

No. 608,554.

Patented Aug. 2, 1898.

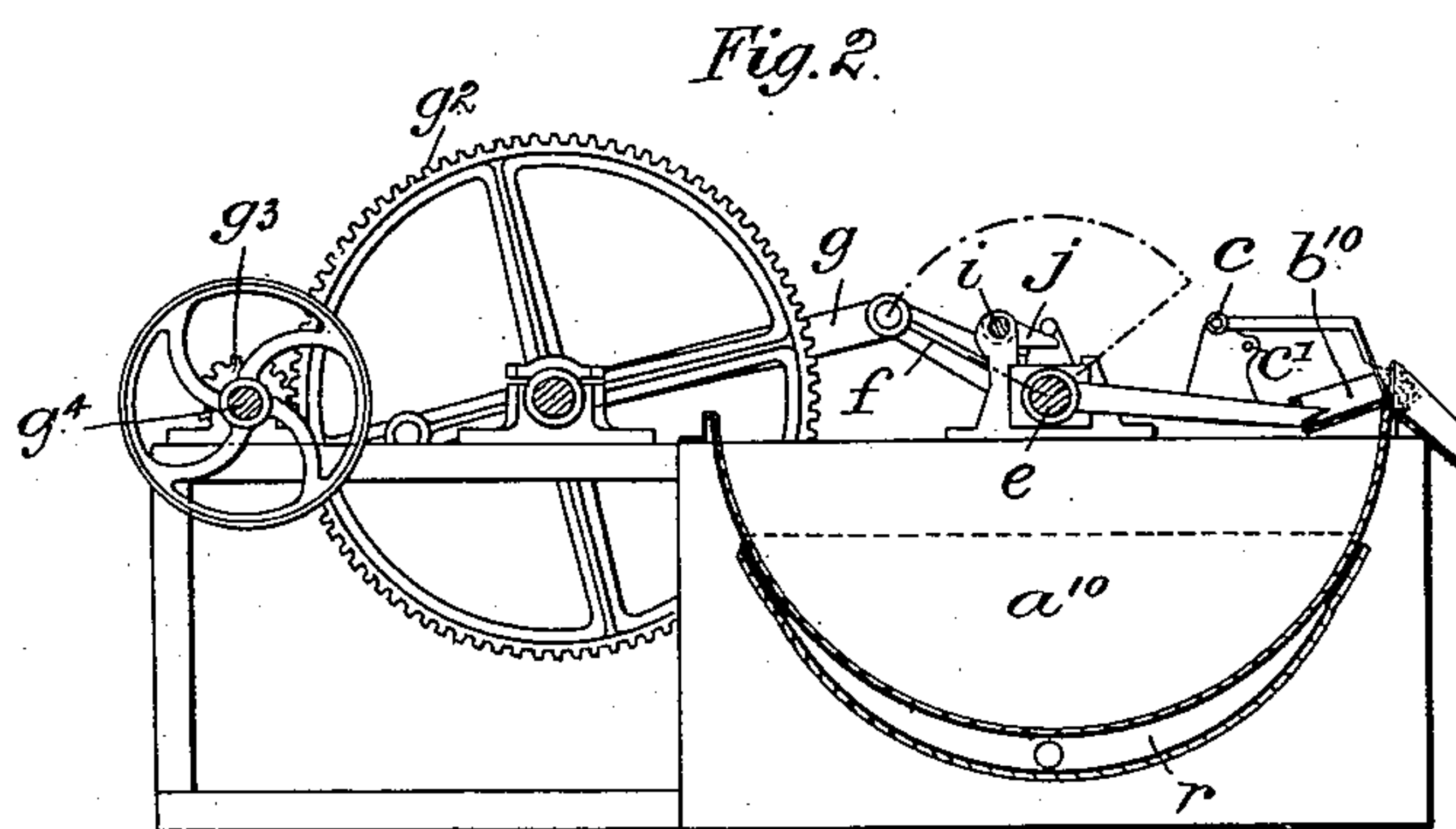
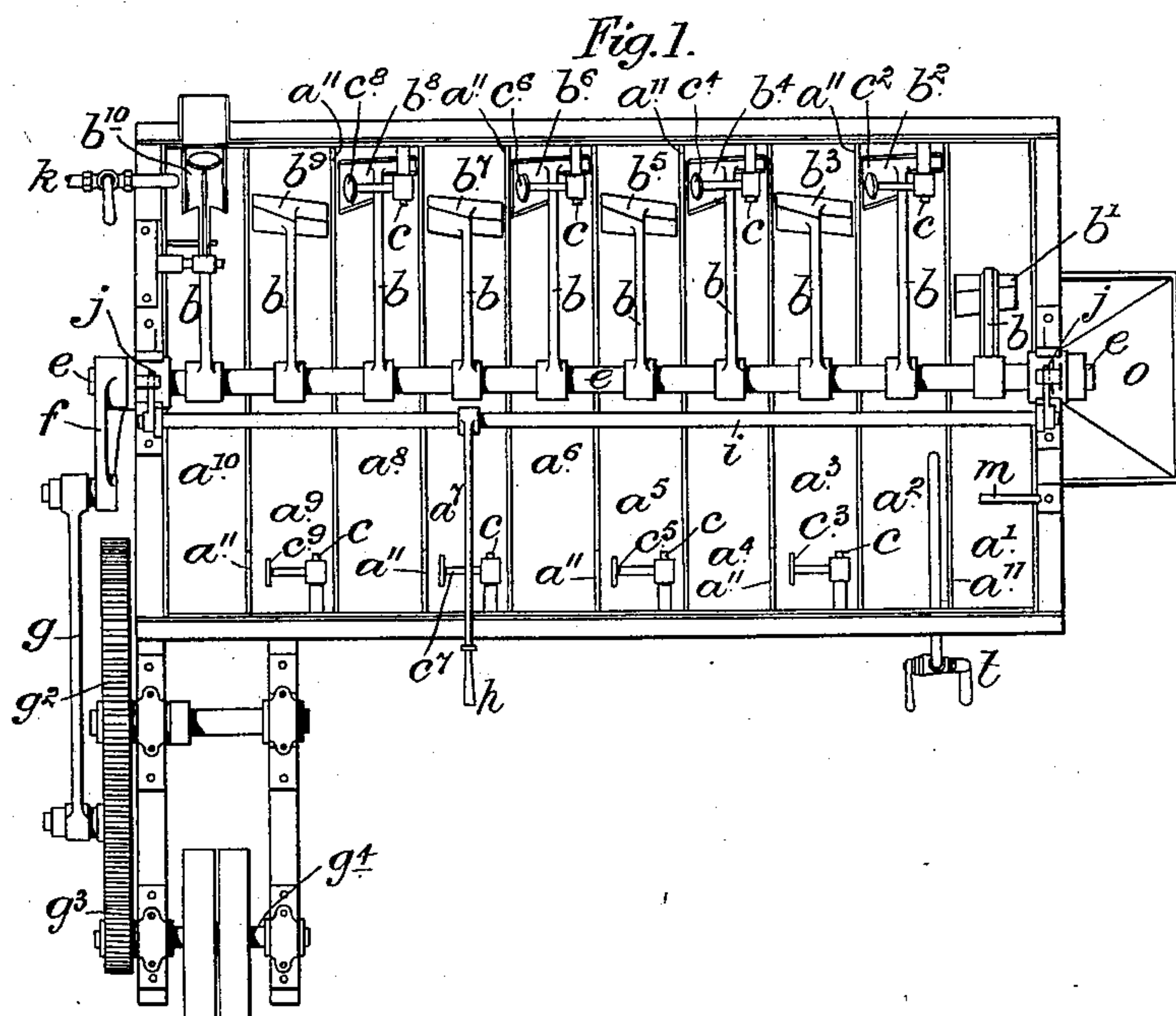
R. MOODIE.

WASHING OR LEACHING APPARATUS.

(Application filed May 16, 1898.)

(No Model.)

2 Sheets—Sheet 1.



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2. Sheets—Sheet 2.

Fig. 3.

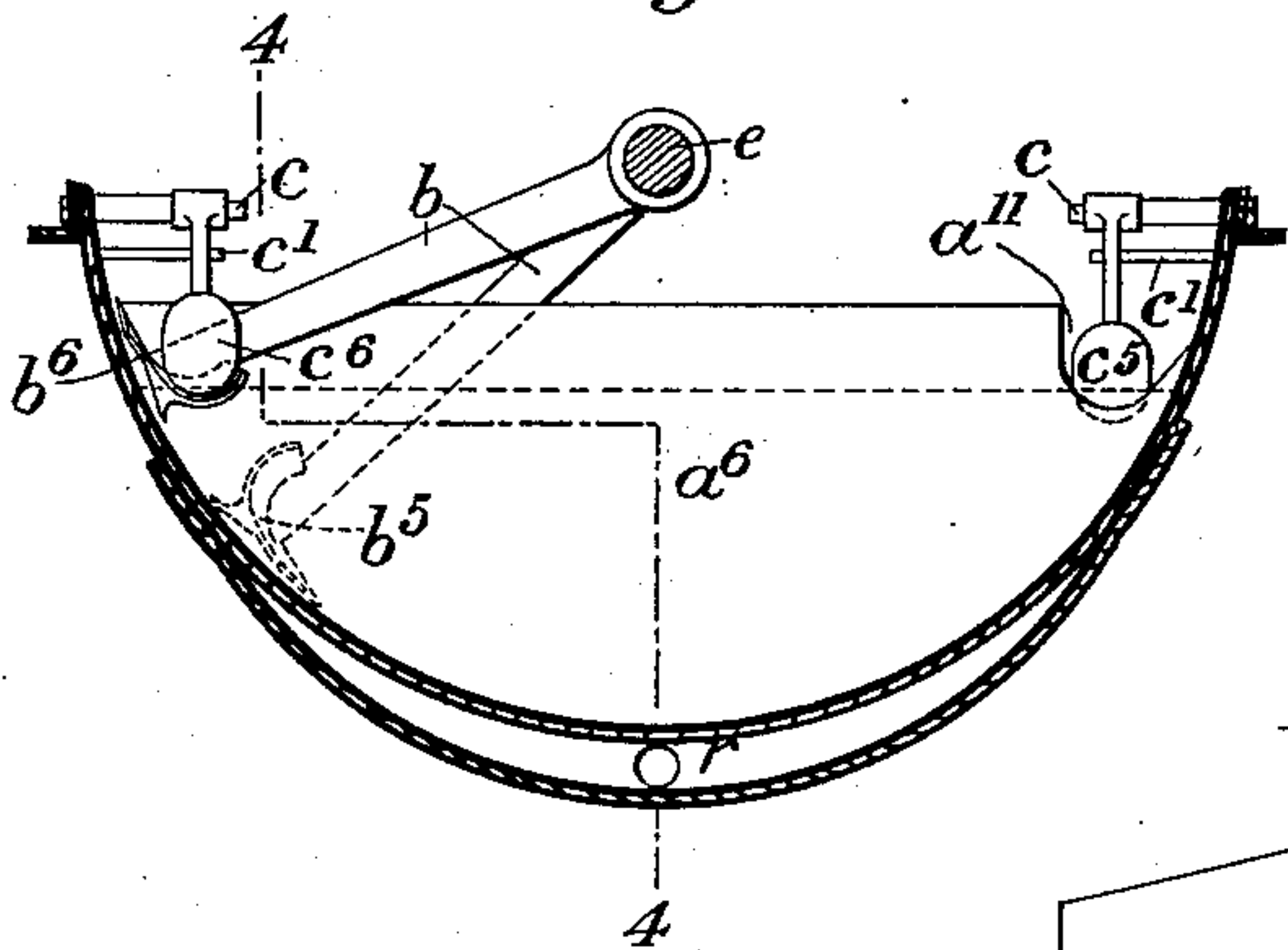


Fig. 4.

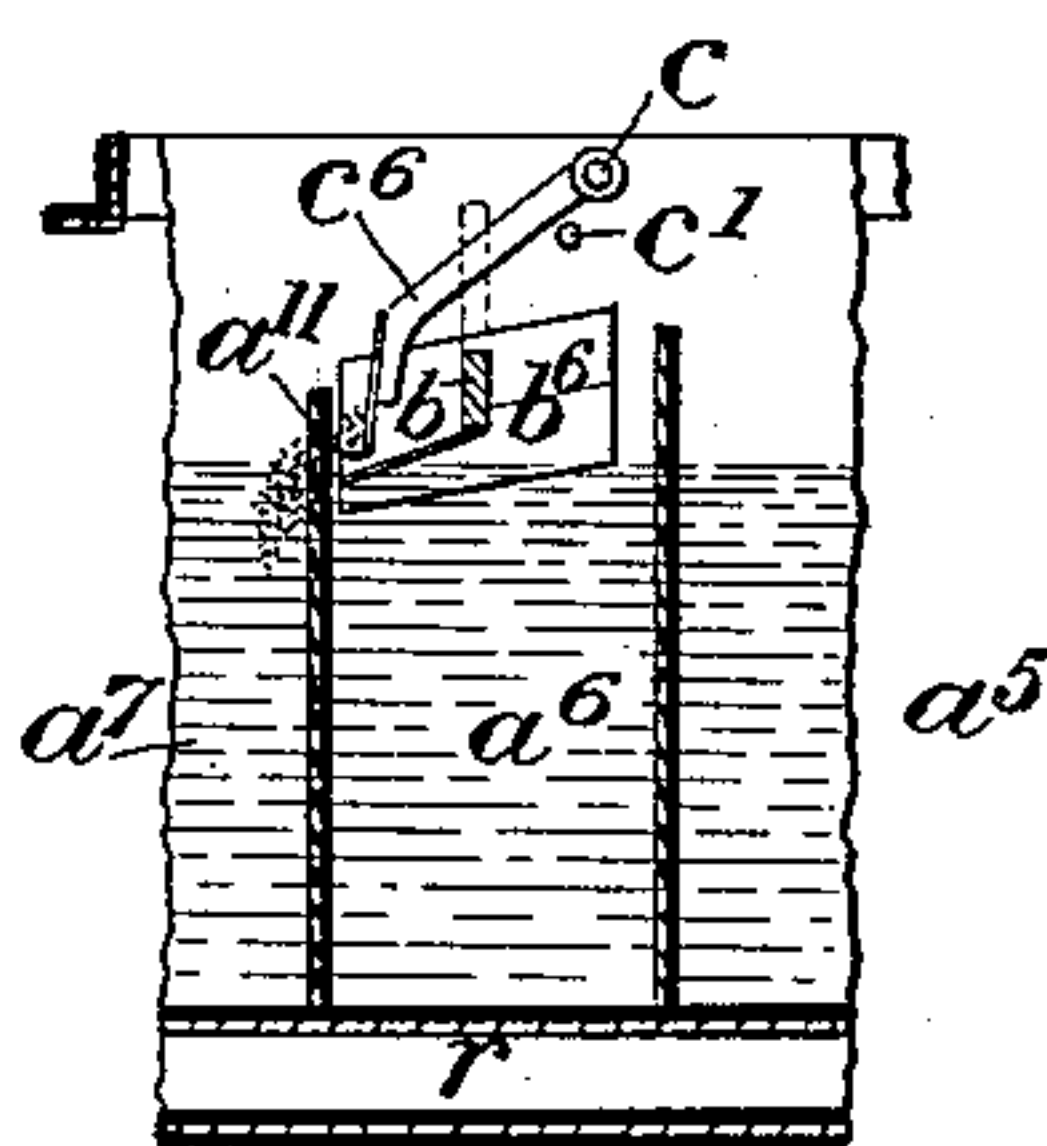


Fig. 7.

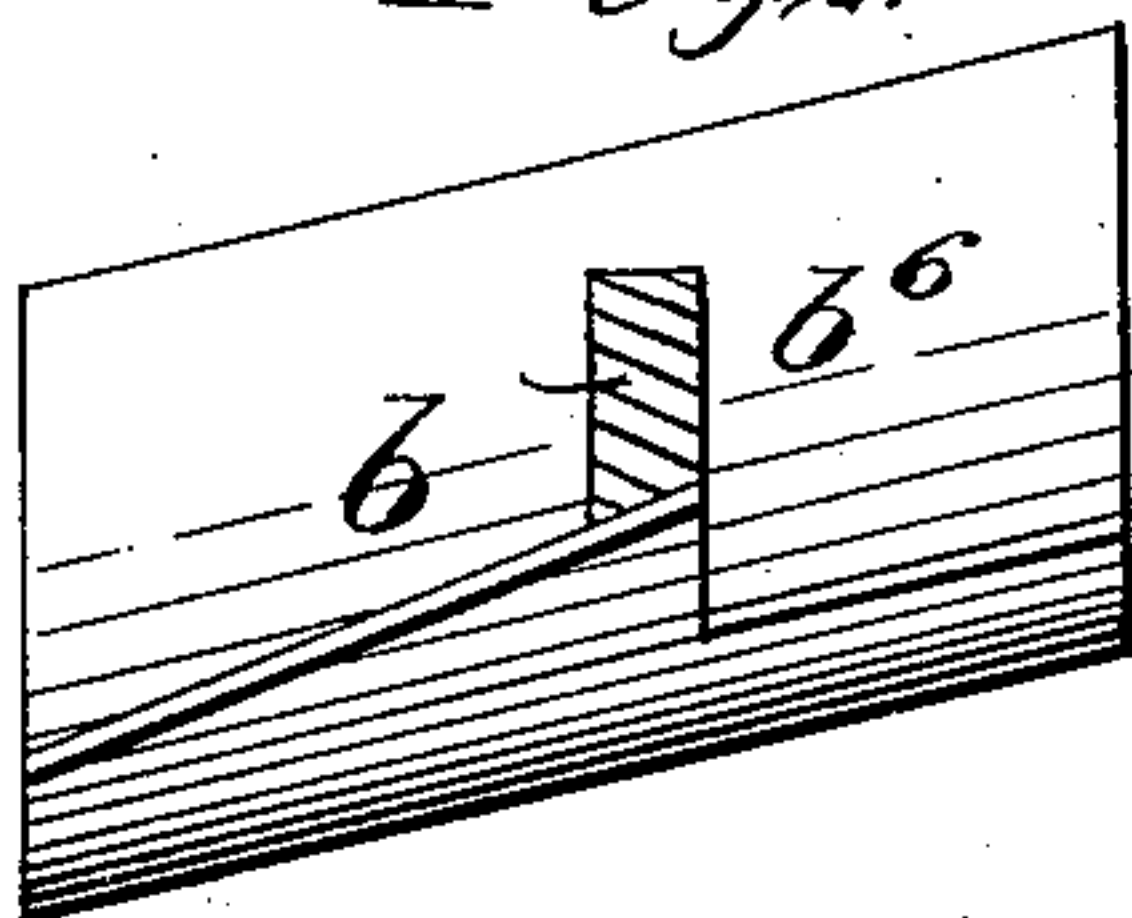


Fig. 5.

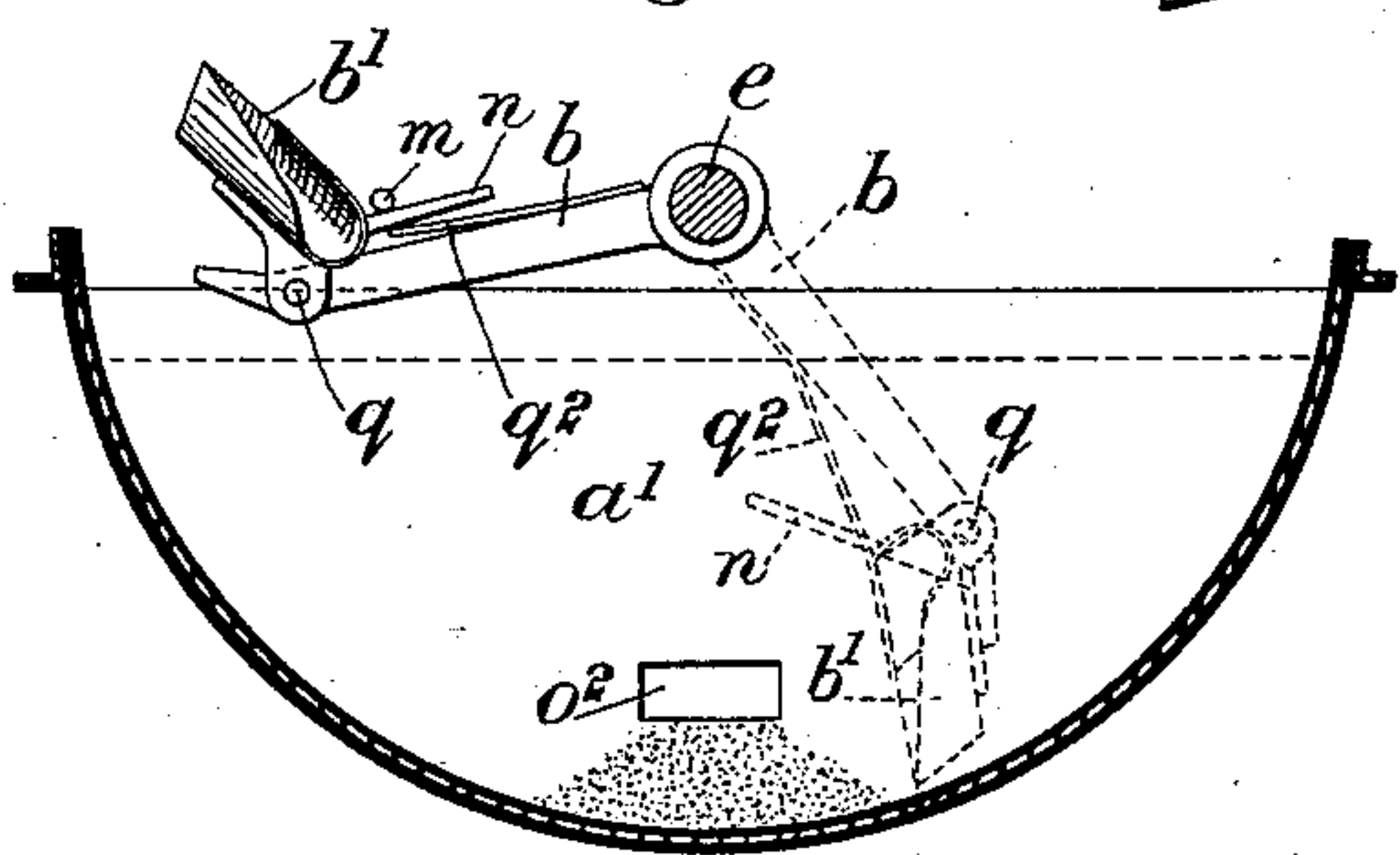


Fig. 6.

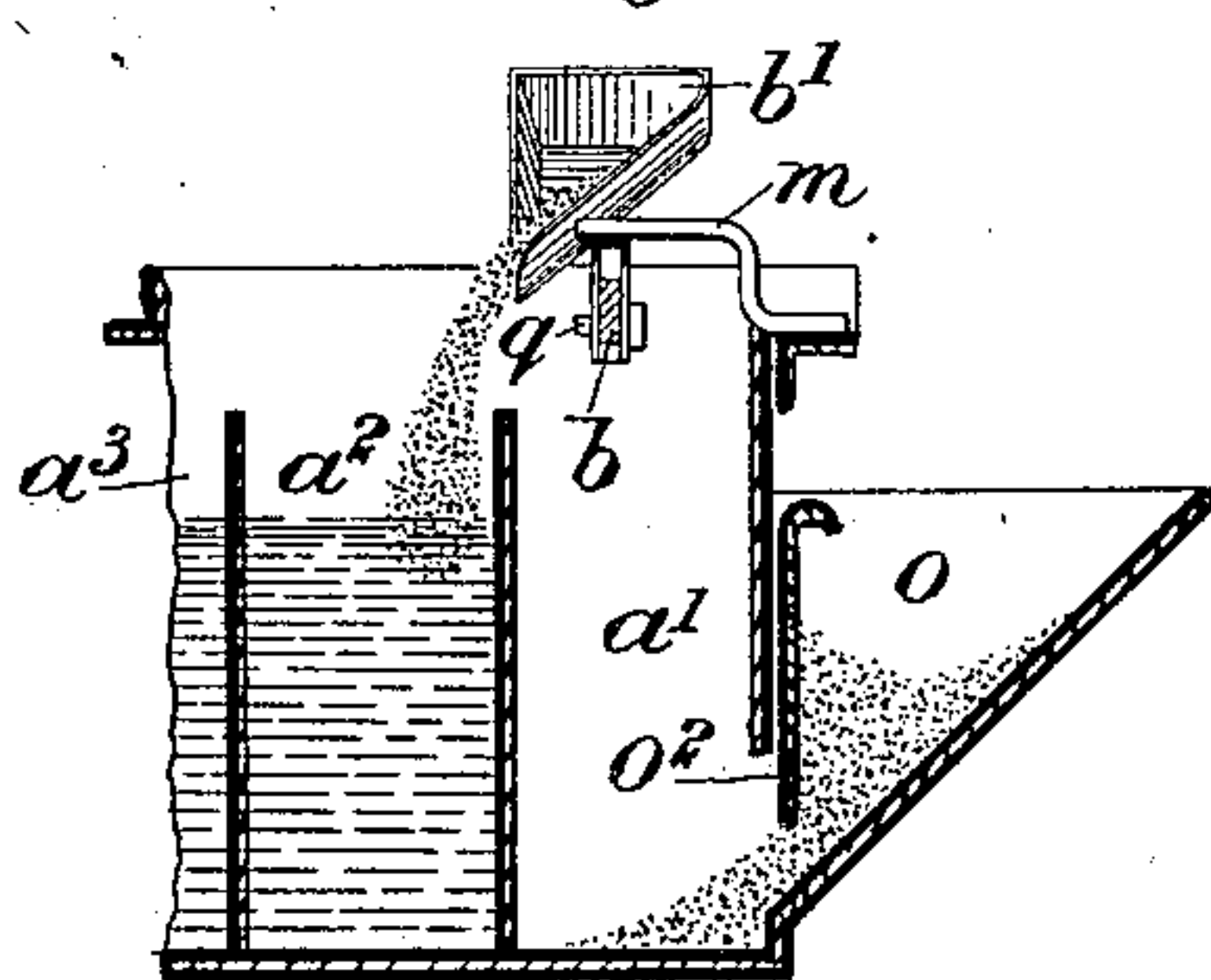
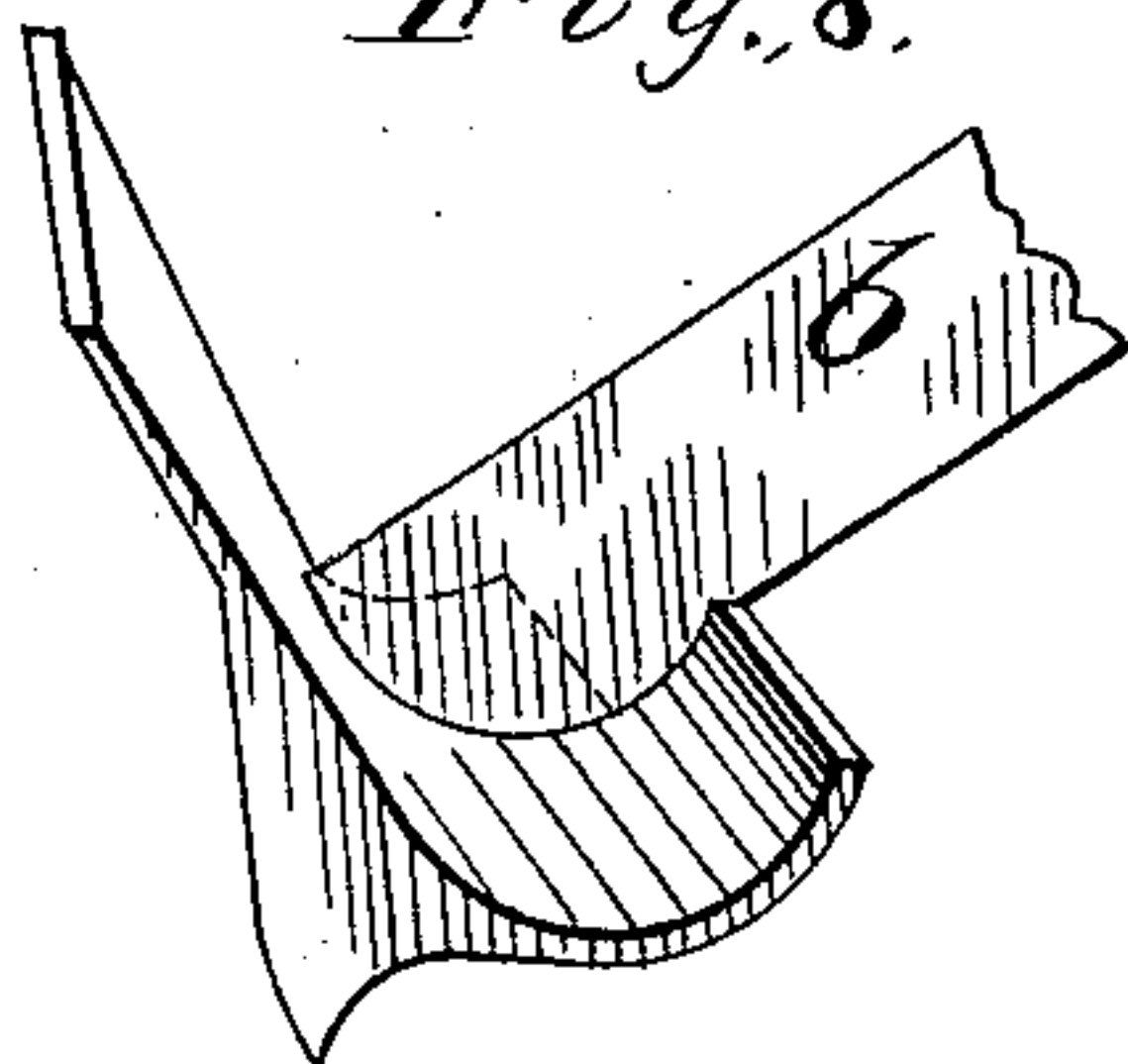


Fig. 8.



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# UNITED STATES PATENT OFFICE.

ROBERT MOODIE, OF LONDON, ENGLAND.

## WASHING OR LEACHING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 608,554, dated August 2, 1898.

Application filed May 16, 1898. Serial No. 680,858. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT MOODIE, engineer, a subject of the Queen of Great Britain and Ireland, and a resident of 41 Alkham road, Stoke Newington, London, England, have invented certain new and useful Improvements in Washing or Leaching Apparatus, (for which I have applied for a patent in Great Britain, No. 4,744, dated February 22, 1897,) which improvements are fully set forth in the following specification.

This invention has for its object to provide an apparatus for washing or leaching in a rapid, economical, and continuous manner granular or powdered or other materials which have to be subjected to the action of liquids.

The apparatus according to this invention consists of a series of compartments (which I will refer to as "cells") placed or constructed side by side and having semicircular or partly circular bottoms. In these cells scoops, stirrers, or propellers (I will refer to them as "scoops") are oscillated, so as to stir the material under treatment, propel it through the liquid from one side of the cells to the other, and to carry up and discharge the said material from one cell into the next. Near each place where this discharge takes place a scraper or brush may be arranged to assist in removing the material from the scoop into the next cell. The liquid is run into the cells at one end of the series to the requisite depth and the material is fed into the cell at the opposite end of the series and is by the oscillatory movement of the scoops stirred and caused to travel through the liquid in a zigzag direction through the cells of the series and is discharged from the last cell. The liquid being introduced into the cell from which the treated material is discharged passes in a direction opposite to that in which the material travels, the said liquid carrying with it what is washed or leached from the material and overflowing from the cell into which the material is first fed.

I will describe with reference to the accompanying drawings an apparatus constructed in accordance with my invention, the same letters of reference indicating the same parts in all the figures of the said drawings.

Figure 1 is a plan of an apparatus with ten cells marked  $a'$  to  $a^{10}$ . Into the cell  $a'$  the

material runs from a hopper  $o$  through an opening controlled by the shutter  $o^2$ , Figs. 5 and 6, and is lifted and thrown into the next cell  $a^2$  by the scoop  $b'$ , carried by the arm  $b$ , keyed to the rock-shaft  $e$ . The material is stirred in the liquid and carried from one cell and discharged into the next by the scoops  $b^2$  to  $b^9$ , each carried by an arm  $b$ , keyed to the shaft  $e$ , the material being discharged from the last cell  $a^{10}$  by the scoop  $b^{10}$ , also carried by an arm  $b$ , keyed to the shaft  $e$ . The scrapers  $c^2$  to  $c^9$  are actuated by the scoops coming into contact with them, so as to turn them upon the center-pins, on which they are mounted, and cause them to scrape along the scoops and force the material therefrom. The scoops  $b^2$  to  $b^9$  act alternately in opposite directions, so that when they are moved in one direction those in the cells  $a^2$ ,  $a^4$ ,  $a^6$ ,  $a^8$ , and  $a^{10}$  discharge the material into the cells  $a^3$ ,  $a^5$ ,  $a^7$ , and  $a^9$  and discharge it from the cell  $a^{10}$ , and when the said scoops are moved in the opposite direction the scoops in the cells  $a^3$ ,  $a^5$ ,  $a^7$ , and  $a^9$  discharge the material into the cells  $a^4$ ,  $a^6$ ,  $a^8$ , and  $a^{10}$ . The arrangement for giving the requisite oscillatory movement to the shaft  $e$  may be of any suitable description. As shown, it consists of a crank  $f$  and connecting-rod  $g$ , actuated by a wheel  $g^2$ , rotated by a pinion  $g^3$  on a shaft  $g^4$ , provided with a loose pulley and a fast or driving pulley. The movement of the shaft  $e$  is so adjusted that each scoop stops in the proper position for discharge, which takes place through openings  $a^{11}$ , made in the sides of the cells at opposite ends alternately.  $h$  is a handle secured to a rod  $i$ , carrying lever-arms  $j$  to lift the bearings of the shaft  $e$  in guides, and consequently the said shaft and the arms  $b$  and scoops  $b'$  to  $b^{10}$ , carried thereby, so that if the apparatus be stopped with a full charge of material the scoops are lifted free or partly free from it to facilitate restarting.  $k$  is the inlet-pipe for the liquid, and  $l$  is the outlet or overflow pipe for the liquid.

Fig. 2 is a cross-section through the cell  $a^{10}$  with a scoop arranged for discharging the material from the apparatus over the end of the last cell; and Fig. 3 is a section, drawn to a larger scale, through one of the wet cells, showing in full lines the scoop at or near the highest point of its travel and in dotted lines



the position at that time of the scoop in the next cell.

Fig. 4 is a cross-section on the line 4 4 of Fig. 3, showing the scoop and scraper in position for discharging the material into the next cell. The arms which carry the scrapers  $c^3$  to  $c^9$  are preferably loose on their supports  $c$  to allow of free movement of the scrapers on the said supports. The scrapers are kept from falling too far by stops  $c'$ .

Fig. 5 is a section, also drawn to a larger scale, through the dry feed-cell  $a'$ , showing in full lines the scoop  $b'$  in position to discharge into the first wet cell the material to be treated. The inner part of this scoop is curved, so as to guide the material in the proper direction, and the scoop is attached to the arm  $b$  by its carrier being hinged thereto at  $q$ , a spring  $q^2$ , bearing on the tail  $n$  of the carrier, allowing the scoop to glide over the material on the back stroke and to penetrate it on the forward stroke. The tail  $n$  of the scoop-carrier when the scoop ascends comes into contact with a stop  $m$  to hasten the discharge of the material by quickly tipping the scoop.

Fig. 6 is a cross-section through a wet cell, a dry feed-cell, and the feed-hopper  $o$ , and Figs. 7 and 8 are enlarged details of the scoop.

I do not restrict myself to the precise details shown in the drawings, as they may be varied to suit the nature of the materials to be treated. For instance, the number of cells may be greater or less than ten, and the first cell may be a wet cell and the material be fed into it dry or damp by a conveyer or other suitable means. For washing purposes the passages  $a^{11}$ , by which the liquid passes from cell to cell, may be broad and shallow. The form, arrangement of, and the means for operating the scoops may also be modified. The inner end of the outlet-pipe for the liquid or solution may be arranged to draw from any suitable part of the liquid or solution in the cell. The washed or leached material may be discharged from the last cell by a scoop, scraper, and opening, as in the other cells, set higher than the water-line, and when it is desirable that the materials should not be exposed to the air during washing or leaching the openings  $a^{11}$  and scoops may be beneath the surface of the liquid in the cells.

The cells may be formed in one vat or be

made separately and joined together. The contents of the cells may be heated by a steam or hot-air jacket, as at  $r$ , Figs. 2, 3, and 4, or by a steam-coil in each cell.

For chemical leaching two or more apparatus containing solutions of different strengths may be arranged to discharge the materials from one to the other. The outflowing liquids from the apparatus may be passed through settling-boxes and the like and used over again.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is—

1. A leaching or washing apparatus consisting of a series of cells, an oscillating shaft extending longitudinally of said series of cells, individual arms on said shaft extending into the individual cells, and scoops on said arms, whereby the oscillations of the shaft serve to stir or move the material being treated and convey and discharge it from cell to cell, substantially as described.

2. A washing, or leaching, apparatus consisting of or comprising adjoining cells, and scoops, provided with means for oscillating them in the said cells, so as to stir, or move, the material being treated, and convey and discharge it from cell to cell, and scrapers located to act on the material when the scoops are in discharge position, substantially as described.

3. In an apparatus for washing or leaching, a series of cells, one of which is a dry cell and the others of which contain washing or leaching liquid, means for introducing the material to be washed into the dry cell, an oscillating shaft extending longitudinally of the series of cells, means operated by said shaft to transfer the material from the dry cell to the washing-cell next in series, arms attached to the oscillating shaft and extending one into each washing-cell and scoops on said arms, substantially as described.

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

ROBT. MOODIE.

Witnesses:

WILLIAM FREDERICK UPTON,  
EDWARD GEORGE DAVIES.