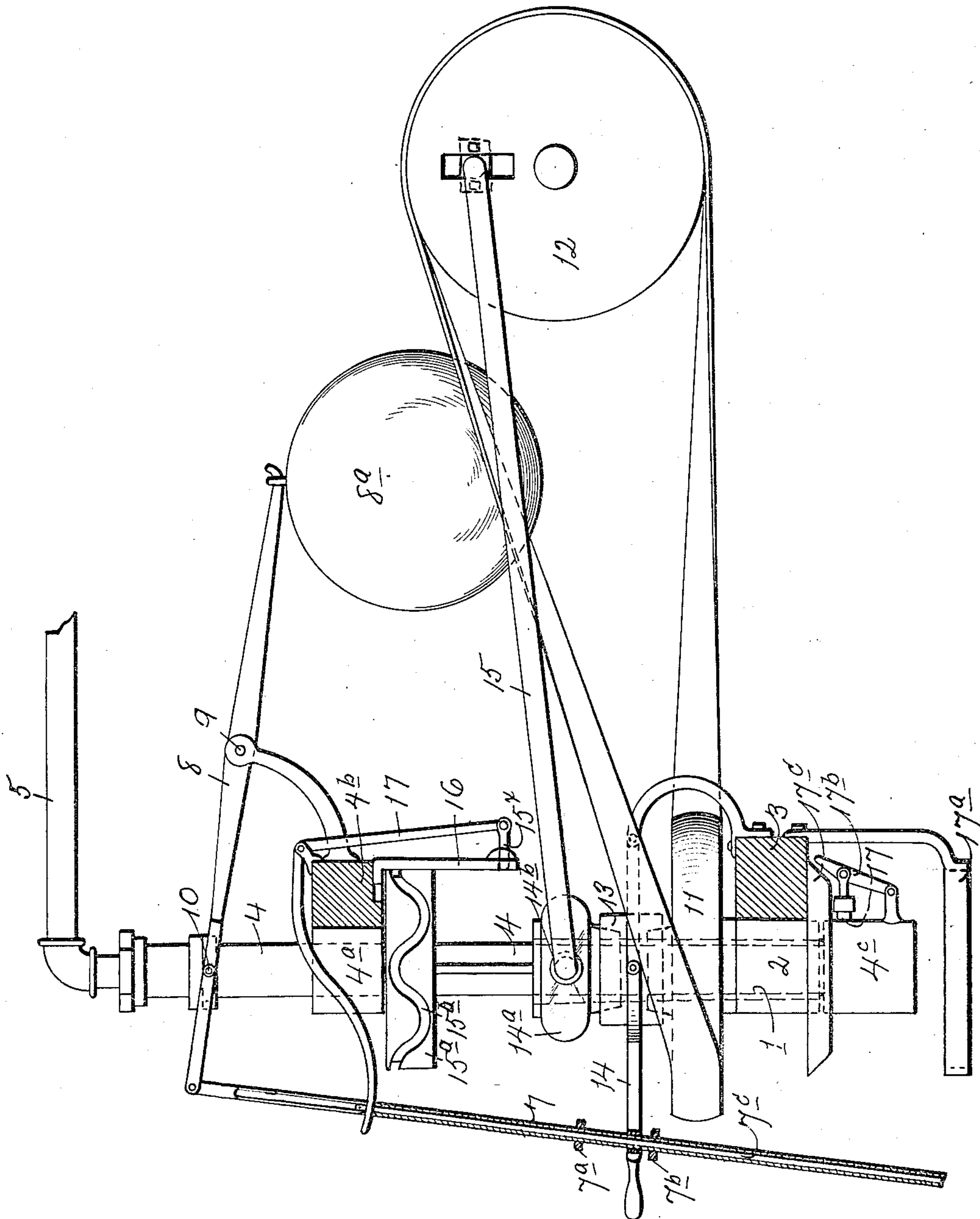
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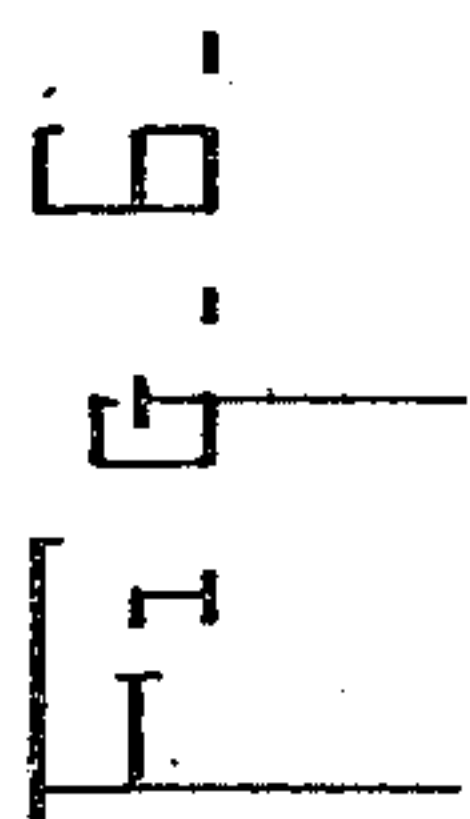
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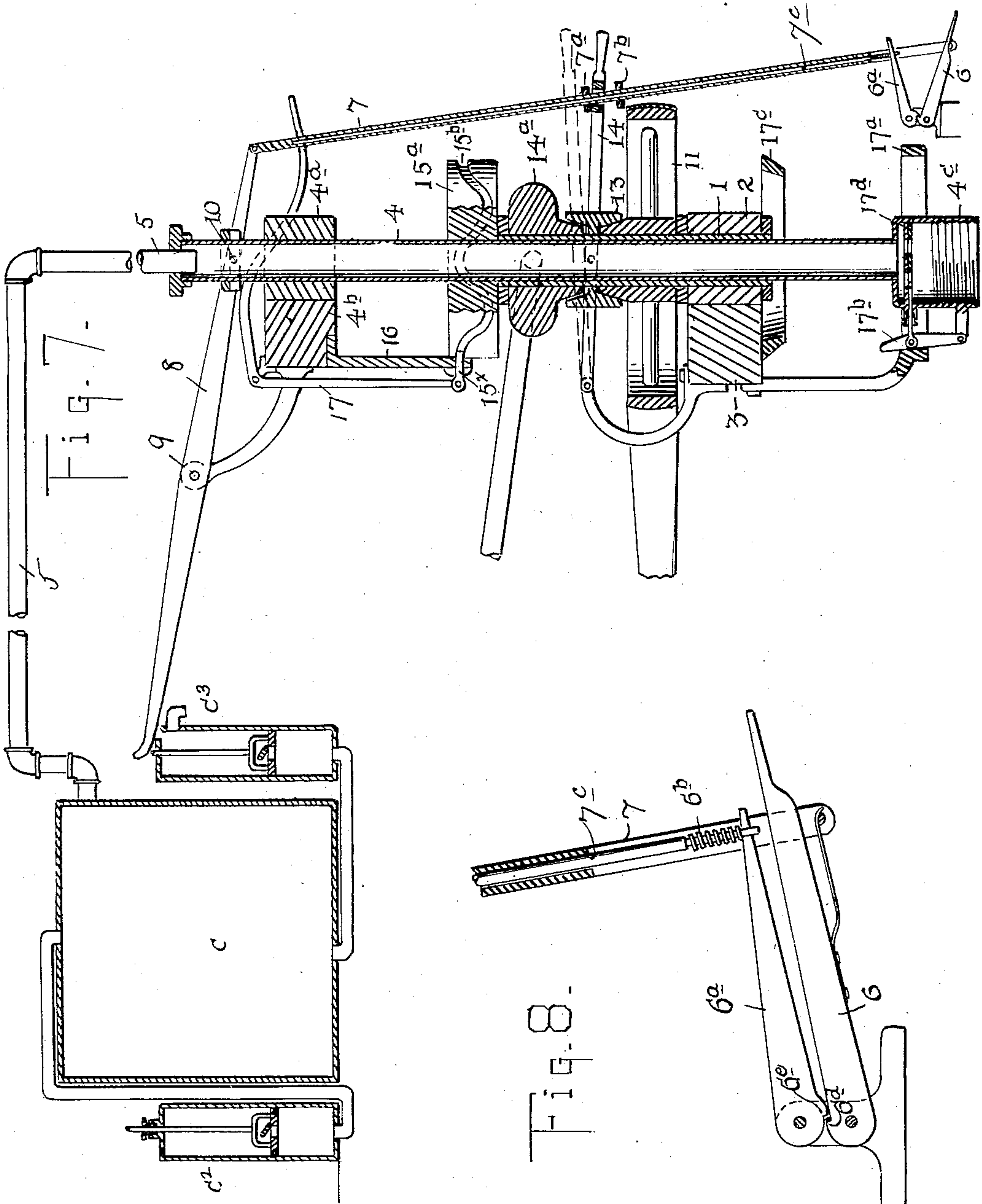
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5 Sheets—Sheet 5.



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UNITED STATES PATENT OFFICE.

CALEB H. VALENTINE, OF BELVIDERE, NEW JERSEY, ASSIGNOR OF ONE-HALF TO WILLIAM H. MORROW, OF SAME PLACE.

PULP-MOLDING DEVICE.

SPECIFICATION forming part of Letters Patent No. 677,330, dated June 25, 1901.

Application filed June 9, 1900. Serial No. 19,756. (No model.)

To all whom it may concern:

Be it known that I, CALEB H. VALENTINE, a citizen of the United States, and a resident of Belvidere, in the county of Warren and State of New Jersey, have made a certain new and useful Invention in Pulp-Molding Devices; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the invention, reference being had to the accompanying drawings, and to letters and figures of reference marked thereon, which form a part of this specification.

Figure 1 is a side elevation of the molding device and attached parts, partly broken away. Fig. 2 is a central vertical section of the same. Fig. 3 is a side elevation of the wire mold or form D. Fig. 4 is a detail view of springs ϵ . Fig. 5 is a detail view of lever device G and parts engaged thereby. Fig. 6 is a side elevation of mechanism for imparting the different motions to shaft 4 and the molding device connected thereto. Fig. 7 is a central longitudinal section of the mechanism shown in Fig. 6 of the drawings, the pedal being shown as depressed and showing the vacuum-chamber and pumps. Fig. 8 is an enlarged detail view of the devices for moving the rod 7^o upwardly upon depression of the treadle.

The invention has for its object the formation of articles of various kinds from fibrous pulp of paper, wood manila, hemp, jute, straw, &c.; and the invention consists in the novel construction and combinations of devices, as hereinafter set forth.

The object of the invention is not only to form the various articles, but to provide in the formative process for the drawing out of the fibers of the material as the article is formed, so that such fibers will lie in a smooth way and the article will have a structure of a laminated and tough nature. In the manufacture the application of a vacuum or suction to air-tight molds or forming-chambers and the motion of said molds or forming-chambers are involved in the invention.

In the accompanying drawings, illustrating the application of the process in the manufacture of pails or buckets, the letter A design-

ates the outer air-tight casing of the mold or forming-chamber.

BB indicate tapering division-strips which are located between the outer and inner air-tight casings A A' and serve to connect said casings while keeping them at an equal distance apart all around. The intervals or flues b between the division-strips are of the same size from the bottom or inlet end at b' to the top b^2 , where they communicate with the chamber c , which is formed between the top a of the outer case and the top T of the inner case. The sectional area of the flues b taken together should be about equal to the sectional area of the suction-pipe E. An air-exhaust pump c^2 is connected to the top of the vacuum-chamber and a water-exhaust pump c^3 is connected to the bottom of such chamber. The lower edge c' of the inner case A' extends nearly to the lower end of the outer case, but is nevertheless free in order that the water may be drawn around it to reach the flues of the incasement. To the bottom of the outer case is secured by means of a threaded construction the inner ring O, which is provided with a screw-thread on its inner side also for connection with the lower ring N of the wire-cloth mold or form D. This connection is designed to be air-tight. The top T of the inner case is preferably made with a central recess for the reception of the end of the exhaust-pipe E, as it provides for centering said pipe in a secure manner. The pipe is fastened to the outer casing, through which it passes, as indicated. Communicating openings between the interior of the pipe and the chamber c are indicated at m .

The wire mold or form D, made in the shape of the pail or other article to be formed, is constructed of coarse heavy wire d on the outside to give it strength and rigidity and to provide free discharge for water and of fine wire cloth, or gauze d' on the inside to hold the pulp and prevent it from passing through. The wire-cloth is secured at bottom to the ring N and at the top to the band K, said band being provided with apertures R for the discharge of water, which is, in the formative operation, drawn through the wire-cloth top I of the mold or form.

The mold or form D may be provided with

strengthening rings or bands, as indicated at *w*, connected by braces *w'*.

In the top T of the inner case is formed an annular recess or internal abutment (indicated at *t*) designed to receive the upper edge of the band K of the wire mold or form and keep the latter in proper central position.

The top S of the mold or form is separable from the side mold or form and is also constructed of coarse and fine wire-cloth, which are secured to the inner band J, which fits within the band K in a manner sufficiently loose to allow it to be moved downward and upward by means of a lever device, (indicated at G,) whereof the handle G' passes through a tubular bearing *g* in such a manner as not to interfere with the suction. By means of the lever device the top form S is pushed down after the pail is formed on the wire-cloth, and in this manner the pail or other article can be readily ejected from the mold. In order to supply air above the top form I when the article is to be pushed downward, an air-tube L is provided, this tube being kept normally closed while the article is being formed, the stop-valve (indicated by letter *l*) being opened after the mold is raised out of the pulp-vat and just before the suction is shut off. Then the air rushing in blows the water off the top of the form S and out through the holes R, and the suction clears the mold of all water and leaves the pail or other article free to be ejected. Springs *z*, connected to band K, serve to engage projections of the band J of the top form, which extend through slots *v* in said band K, and are designed to automatically raise the top form to position after it has been depressed for the purpose of ejecting the formed pail or other article from the mold.

A coupling *e* is provided at the upper end of the pipe E, whereby the device is connected to a hollow upright shaft 4, which is provided with a bearing and is geared to receive rotary motion as well as up-and-down motion for all round wares and backward and forward as well as up-and-down motion for articles of oblong or elongated forms. The top of the hollow shaft is provided with a suitable coupling to connect it with a pipe leading to an air-tight chamber C, which has an air-pump C² attached to its upper portion and a water-pump C³ attached to its bottom, said pumps being respectively for the purpose of exhausting the air and water from the forming device. A valve is provided in the lower end of the hollow shaft which is arranged to open when the molding device descends into the pulp-vat and to close when it rises out of the pulp. In this operation it will be observed that the molding device having a rotary or reciprocating motion is lowered into the pulp-vat, and the suction causes the pulp to adhere to the wire-cloth of the form in a laminated way, the fibers being drawn out by the movement of the mold

in the pulp, so that they lie smooth and close, and when a suitable thickness of pulp has been accumulated to form the article the molding device is raised out of the pulp, the air-inlet opened, and the article ejected from the mold. While these movements can be made by hand, it is preferred to connect the molding device to mechanism which will lower and raise and give the rotary or reciprocating motion to the molding device in an automatic manner. This machinery for accomplishing these movements may be described as follows: Referring to Fig. 6 of the drawings, the numeral 1 indicates an upright sleeve having bearings at its lower end portion in a box 2, secured to support 3. Sliding in this sleeve and rotatably connected therewith is a hollow shaft 4, provided with a bearing at its upper portion in the box 4^a upon support 4^b, and having a screw-coupling 4^c at its lower end with the coupling *e* of exhaust-pipe E, and having a communication at its upper end with a pipe 5, leading to a vacuum-tank C, in which a vacuum is obtained by a vacuum air-pump C², attached at the top, and a suction water-pump C³, attached at the bottom. 6 is a pedal having a connecting-rod 7, with a lever 8 pivoted at 9 and connected with shaft 4 at 10, whereby upon downward pressure upon the pedal the shaft 4 is forced downwardly and through the coupling at its lower end the molding device is also forced downwardly into the pulp. A pulley 11 is loosely mounted upon the sleeve 1 and is belted to a second pulley 12 to give said sleeve-shaft 4 and molding device rotary motion when connected to said sleeve by the friction-clutch 13, which may be operated by hand through the lever 14 or through downward movement of the connecting-rod 7 by the collar 7^a. 14^a is a collar loose upon said sleeve, and 15 a connecting-rod between pulley 12 and arm 14^b of said collar to obtain a forward and back rotary movement of said sleeve-shaft and molding device through the friction-clutch 13, which may be operated by hand through the lever 14 or through upward movement of the connecting-rod 7 by the collar 7^b thereon.

15^a is a collar fast upon the shaft 4 and which is provided with a cam-groove 15^b therein, engaged by a pin 15^x, sliding through a guide-opening of bracket 16, secured to support 4^b, said pin being actuated by the bell-crank lever 17 upon upward movement of rod 7^c after the collar has been brought downward by operation of the pedal, with the cam-groove in register with said pin. This rod 7^c slides in hollow connecting-rod 7 and is forced upwardly when said rod 7 is forced downwardly by means of a lever 6^a, pivoted above the treadle 6 and connected to said rod 7^c at its free end, a spring 6^b surrounding the end portion of said rod, being interposed between said lever and a shoulder of the rod to cause a yielding pressure to be exerted upon said rod by

said lever. When the treadle is moved downwardly a short distance, a lug 6^d thereof at its pivoted end engages a lug 6^e of the lever 6^a, at the pivoted end thereof, to cause said lever and rod 7^c, connected thereto, to move upwardly during the remainder of the downward movement of said treadle to effect the result hereinbefore described.

A counterweight 8^a is provided upon lever 8 for the purpose of raising the molding device out of the pulp after the article is formed.

A valve 17^d is located in the coupling 4^c, which valve is opened just as the molding device enters the pulp by means of ring 17^a engaging pivoted valve-lever 17^b as the hollow shaft 4 moves downwardly through such ring. This valve 17^d is closed when the shaft 4 reaches its highest point by engagement of pivoted valve-lever 17^b with a tapered ring 17^c.

To describe the operation in detail, the mold or form D is first lowered into the pulp-vat, the valve 17^d automatically opening, and suction is then applied through hollow shaft H and pipe E by the air-exhaust pump. The pulp is thus drawn into the mold or form, the water passing through such mold into the annular space between the same and the inner casing A', up flues b into chamber c, through openings m, pipe E, and hollow shaft H to the vacuum-chamber, the pulp being through suitable movement of the form or mold D distributed in an even manner thereover. When the article is formed and it is desired to eject it from the mold, the air-inlet valve l is opened and the movable top of the mold pushed downwardly through the lever devices aforesaid.

Having described this invention, what I

claim, and desire to secure by Letters Patent, is—

1. The combination with an air-tight wire-cloth molding device, and a hollow shaft connected thereto, of mechanism adapted to give said shaft a rotary an up-and-down vibratory and a vibratory rotary motion, a vacuum-chamber, an air-pump and a water-pump, substantially as specified.

2. In a molding device for fibrous articles, the combination with an air-tight incasement and an exhaust-tube in connection thereunto, of an inner wire-cloth mold or form, a movable wire-cloth top thereof, and devices for moving said top to eject the formed article, substantially as specified.

3. In a molding device for fibrous articles, the combination with an air-tight incasement and its exhaust-tube, of an inner wire-cloth mold or form, a movable wire-cloth top thereof, lever devices for moving said wire-cloth top, and a valved air-supply tube, substantially as specified.

4. In a molding device for fibrous articles, the air-tight incasement having an exhaust-tube, and double-wall casing provided with flues between said walls of sectional area approximately equal to the sectional area of said exhaust-tube, and connected to said incasement, an inner wire-cloth mold or form, substantially as specified.

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

CALEB H. VALENTINE.

Witnesses:

CHARLES E. HARRIS,
RODERICK B. LEADER.