

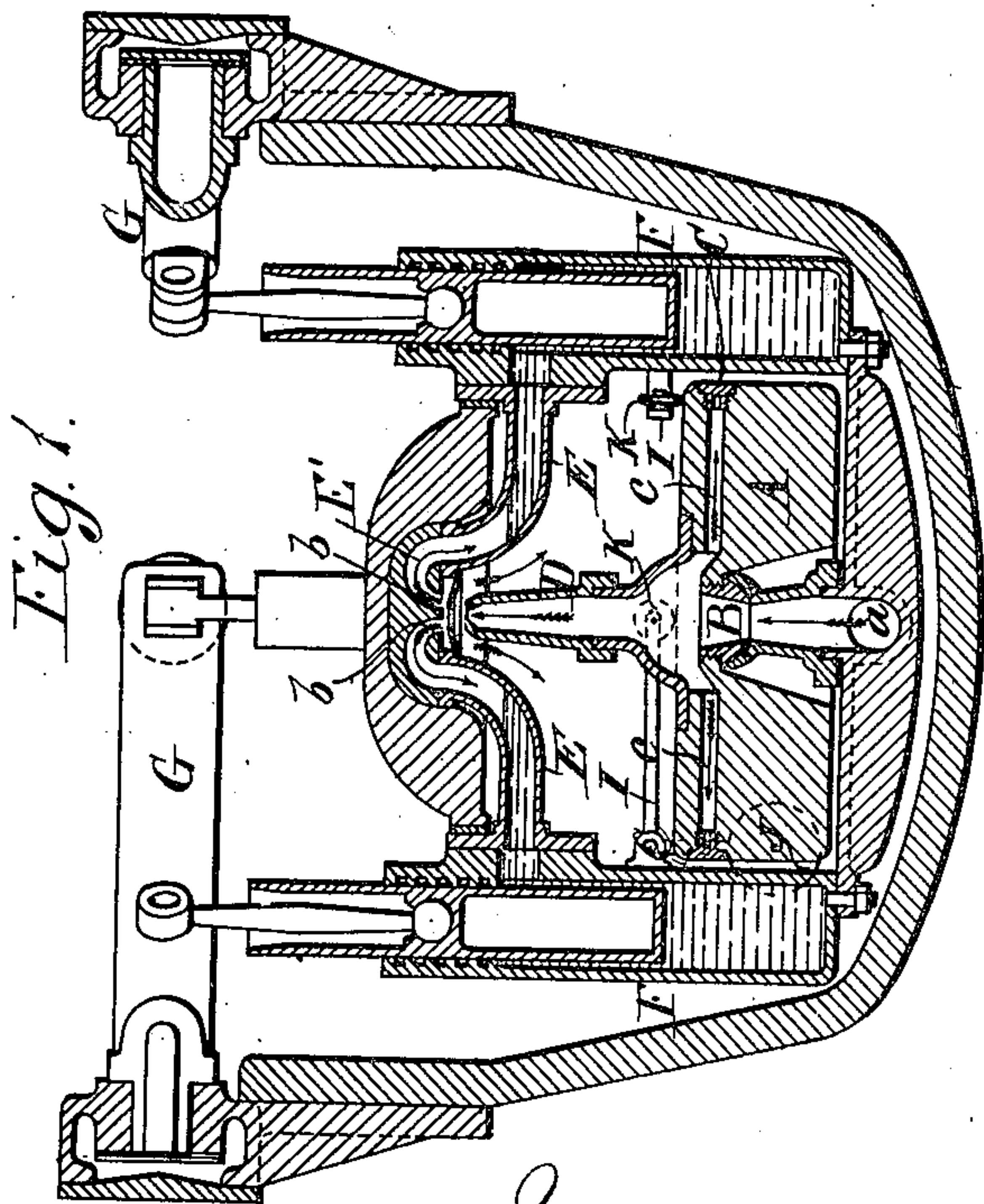
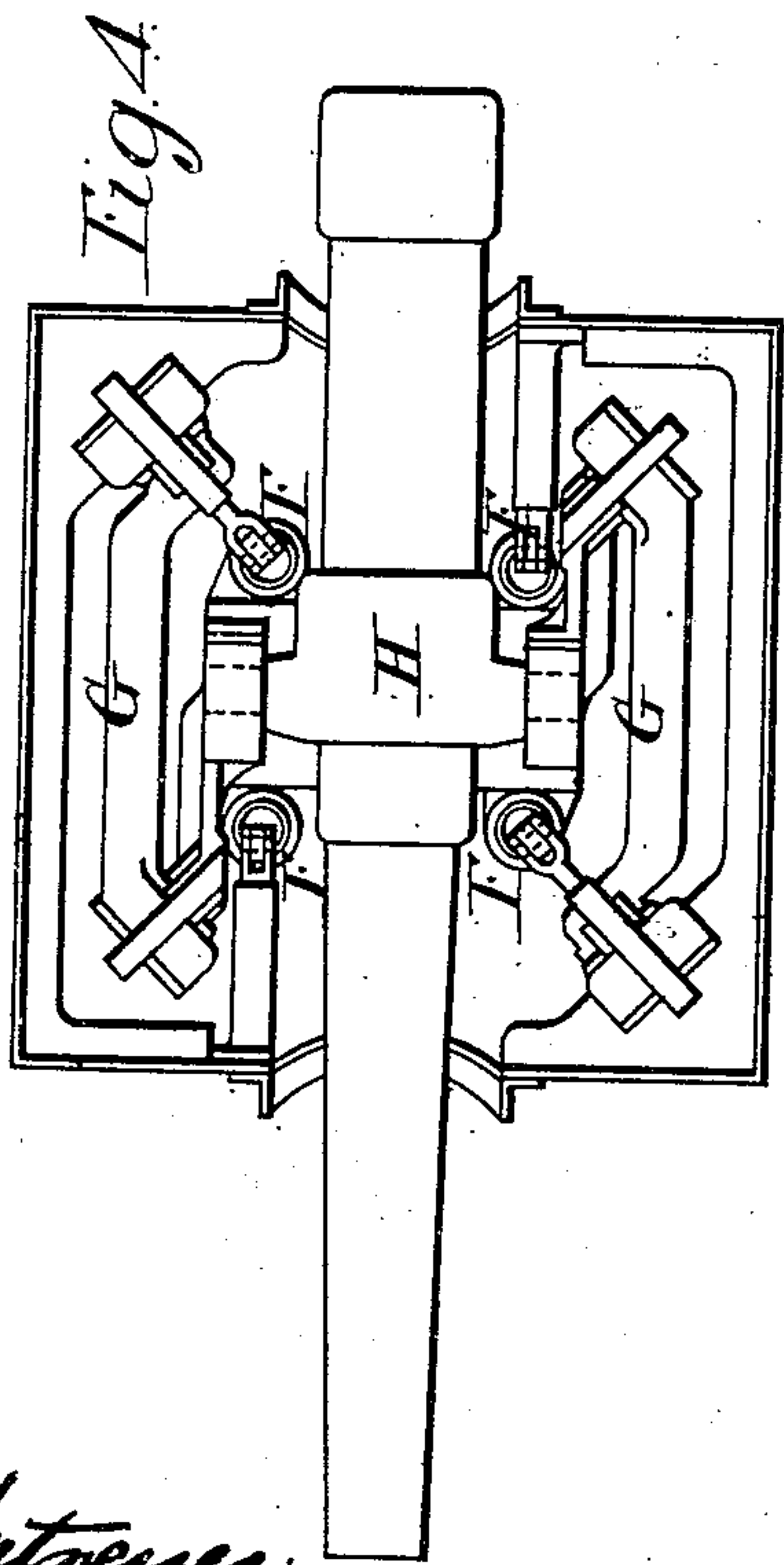
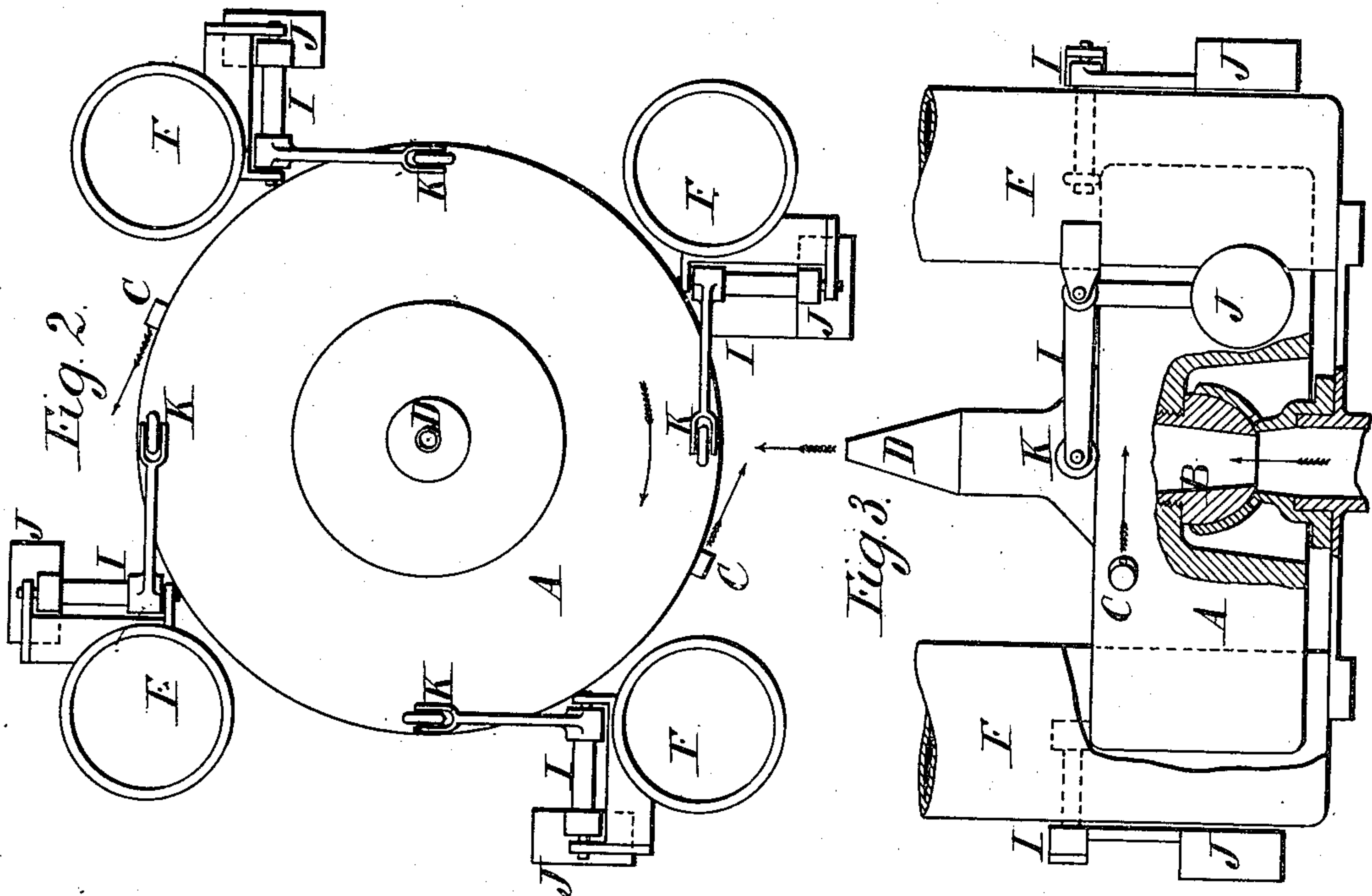
(No Model.)

2 Sheets—Sheet 1.

B. TOWER.
APPARATUS FOR MAINTAINING A CONSTANT PLANE IN FLOATING VESSELS.

No. 464,806.

Patented Dec. 8, 1891.



Witness:
J. A. Ritchey
J. G. Meyer

Inventor:
Beauchamp Tower
By James L. Norris
Attorney

(No Model.)

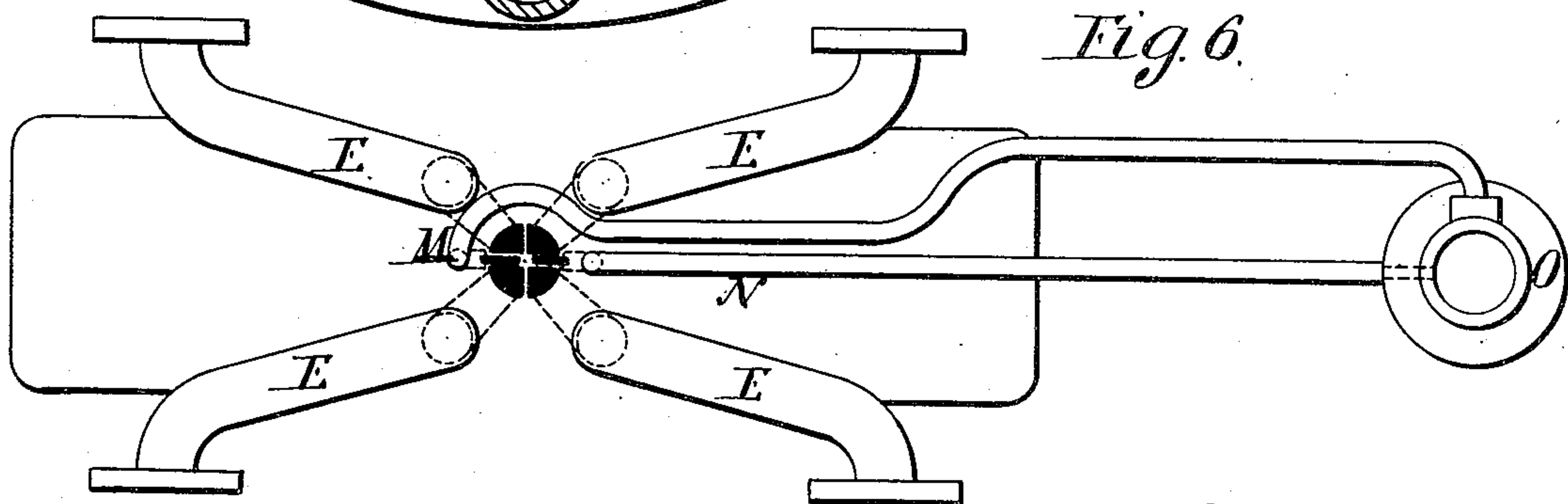
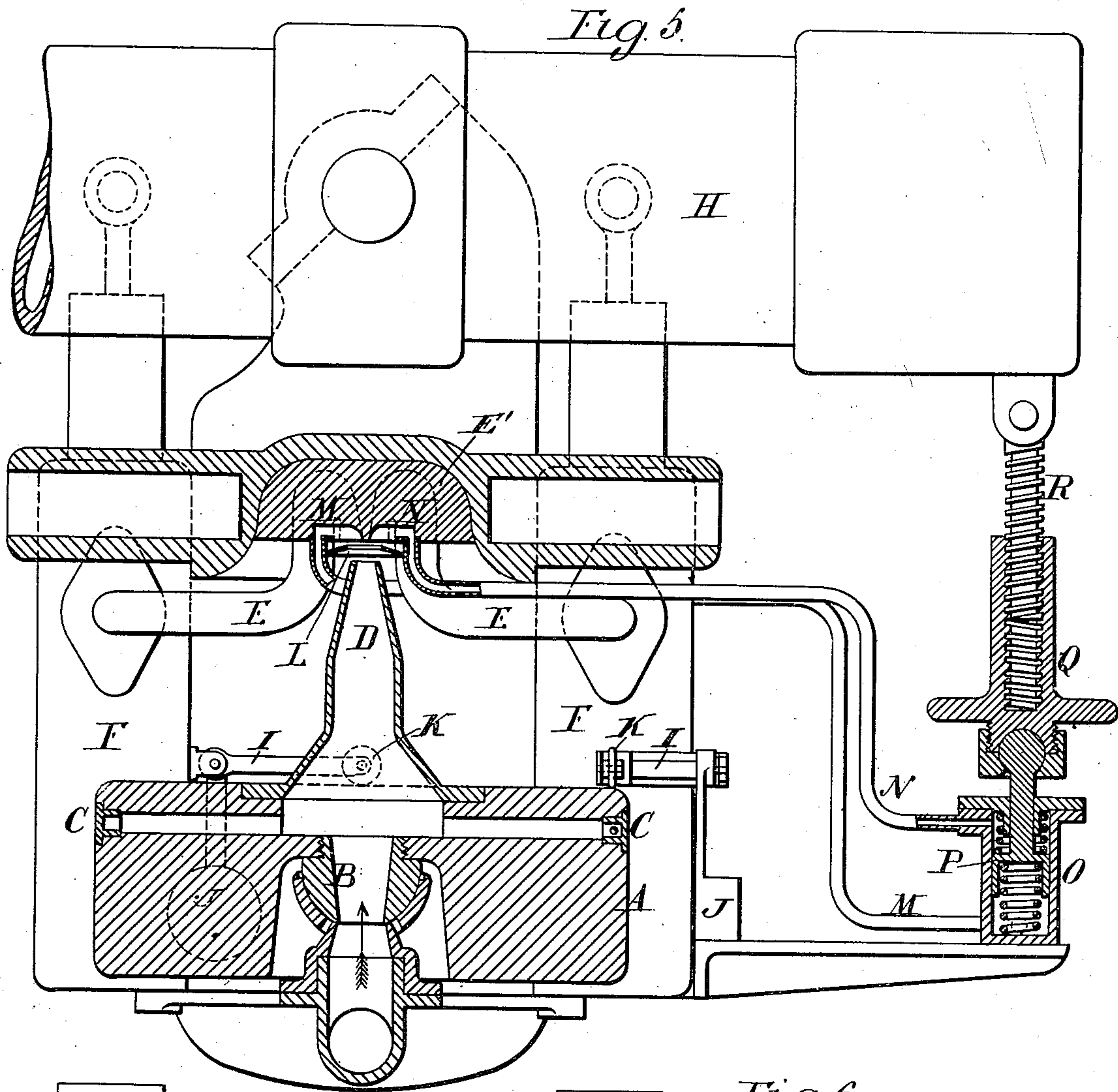
2 Sheets—Sheet 2.

B. TOWER.

APPARATUS FOR MAINTAINING A CONSTANT PLANE IN FLOATING VESSELS

No. 464,806.

Patented Dec. 8, 1891.



Witnesses:-
J. A. Rutherford.
J. G. Meyers Jr.

Inventor:
Beauchamp Tower
By James L. Norris.
attorney.

UNITED STATES PATENT OFFICE.

BEAUCHAMP TOWER, OF WESTMINSTER, ENGLAND.

APPARATUS FOR MAINTAINING A CONSTANT PLANE IN FLOATING VESSELS.

SPECIFICATION forming part of Letters Patent No. 464,806, dated December 8, 1891,

Application filed November 20, 1890. Serial No. 372,039. (No model.) Patented in England December 16, 1889, No. 20,220; in France October 16, 1890, No. 208,905, and in Italy November 12, 1890, LVI, 56.

To all whom it may concern:

Be it known that I, BEAUCHAMP TOWER, a citizen of England, residing at No. 5 Queen Anne's Gate, Westminster, in the county of Middlesex, England, have invented new and useful Improvements in Apparatus for Maintaining a Constant Plane in a Floating Vessel, (for which I have obtained patents in Great Britain, No. 20,220, dated December 16, 1889; 10 in France, No. 208,905, dated October 16, 1890, and in Italy, Vol. LVI, 56, dated November 12, 1890,) of which the following is a specification.

This invention has for its object to improve 15 the apparatus for maintaining a constant plane in a floating vessel, for which Letters Patent No. 366,438 were issued to me July 12, 1887.

To such end my invention consists in the 20 features of construction and the combination or arrangement of devices hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a vertical central sectional view 25 of sufficient of the apparatus to enable my present invention to be understood. Fig. 2 is a plan, and Fig. 3 an elevation, partly in section, showing one of the improvements according to my present invention. Fig. 4 is a 30 plan showing a gun mounted on the apparatus. Fig. 5 is an elevation, partly in section, showing the mounting of the gun and means, according to my present invention, of correcting slight errors in its elevation. Fig. 6 is a 35 part plan showing the correcting appliance.

As shown in Figs. 1, 2, and 3, the heavy reaction-wheel A, mounted on a spherical hollow pivot B, is provided with horizontal channels c. To the vessel containing the reaction-wheel 40 A are fixed the four hydraulic cylinders F, each fitted with a plunger; and two of these plungers are linked to one of the gimbals G and the other two are linked to the remaining gimbal G, all in such manner that the 45 vessel is free to oscillate as described in my patent before alluded to. From the upper parts of the cylinders F the channels or pipes E communicate through a head E' with orifices b, located on the under side of the head 50 E' immediately above the nozzle D, which

projects upwardly from the reaction-wheel A. The water under pressure entering by the pipe a, Fig. 1, flows through the spherical hollow bearing B and partly to the channels c and partly to the nozzle D in the line 55 of the axis of the reaction-wheel A. While the reaction-wheel L is caused to revolve rapidly by the action of the water issuing from its horizontal channels c, its axis tends to remain permanent in position even when 60 force is applied to alter it. As long as the axis of the vessel containing the reaction-wheel remains coincident with the axis of such wheel the jet from the nozzle D acts 65 equally on the water in the orifices b, thereby producing equal pressure in the four hydraulic cylinders F. Should the axis of the vessel containing the wheel move a little out of alignment with the axis of such wheel, then one or the other of the orifices b will re- 70 ceive more of the jet from the nozzle D than the other orifices, and the pressure in that one of the cylinders F with which that orifice communicates will be increased, causing its plunger to tend to move outward, and thus 75 imposing a strain on the gimbal-arm to which that plunger is linked. This excess of force on one of the gimbal-arms reacts on the vessel, causing it to recover its normal position and bringing its axis into coincidence with 80 the axis of the reaction-wheel A. Consequently as long as the reaction-wheel A revolves the axis of the vessel is maintained in a permanent position. By this means, the 85 axis of the reaction-wheel A remaining constant in direction, should the axis of the platform and other parts carried by the gimbals G tend to deviate from the axis of the wheel A more of the jet from the nozzle D would be directed into one of the channels or pipes E 90 than into the others, thus creating a greater pressure in one of the hydraulic cylinders F and causing such depression of that cylinder as to correct the deviation.

The apparatus thus far described is substantially the same as described and shown 95 in my Letters Patent hereinbefore referred to, and in order to improve such apparatus and maintain constancy in the direction of the axis of the reaction-wheel A, I arrange the 100

center of the spherical bearing B to be as nearly as possible coincident with the center of gravity of the wheel A, and I mount on the hydraulic cylinders F four bell-crank levers having their vertical arms loaded by equal weights J and having on their horizontal arms rollers K, which bear on the upper surface of the wheel A. The bell-cranks might be arranged at a lower level with their rollers bearing against the under surface of the wheel A. By the action of the pendulous weights J any tendency of the wheel A to deviate from true horizontality of its upper or under surface is at once corrected. When a gun II is mounted on trunnions on the apparatus, as shown in Fig. 4, I apply to it means of correcting slight errors in elevation, as shown in Figs. 5 and 6. Over the jet-orifice of the pipe D, I fix a guard L, having a round hole through its middle and sloping down to its outer edge. The water from the jet-pipe D passes through the central hole of the guard L, and the water which is dashed back is deflected by the border of the guard L, so as to take a course outward clear of the wheel A, the action of which might be more or less interfered with by the water dashing on it.

Besides the four quadrantal orifices of the channels E, leading to the four hydraulic cylinders F, I provide two rectangular orifices and channels M N from the head E', Fig. 5, leading, respectively, to the lower and upper ends of a hydraulic cylinder O. This cylinder is fitted with a piston P, which is maintained in middle position between two springs. To the piston-rod is connected by a spherical joint a socket-nut Q for the elevating-screw R of the gun II. The gun being once set to the desired elevation, is maintained without change of elevation by the action of the piston P, subject to excess of pressure on the one side or the other, resulting from direction of the jet more into the one of the channels M N than into the other. If, for instance, the breech of the gun descended a little, the channel M would receive more of the jet from the pipe D than the channel N. The piston P, being therefore pressed more on its under than on its upper side, would rise a little, raising the breech; and, in like manner, if the breech rose a little the excess of pressure would be on the upper side of the piston P, causing the breech to descend.

The correcting appliance shown in Figs. 5 and 6 as applied to maintain constant position of the longitudinal axis of a gun, might be applied also in a plane at right angles to the plane of that axis in cases where a platform requires to be kept always parallel to one plane, the platform being in this case mounted on gimbals.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

1. In an apparatus for maintaining a constant plane in a floating vessel, the combination, with the reaction-wheel mounted on a spherical bearing having its center coincident with the center of gravity of the wheel, of bell-cranks provided with pendulous weights and having rollers acting against the surface of the reaction-wheel, substantially as and for the purpose described.

2. In an apparatus for maintaining a constant plane in a floating vessel, the combination, with the cylinders, the plungers arranged in the cylinders, the gimbals connected with the plungers, the reaction-wheel, the jet-pipe, and channels leading to the cylinders, of the guard L, having a central orifice and arranged over the delivery-mouth of the jet-pipe, substantially as described.

3. In an apparatus for maintaining a constant plane in a floating vessel, the combination, with the reaction-wheel, the jet-pipe at the center thereof, the cylinders, the channels leading from the cylinders to points over the jet-pipe, the plungers arranged in the cylinders, and the gimbals connected with the plungers, of the subsidiary cylinder O, containing a piston P, and the supplementary channels M N, leading from points above the jet-pipe to the subsidiary cylinder, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 3d day of November, A. D. 1890.

BEAUCHAMP TOWER.

Witnesses:

OLIVER IMRAY,
Patent Agent, 28 Southampton Buildings, London, W. C.

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