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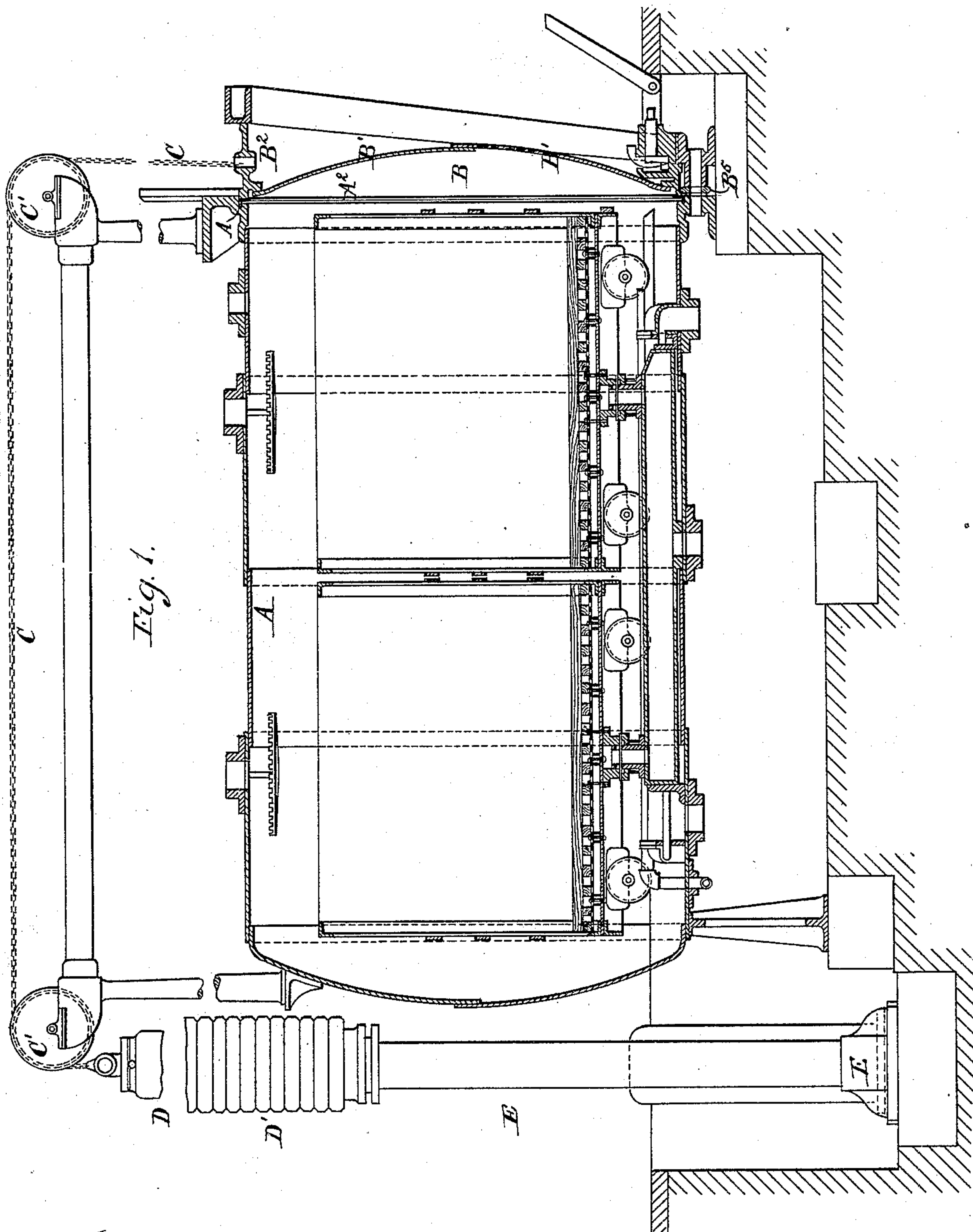
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W. MATHER.

KEIR.

No. 415,545.

Patented Nov. 19, 1889.



Witnesses:
J. A. Rutherford
Percy B. Stille.

Inventor:
William Mather.
By James L. Norris,
Atty.

(No Model.)

5 Sheets—Sheet 2.

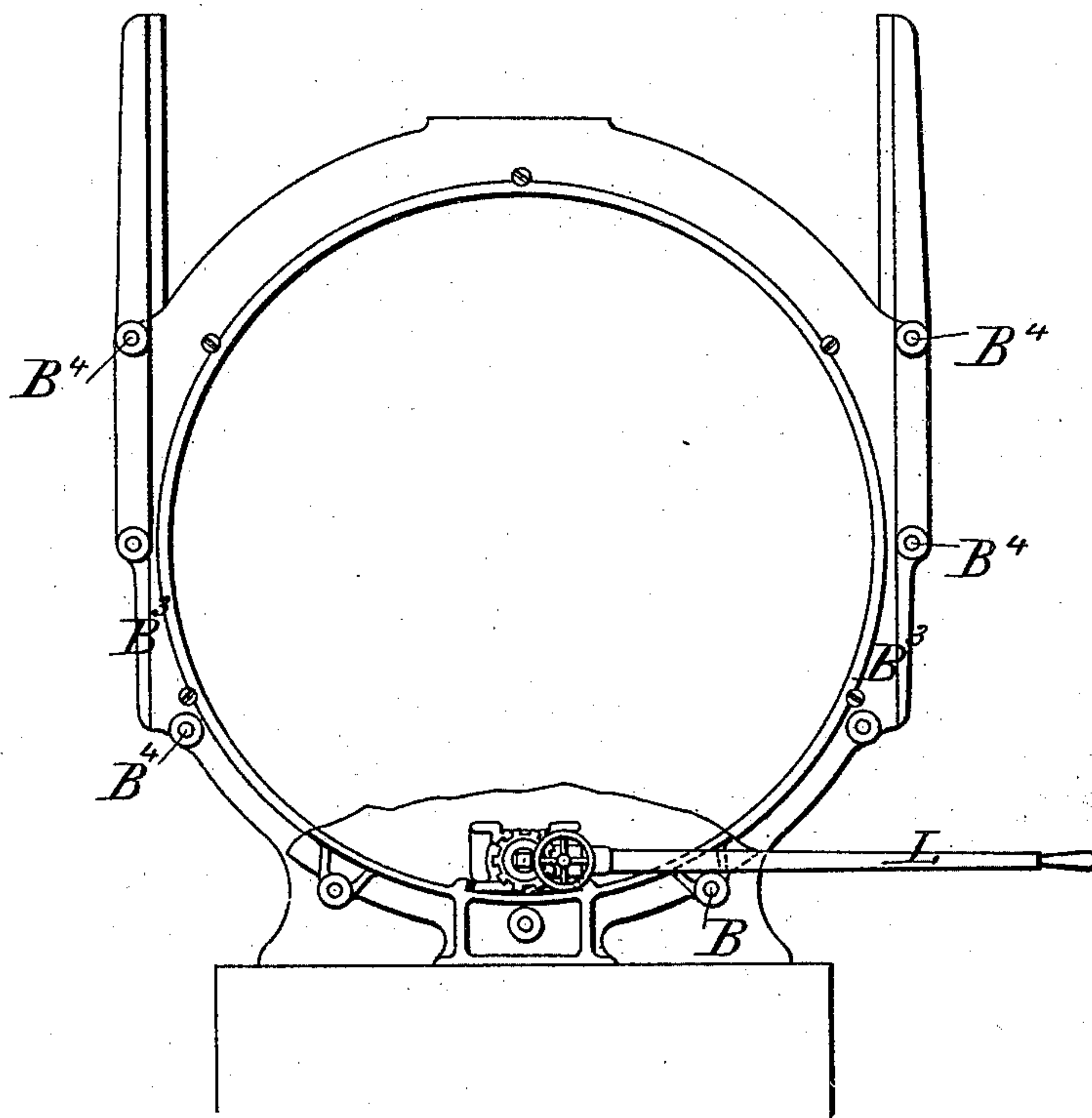
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Fig. 1^a



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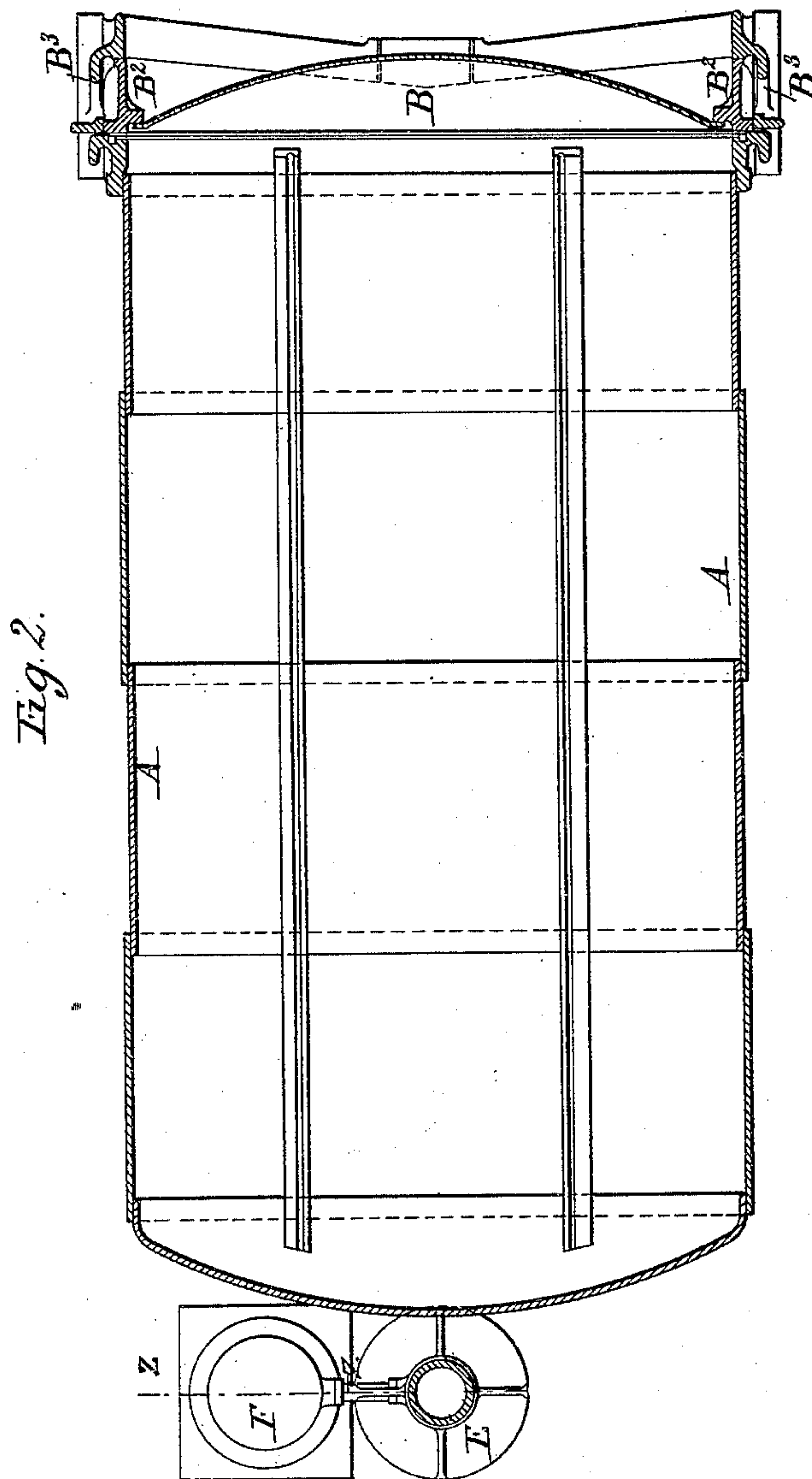
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W. MATHER.
KEIR.

No. 415,545.

Patented Nov. 19, 1889.



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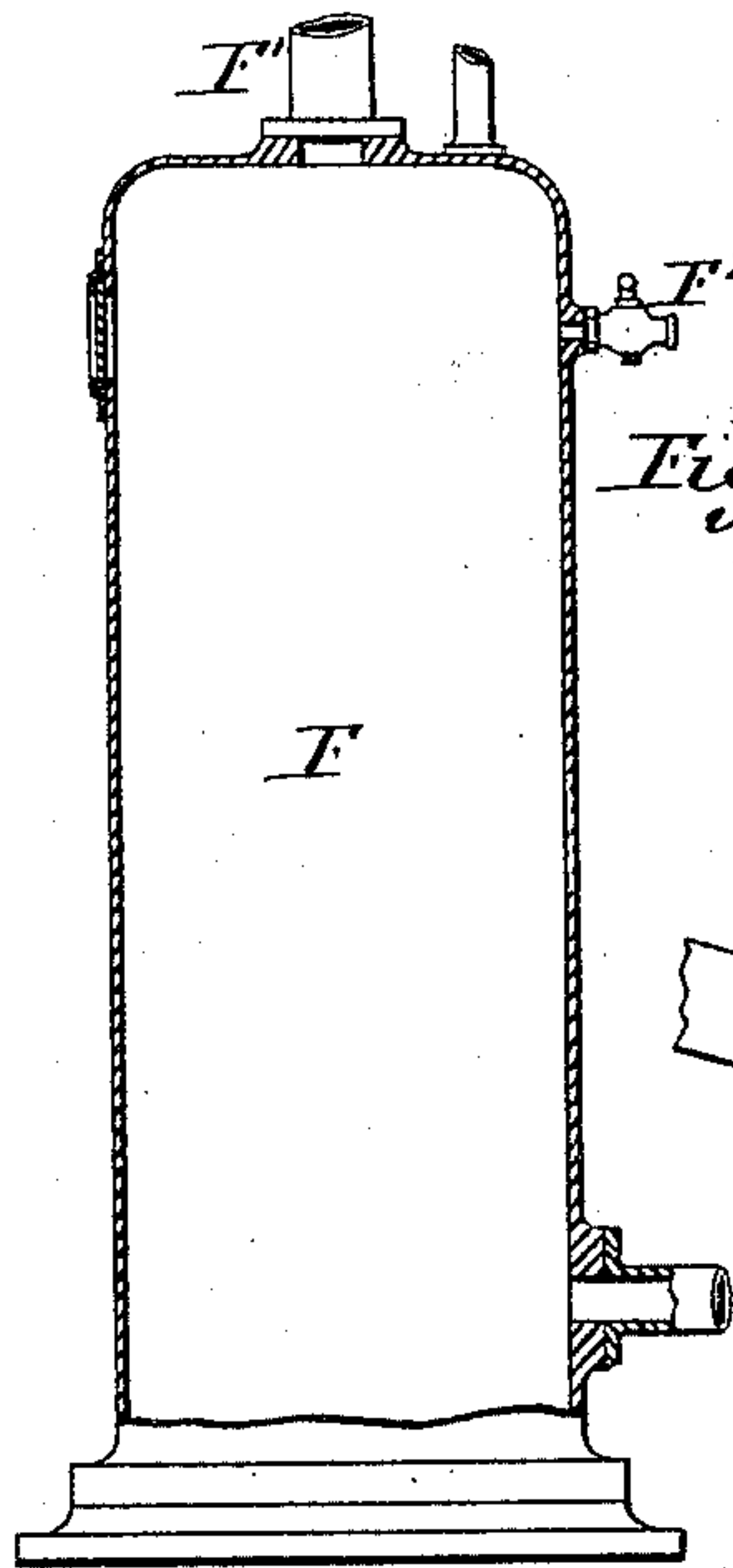


Fig. 3.

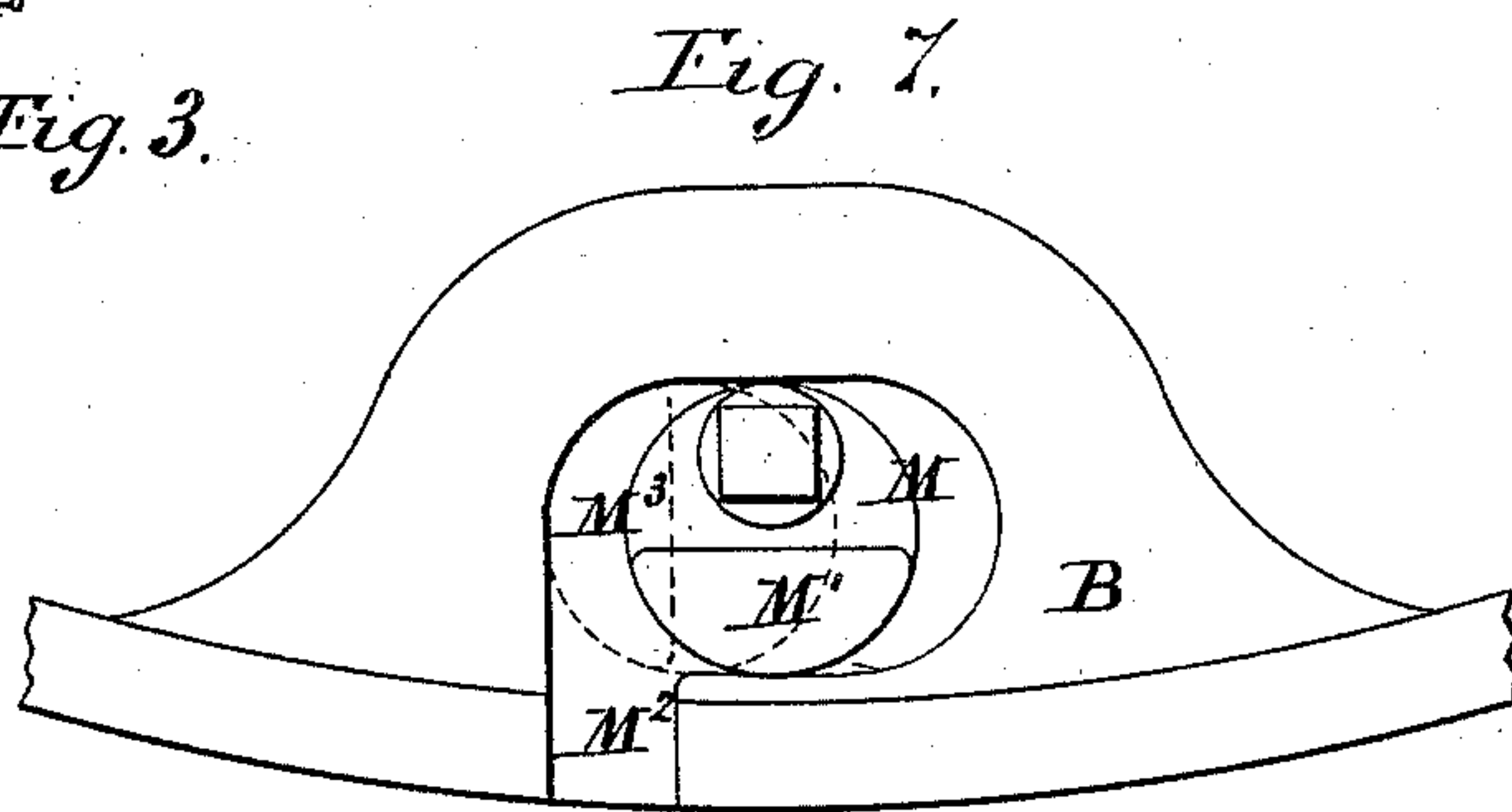


Fig. 7.

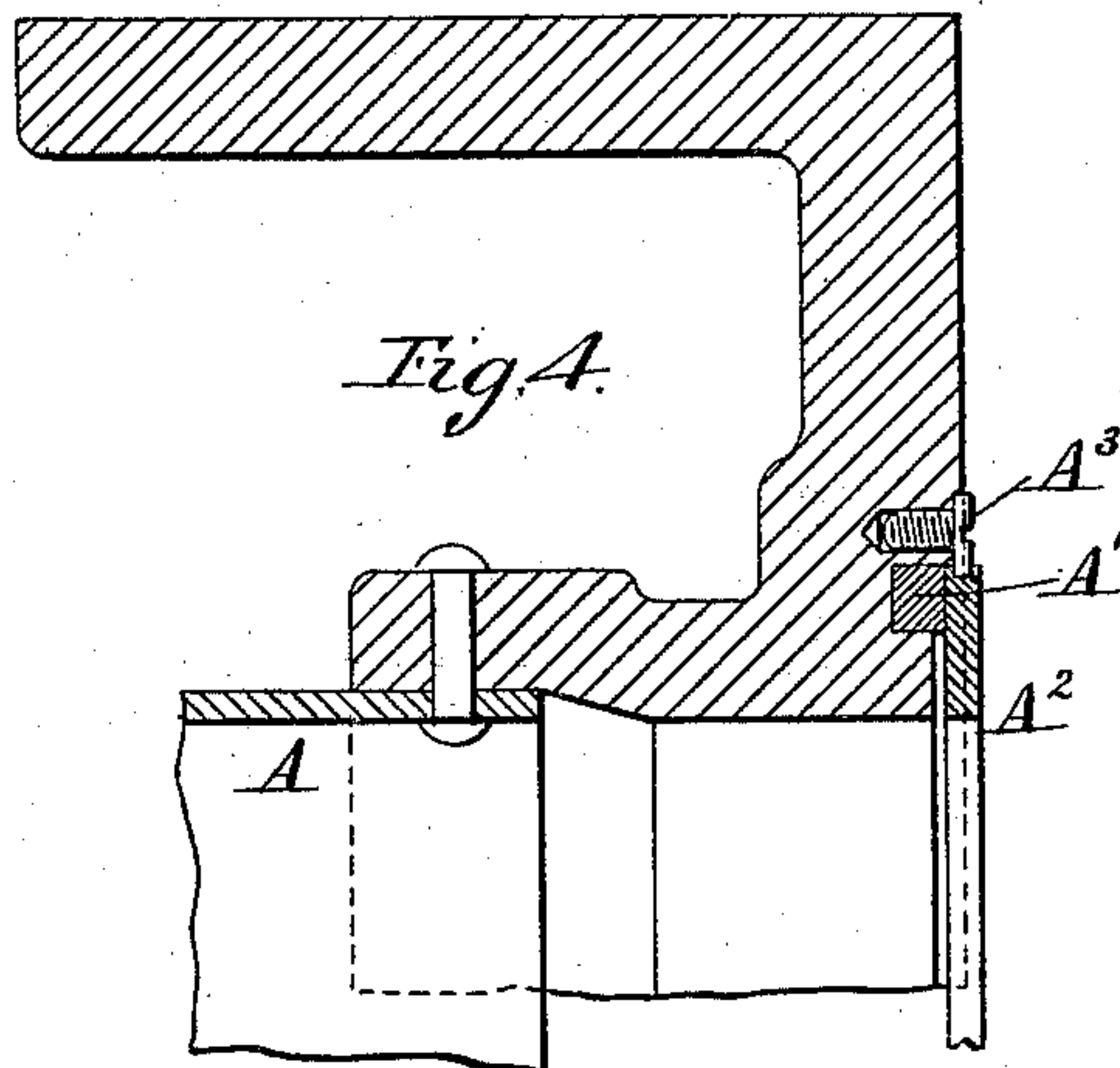


Fig. 4.

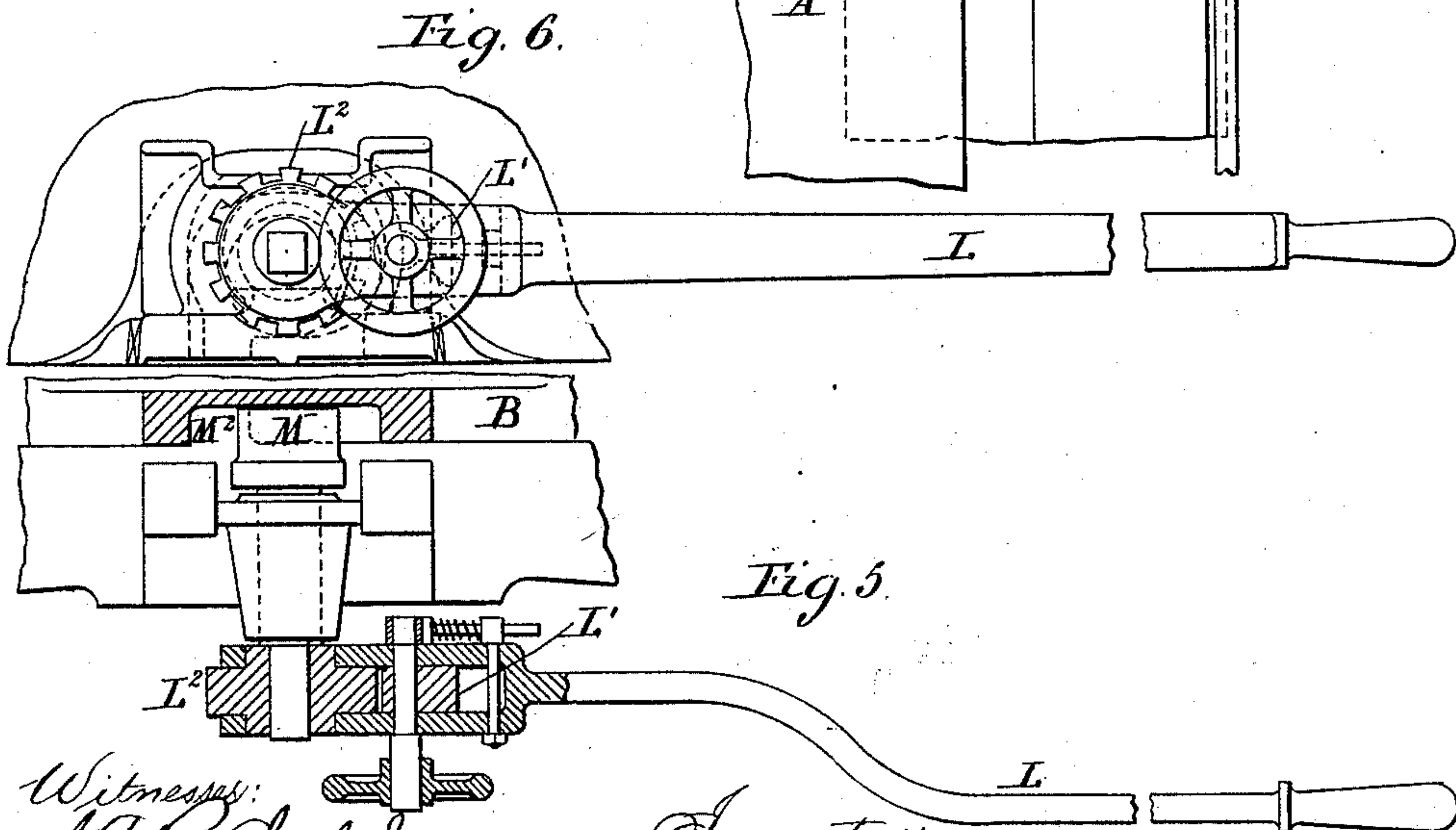


Fig. 6.

Fig. 5.

Witnesses:
J. A. Rutherford.
Percy B. Hill.

Inventor:
William Mather
By James C. Norris, Atty.

(No Model.)

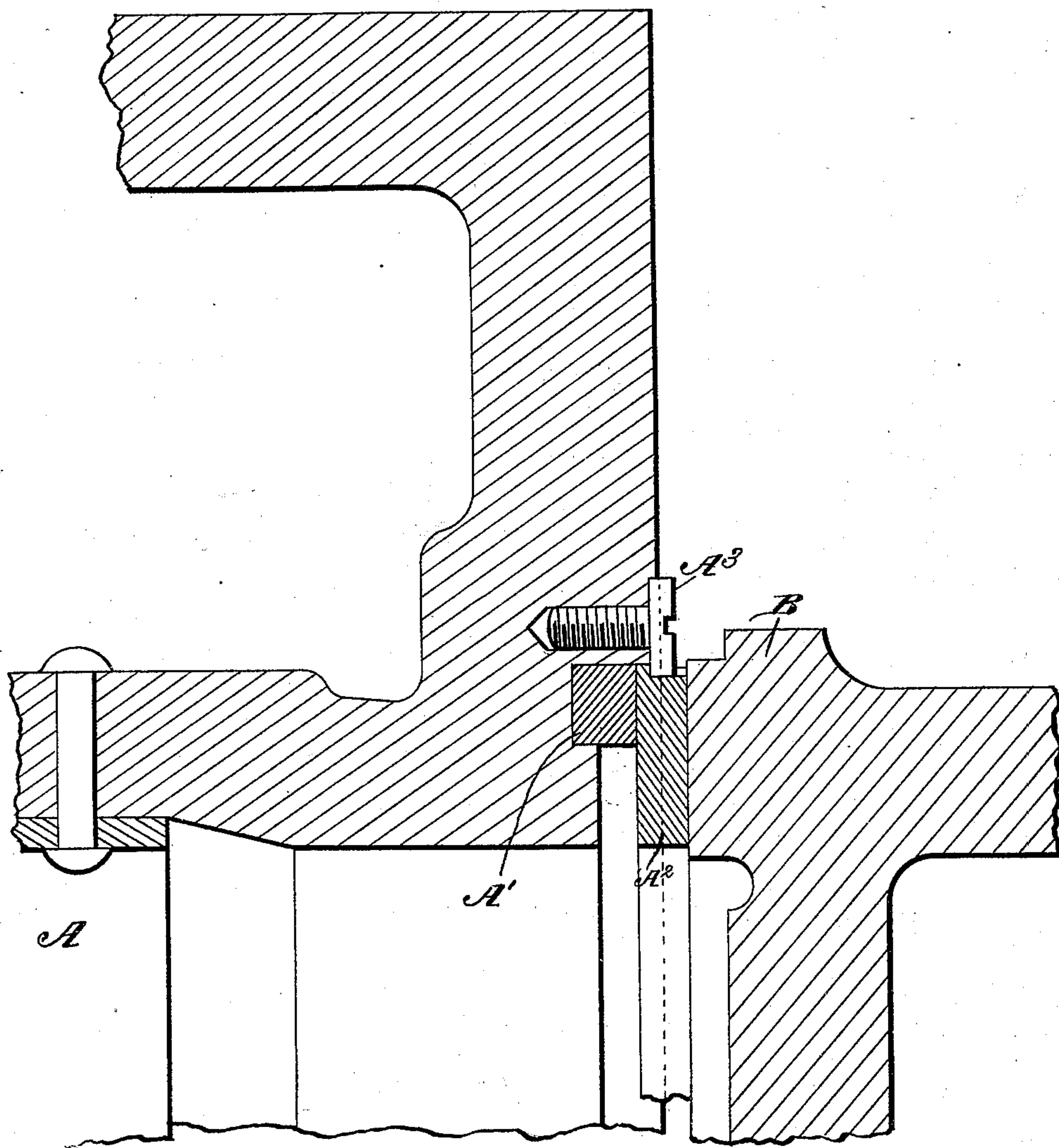
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W. MATHER.
KEIR.

No. 415,545.

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Fig. 8.



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UNITED STATES PATENT OFFICE.

WILLIAM MATHER, OF SALFORD IRON WORKS, MANCHESTER, COUNTY OF LANCASTER, ENGLAND.

KEIR.

SPECIFICATION forming part of Letters Patent No. 415,545, dated November 19, 1889.

Application filed January 31, 1889. Serial No. 298,229. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MATHER, engineer, a citizen of England, residing at Salford Iron Works, Manchester, in the county of Lancaster, England, have invented a new and useful Improvement in Apparatus for Treating Textile Materials with Liquids, Gases, or Vapors, of which the following is a specification.

In my patent dated August 4, 1885, No. 323,819, and in my later patent, dated January 5, 1886, No. 333,876, I described apparatus for treating textile materials with liquids, gases, or vapors for various purposes, such as soaking, boiling, or dyeing. That apparatus consisted of a keir or vessel like a horizontal cylindrical boiler closed at either end or at each end by a wedge sluice-door, and having in it rails to receive trucks containing the material to be treated, and pipes for supply, discharge, and circulation of the fluids to the action of which the material in the trucks was subjected.

The objects of my present invention are to provide novel and efficient means for utilizing the fluid-pressure within the keir for the purpose of securing a tight joint between the door and the end of the keir or vessel, and, further, to provide novel mechanism for effecting a tight closure of the door against the outward pressure of the gases and fluids within the keir.

The objects of my invention I accomplish by the combination of devices hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a longitudinal section of a keir accommodating two trucks with a wedge sluice-door at one end. Fig. 2 is a sectional plan view of the same. Fig. 3 is a part transverse section on the line $z z$, Fig. 2. Fig. 1^a is an elevation of the abutment and guide in which the wedge-door slides. Fig. 4 is a section on a larger scale of part of the end of the keir, showing the packing of the door. Fig. 5 is a sectional plan view, and Fig. 6 an elevation, of the gear for tightening the door. Fig. 7 is an elevation showing the recess of the door in which the tightening-segment works; and Fig. 8 is an enlarged sectional de-

tail view of the mouth of the keir and its door, showing the packing-rings.

The keir A is made with a flat end, against which the wedge sluice-door B is pressed by sliding in the adjustable abutment B³. This door consists of a bent plate B', inclosed in a cast-frame B², having an inclined back. At the back of the door B is an adjustable framing or abutment B³, presenting a groove in which the sides of the frame B² can slide, the abutment B³ having at its back an inclination corresponding with that of the frame B².

As the sluice-door B is of considerable size and the fixed incline-framing B³, which forms the abutment, when it is closed should force it against the end of the keir with uniform pressure throughout the whole circumference, I secure the framing B³ to the flange at the end of the keir A by a number of bolts B⁴, as shown in Figs. 1 and 1^a, these bolts being inclosed in tubes, between which are distance-pieces B⁵, between the end of the keir and the framing B³. The lengths of these distance-pieces are adjusted by trial—that is to say, the door being closed the keir A is charged with liquid and subjected to internal pressure. It is observed where leakage takes place between the door and the keir, and the distance-pieces for the bolts adjacent to the leaking-place being shortened a little, by filing or otherwise, the bolts are again tightened. This is repeated until the leakage is suppressed.

From the top of the frame B² a chain C passes over guide-pulleys C' to a cylinder D loaded with weights D' sufficient to overbalance the door B. This cylinder works on a tubular plunger E not necessarily requiring packing, as the movement of the cylinder is only occasional and momentary, and a little leakage is not seriously objectionable.

With the bottom of the tubular plunger E communicates a pressure-vessel F, having at its top a steam-pipe F' and gage-cock F². When the door B is raised, the cylinder D being then down on the plunger E, the vessel F is charged with water up to the level of the gage-cock F². When it is desired to lower the door B, the gage-cock F² is closed and steam is admitted by the pipe F' to press on the water in the vessel F. The pressure trans-

mitted through the plunger E forces up the cylinder D, and the door B closes tightly against the end of the keir A.

In order to prevent leakage, the end of the keir is made with an annular groove containing an elastic packing-ring A', against which bears a metal ring A², held in position by screws A³, the heads of these screws overlapping the thinned edge of the ring A², but allowing it to be pressed up toward the face of the keir. By referring to Fig. 4 it will be seen that the elastic packing-ring A' projects somewhat from the groove in which it sets, so that it will be exposed to the fluid-pressure within the keir, and be thereby forced tightly against the inner face of the keir and form a tight joint therewith. At the same time the fluid-pressure exerted on this elastic packing-ring A' causes it to expand and press tightly against the metal ring A², thereby forcing the latter closely against the closed door B, and as this metal ring A² is of greater width than the ring A' and projects inward beyond the same it will also be subjected on its inner face to the direct effect of the fluid-pressure within the keir. It will thus be seen that under the direct action of the fluid-pressure on the ring A² and the outward pressure of the expanded elastic packing-ring A' the metal ring A² will be forced so closely against the keir and its door as to form a tight joint that will effectually prevent leakage. When the door is fully closed, it presses the ring A² toward the keir, the elastic ring A' is forced toward the inner face of the keir by the fluid-pressure and at the same time expanded or pressed tightly against the inner face of the metal ring A², and the latter, under the action of the fluid-pressure, is pressed tightly against the keir and the door B, so that it is obvious that a tight joint will be formed all around the mouth of the keir.

As the descent of the door B due to gravity is not quite sufficient to insure the required wedging action, gearing is employed to draw down the door B a little farther than it would descend of itself, and to hold it down, notwithstanding the relief of the hydraulic pressure in the cylinder E. This gearing consists of a lever L, with reversible pawl L', engaging a square-toothed ratchet-wheel L², which can be turned by working the lever L as a ratchet-brace in either direction, according as the pawl L' is turned the one way or the other. On the axis of the ratchet-wheel L² is fixed an eccentric disk M, having projecting from its face a segment M'.

In the lower framing of the door B is formed a recess, as shown in Fig. 7, having through its bottom rib at one side a slot M² wide enough to allow the segment M' to pass through it. The disk M being turned so that the segment M' stands in the position indicated by the dotted lines M³, Fig. 7, the door

B is lowered, the slot M² passing the segment M³. The disk M is then turned so as to bring the segment M' over the lower rib of the recess, the eccentricity of the segment pressing this downward, and thereby further wedging down the door and holding it down. When it is desired to raise the door B, it can first be slacked by turning the segment M' so as to bear up against the top rib of the recess, so slightly raising the door B, and then on turning the segment back to the position M³ and relieving the pressure in the hydraulic cylinder D by opening the cock F² the loaded cylinder D descends, pulling up the door B.

Having thus described my invention, what I claim is—

1. The combination, with a keir and its door, of a packing composed of an elastic ring and a metal ring located in the mouth of the keir at the inner side of the door, and means for closing and securing the door, whereby the fluid-pressure within the keir will force the said packing against the inner face of the keir and its door and form a tight joint around the mouth of the keir, substantially as described.

2. The combination, with a keir and its door, of a packing composed of an elastic ring and a metal ring interposed between the mouth of the keir and its door and exposed to the action of the fluid-pressure within the keir, whereby said packing is caused to form a tight joint around the mouth of the keir, substantially as described.

3. The combination, with a keir and its door, one of said parts being provided with an annular groove, of an elastic ring located in and projecting from said groove, a metal ring bearing against the end of the elastic ring and against the inner face of the keir, and means for closing and securing the door, whereby a tight joint is formed by the fluid-pressure within the keir acting in said rings and forcing them against the inner face of the keir and its door, substantially as described.

4. In combination with the wedge sluice-door of a keir, a ratchet, reversible pawl and lever, an eccentric disk with projecting segment, and a recess in the door with slot for passage of the segment, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 12th day of January, A. D. 1889.

W. MATHER.

Witnesses:

GEO. J. B. FRANKLIN,
17 Gracechurch Street, London, E. C.

JNO. P. M. MILLARD,
Clerk to Messrs. Abel & Imray, Consulting
Engineers and Patent Agents, 28 Southampton Buildings, London, W. C.

It is hereby certified that Letters Patent No. 415,545, granted November 19, 1889, upon the application of William Mather, of Salford Iron Works, Manchester, County of Lancaster, England, for an improvement in "Keirs," was erroneously issued to said William Mather as owner of the patent; whereas said Letters Patent should have been issued to *The Mather Bleaching and Kier Company, of Wilmington, Delaware*, said Mather Bleaching and Kier Company being assignee of the entire interest as shown by the record of assignments in this Office; and that said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 10th day of December, A. D. 1889.

[SEAL.]

CYRUS BUSSEY,
Assistant Secretary of the Interior.

Countersigned:

C. E. MITCHELL,
Commissioner of Patents.