

**No. 621,640.**

**Patented Mar. 21, 1899.**

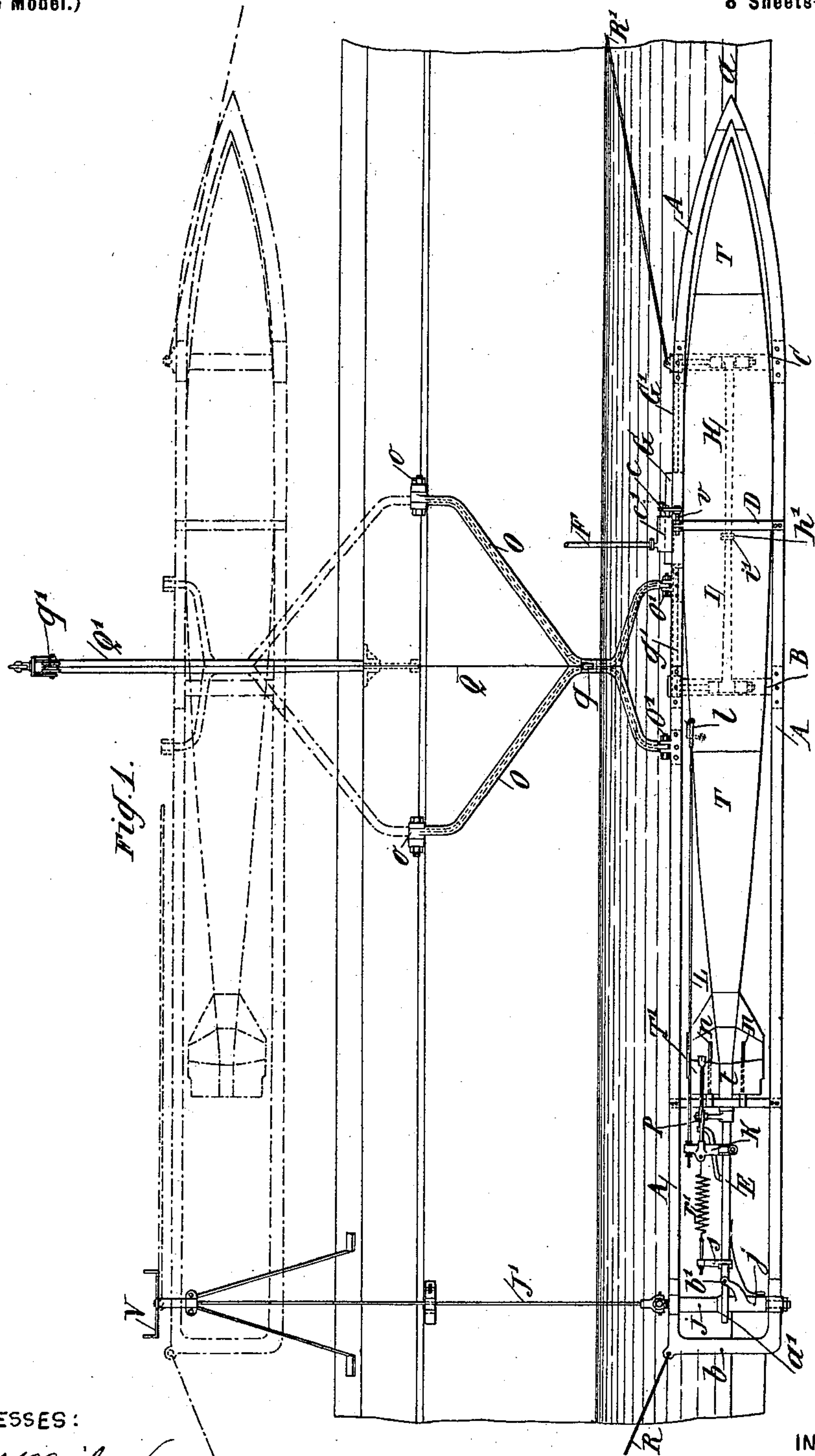
**S. DRZEWIECKI.**

**TORPEDO LAUNCHING APPARATUS.**

(Application filed Aug. 11, 1898.)

(No Model.)

**8 Sheets—Sheet 1.**



WITNESSES:

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No. 621,640.

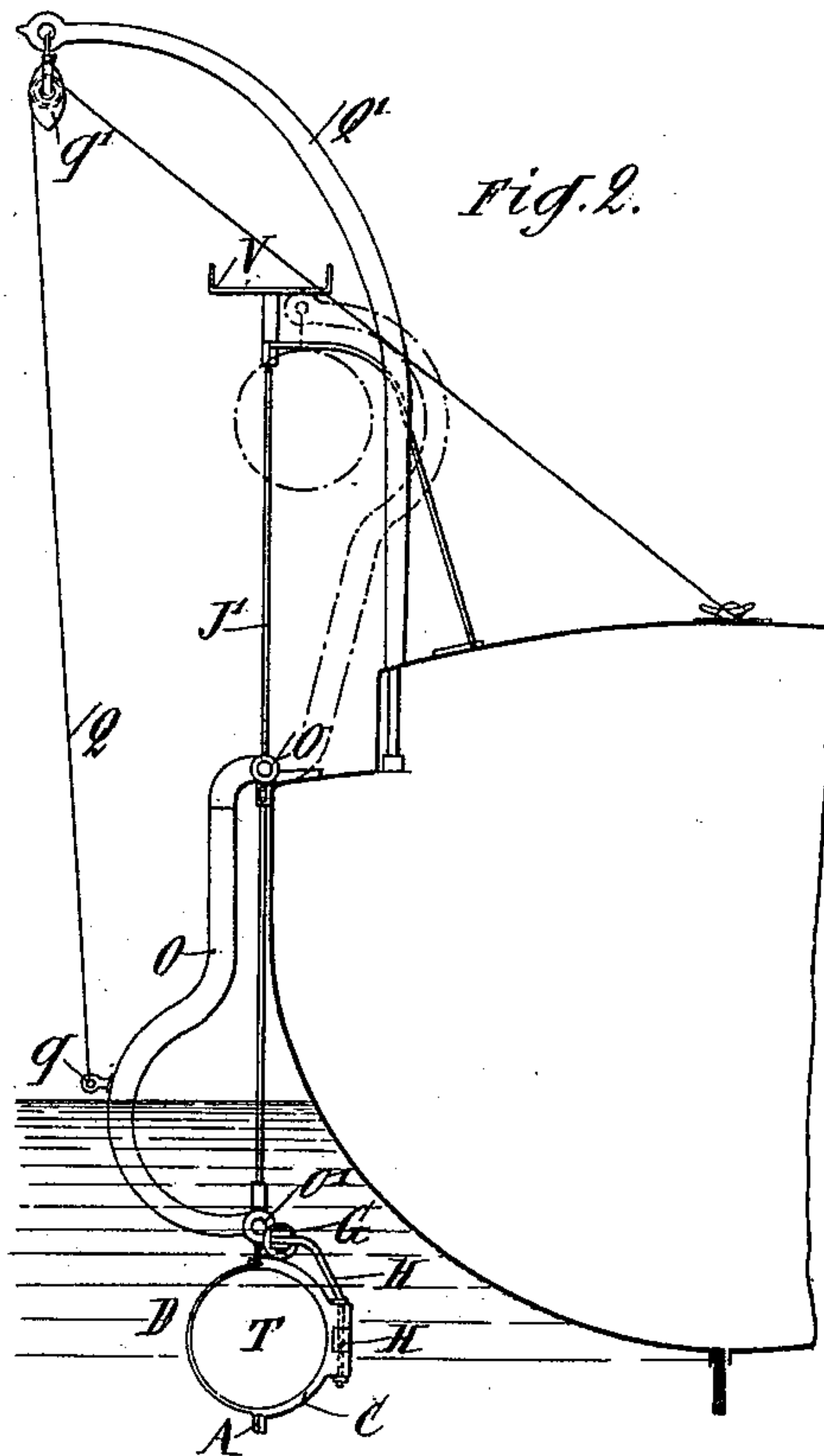
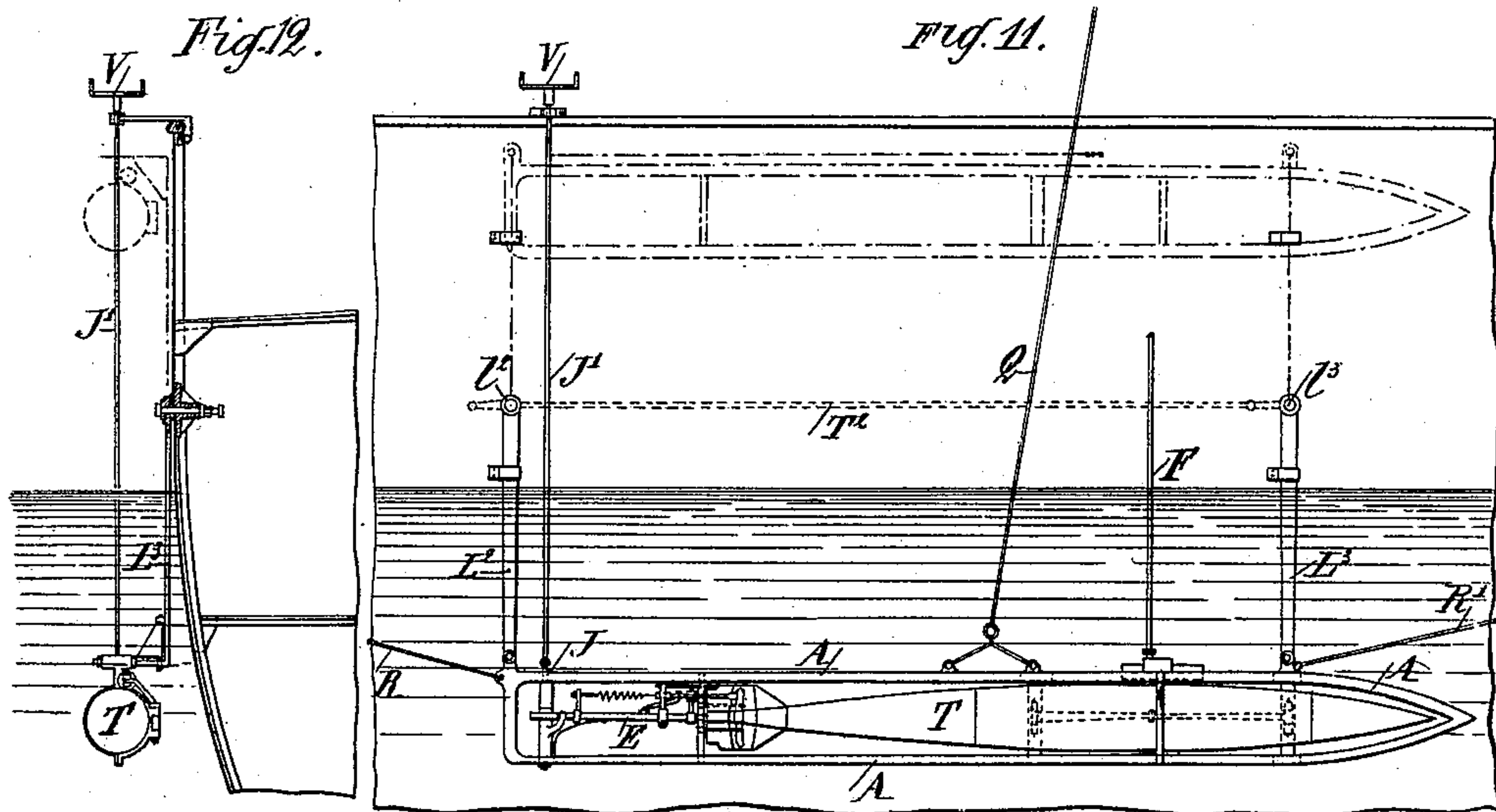
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8 Sheets—Sheet 2.



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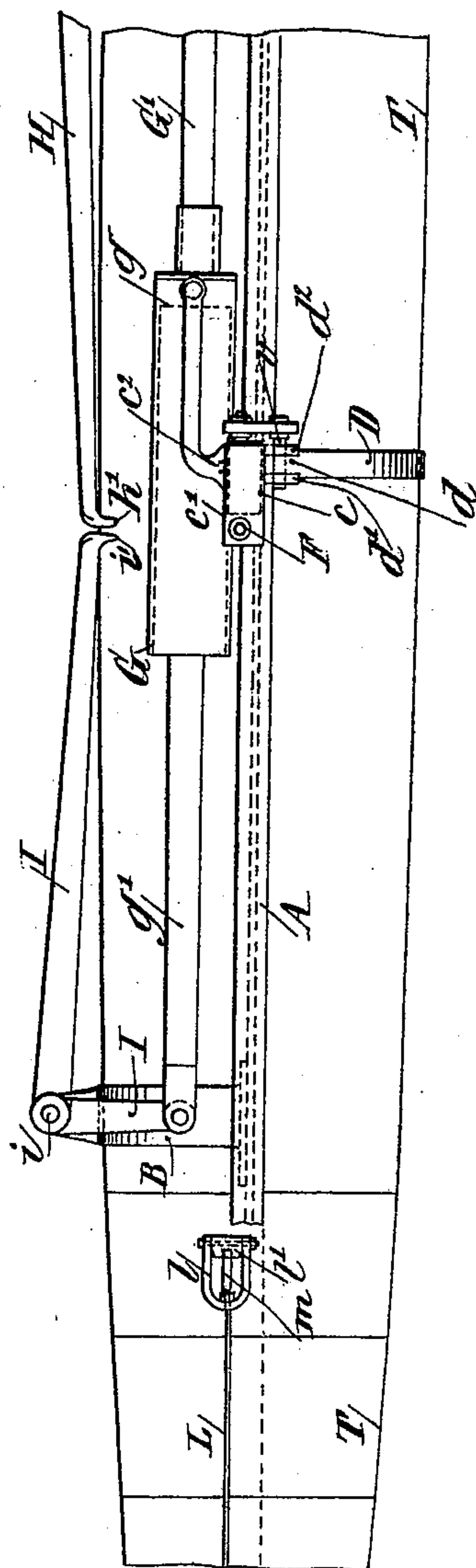
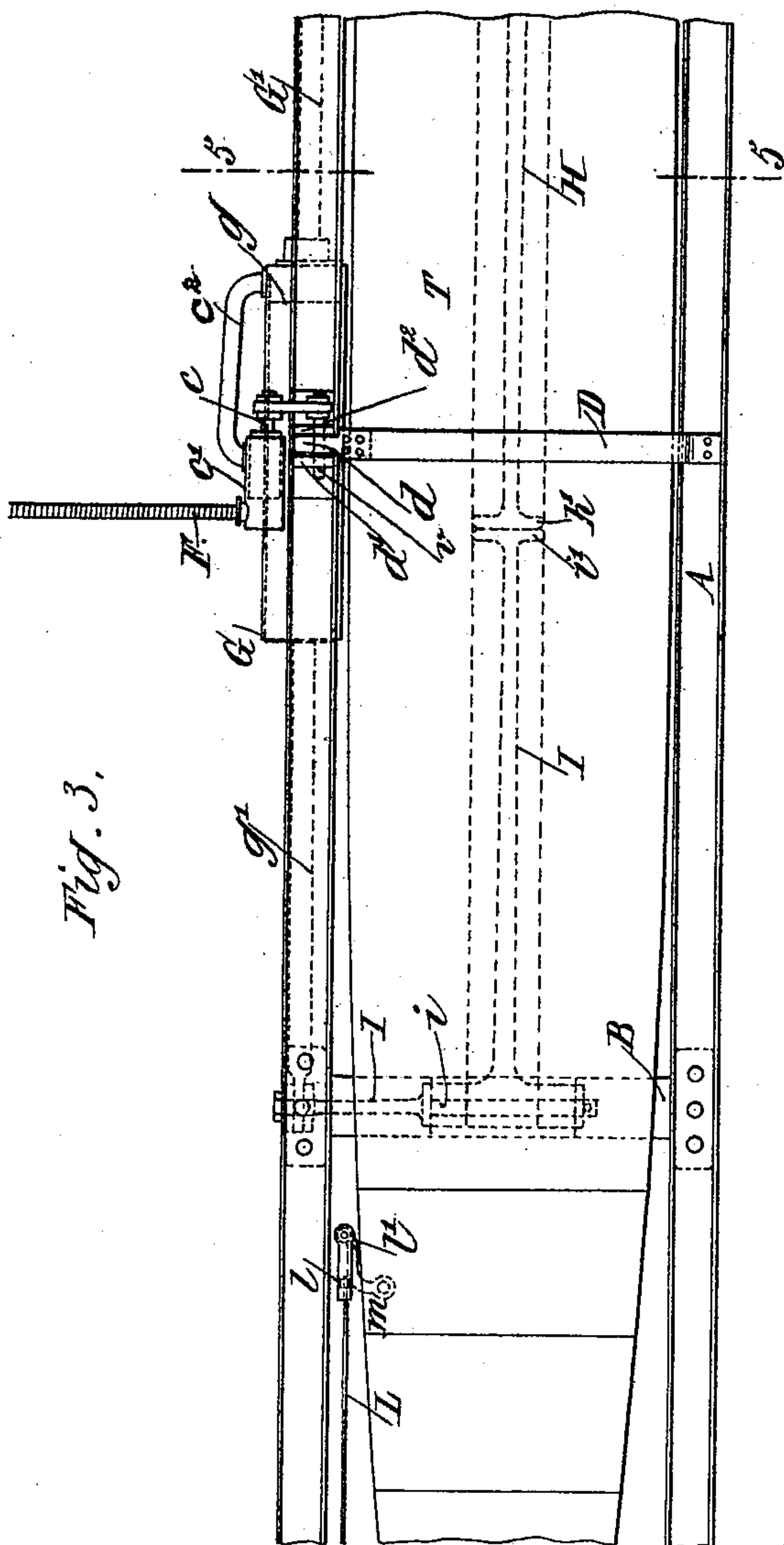
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No. 621,640.

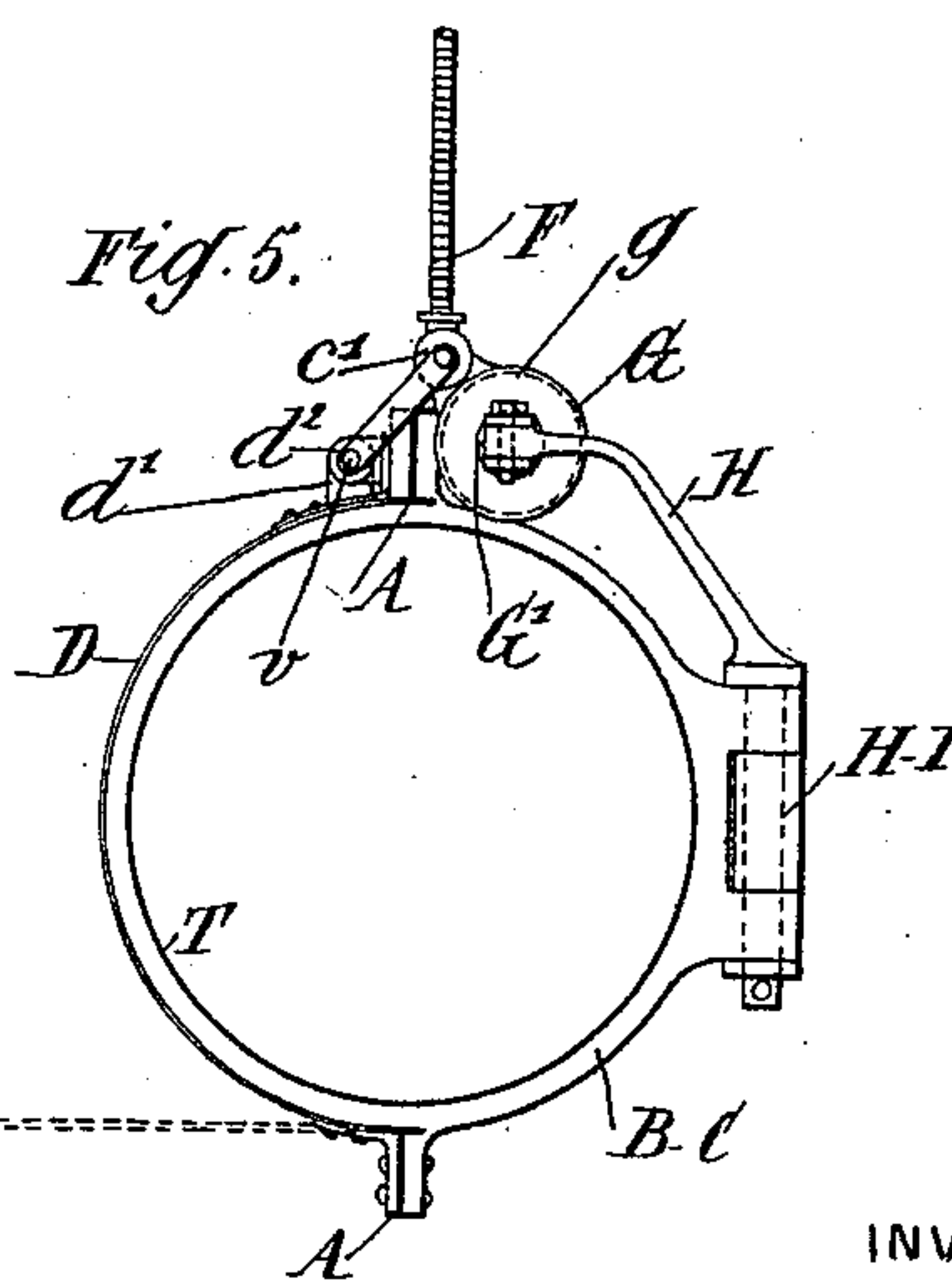
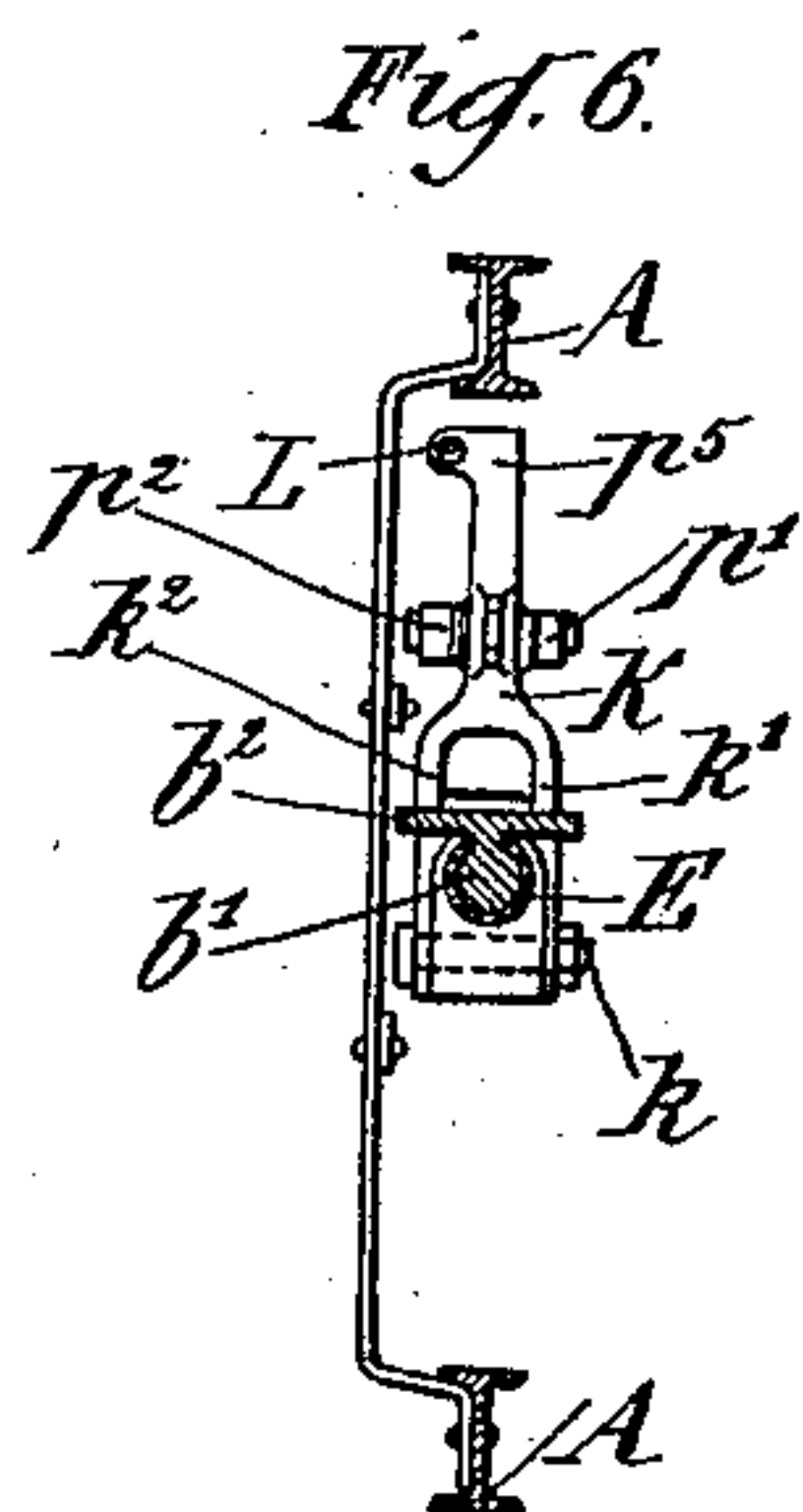
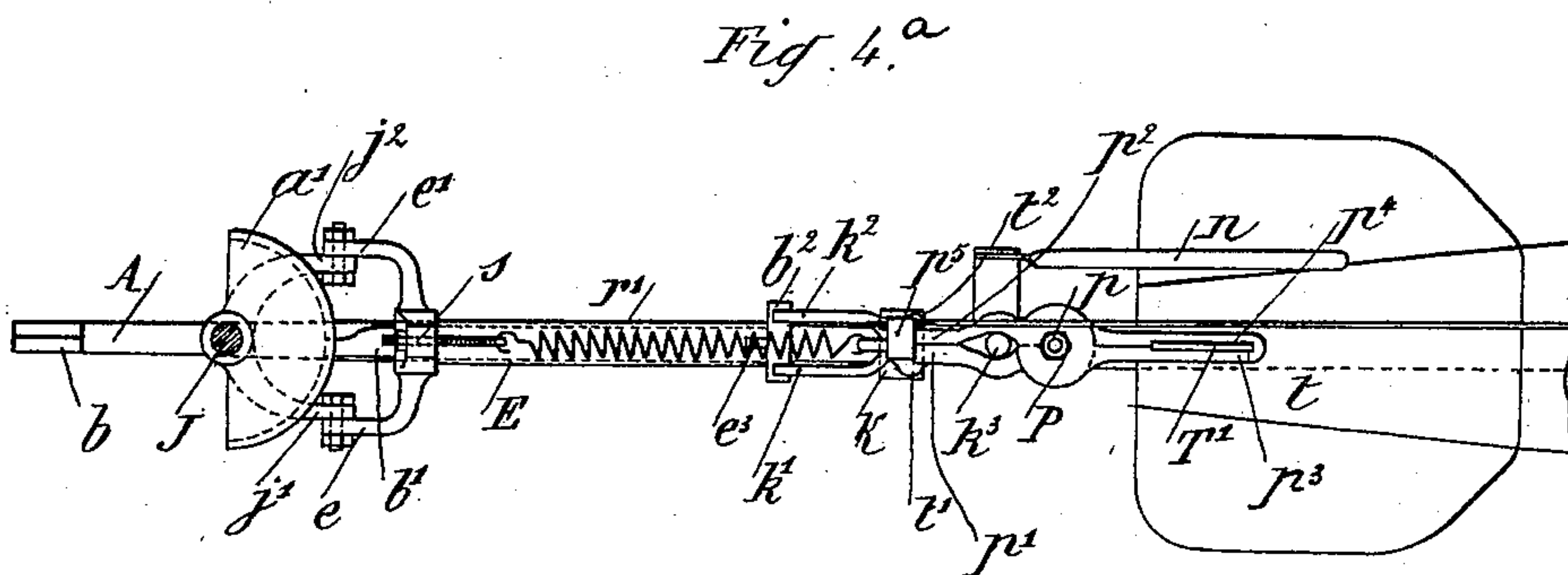
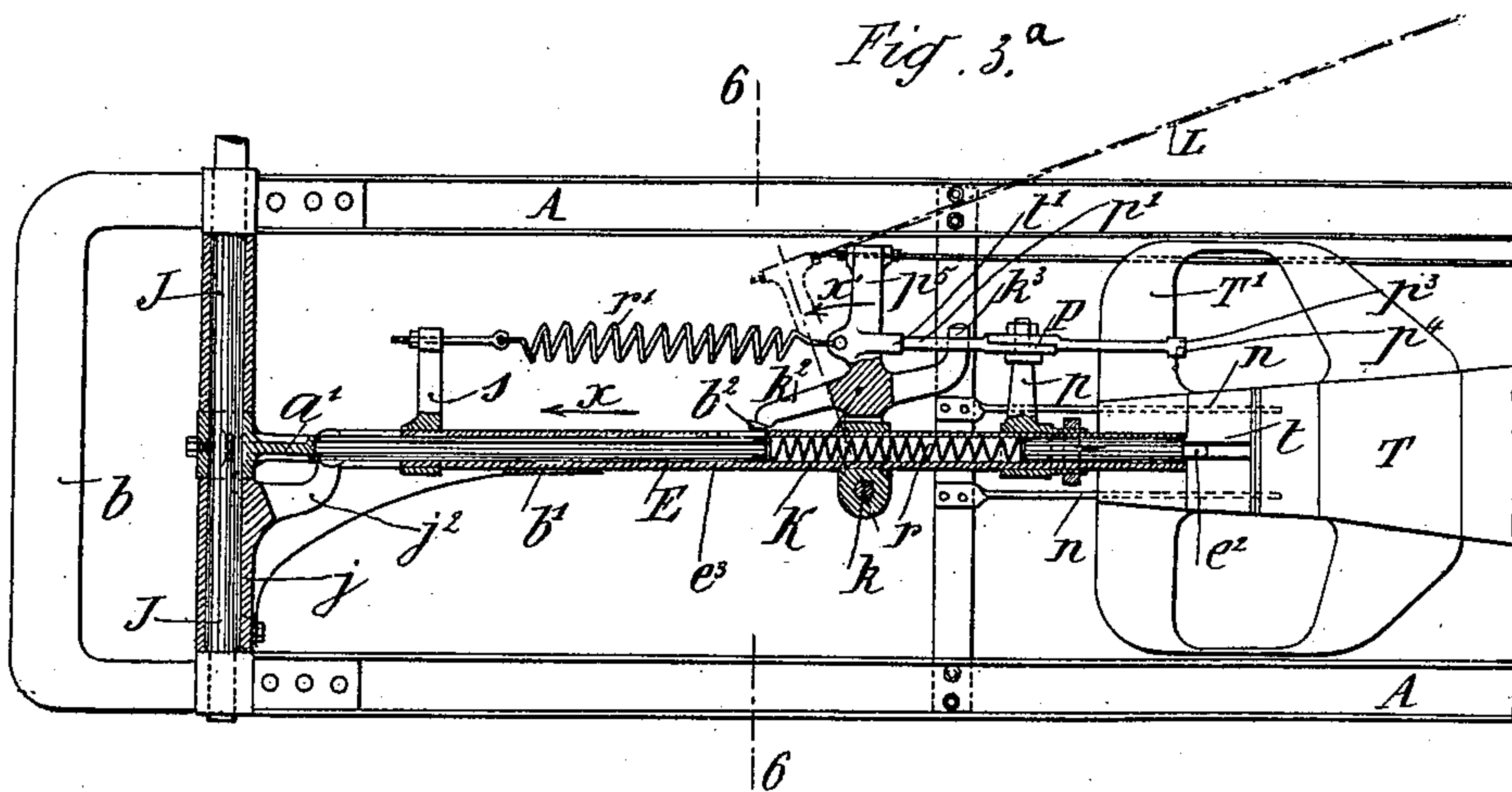
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8 Sheets—Sheet 4.



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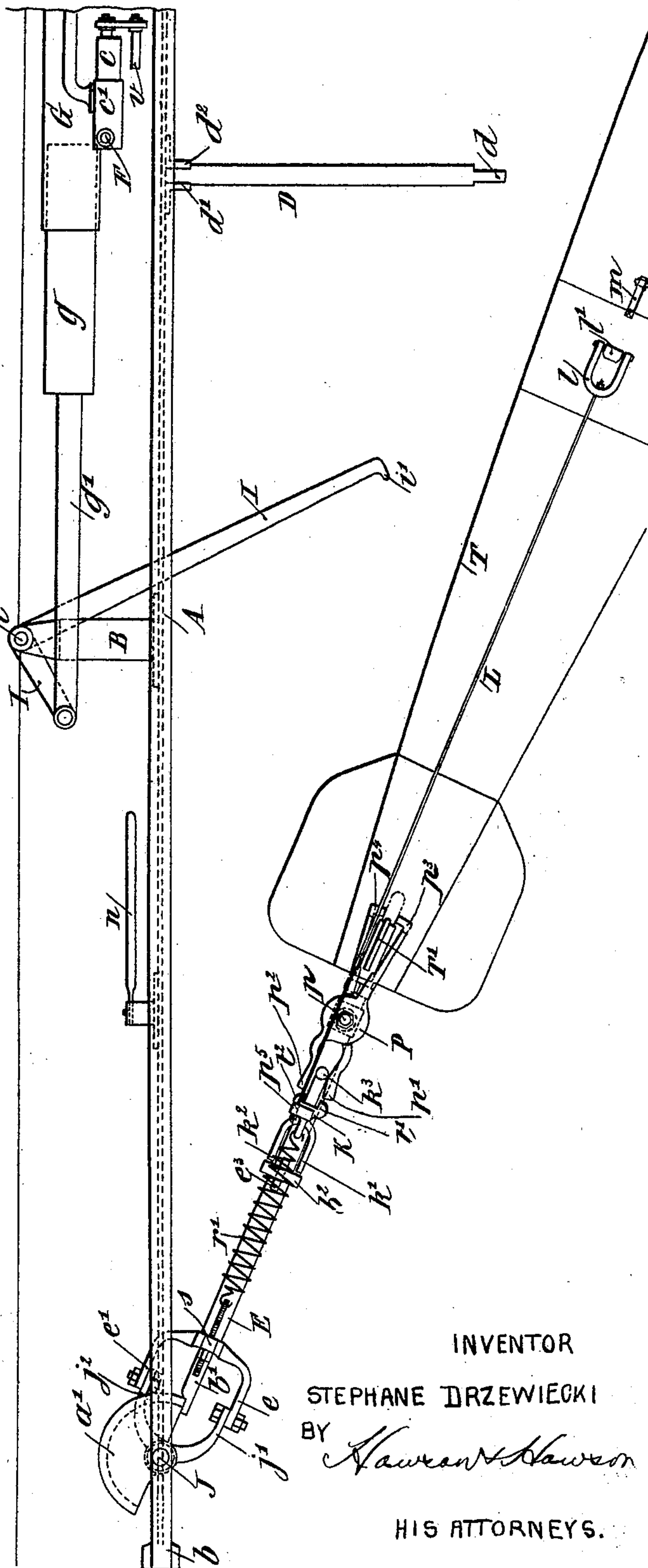
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8 Sheets—Sheet 5.

Fig. 7.



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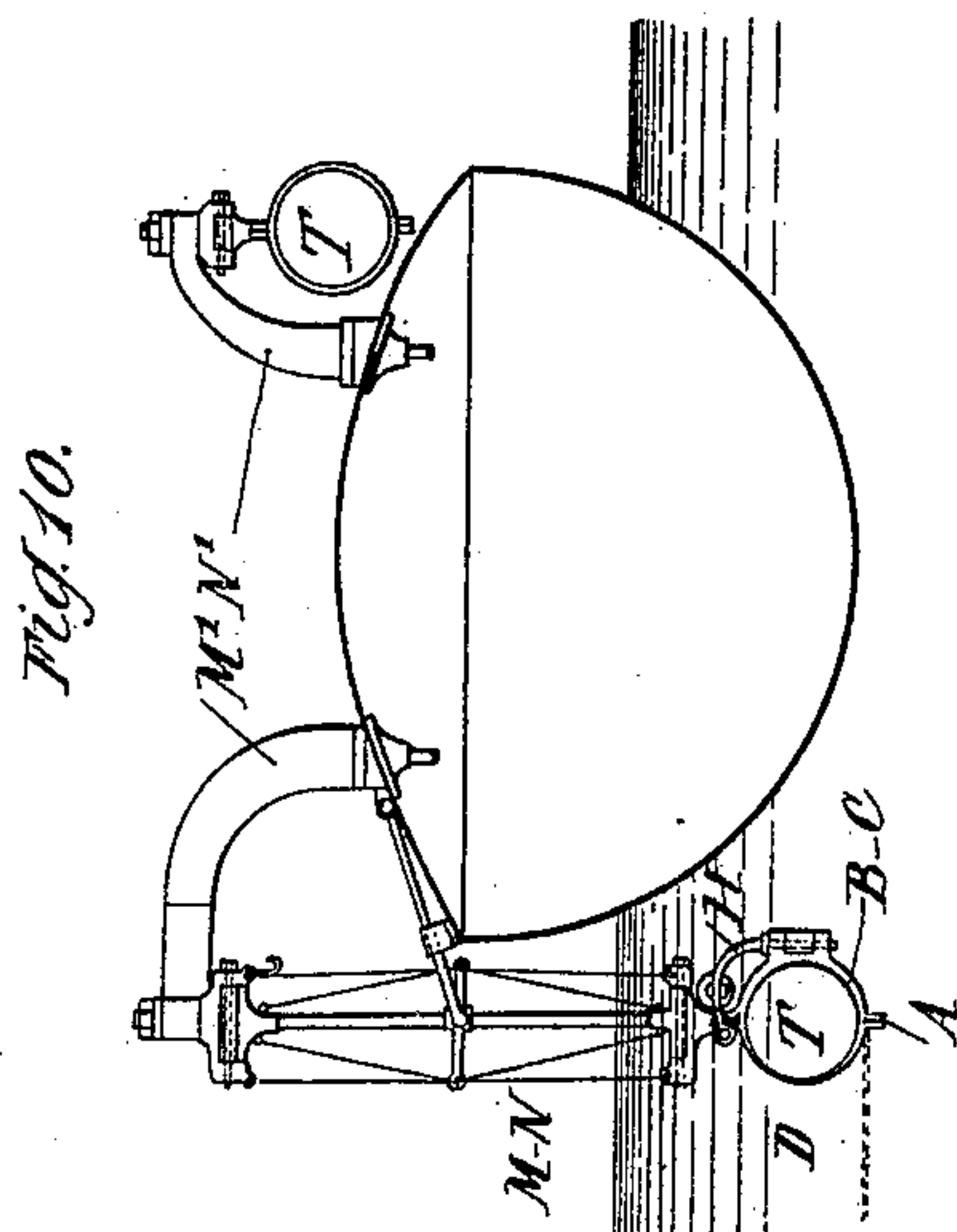
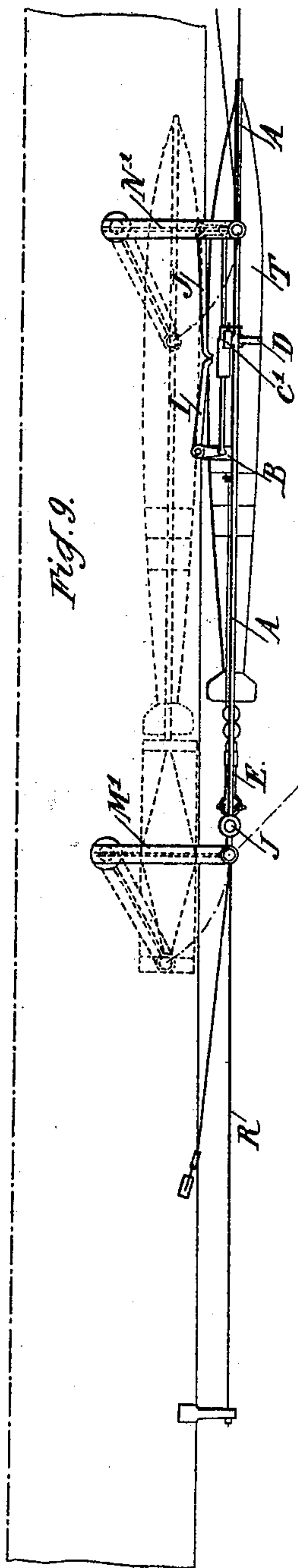
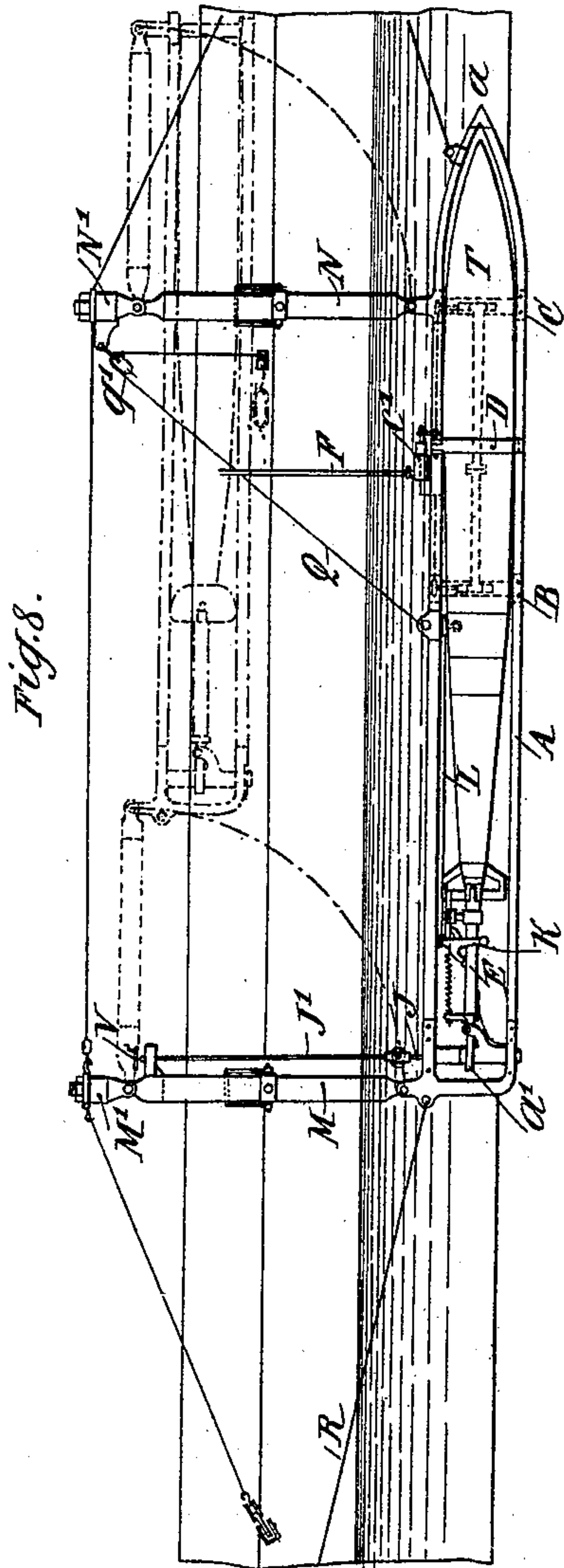
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(No Model.)

8 Sheets—Sheet 8.



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Fig. 13.

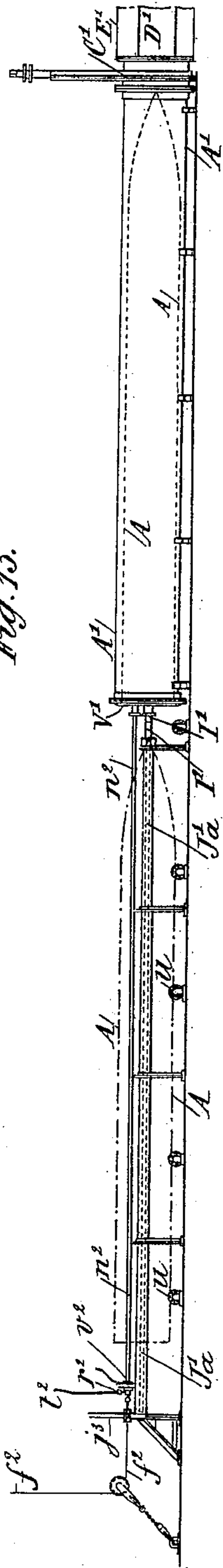


Fig. 14.

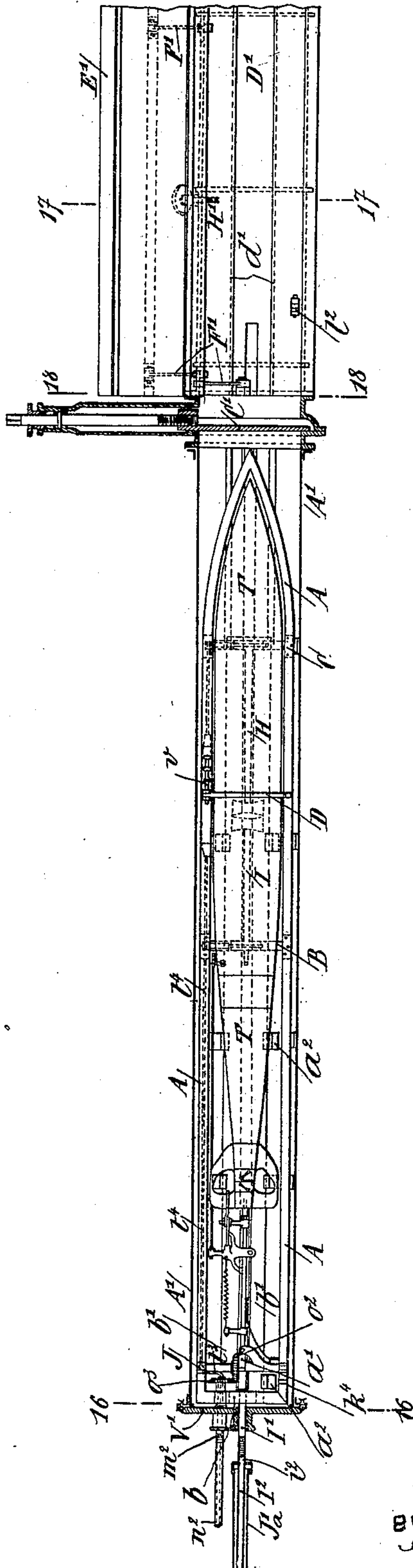
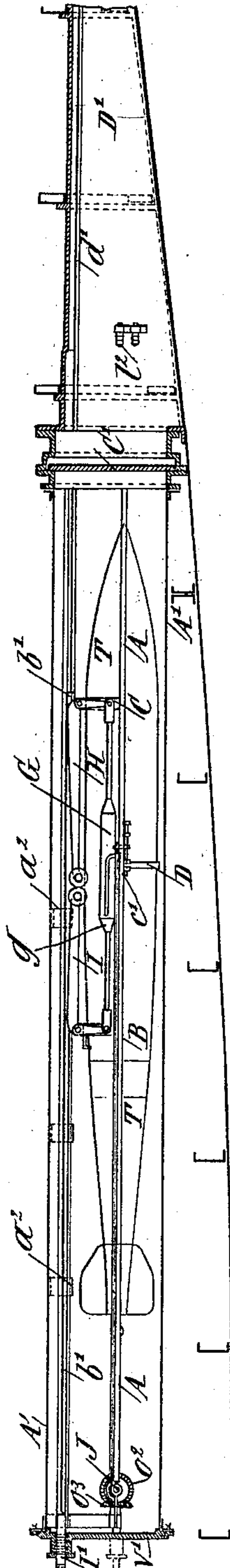


Fig. 15.



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Fig. 18.

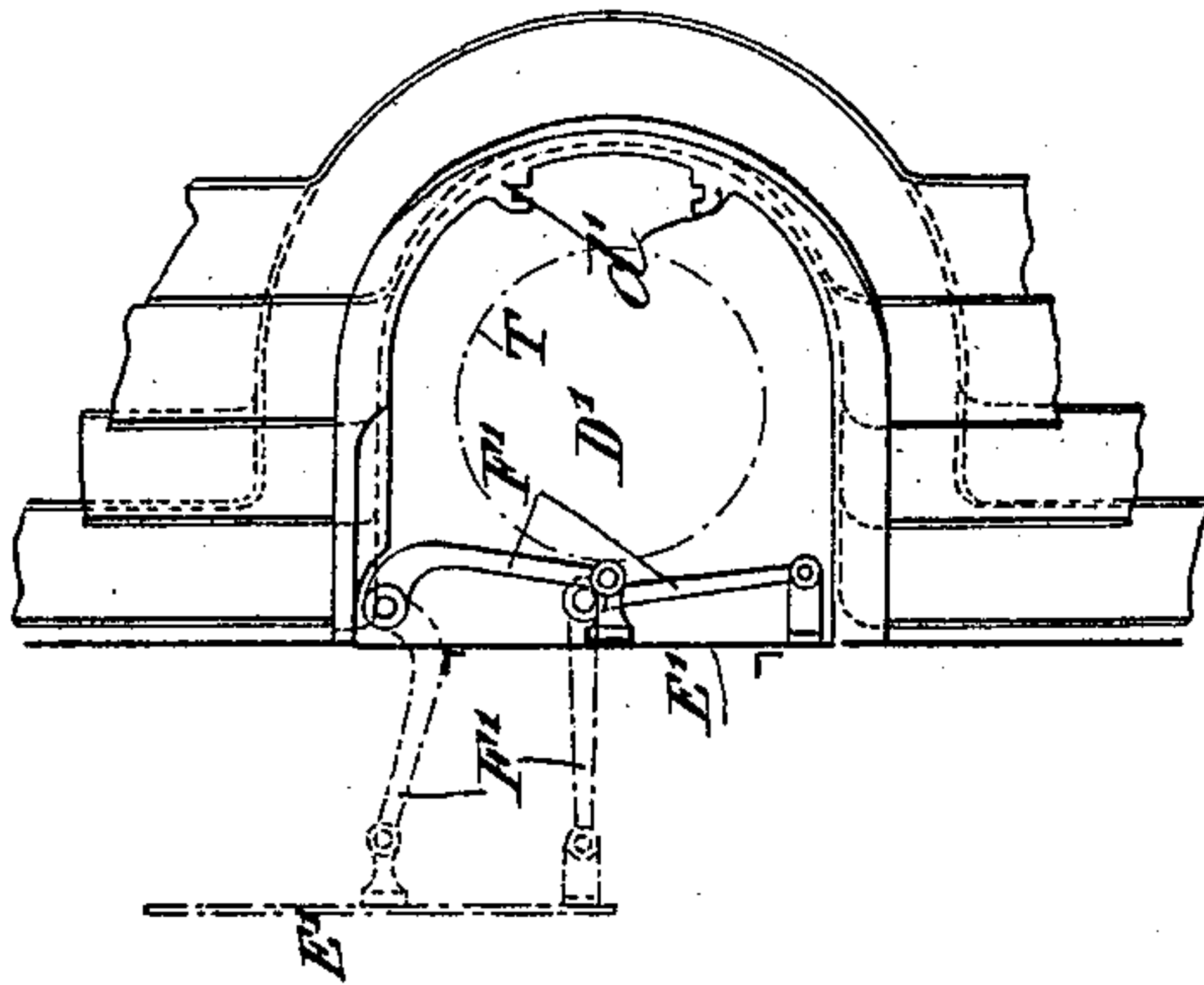


Fig. 17.

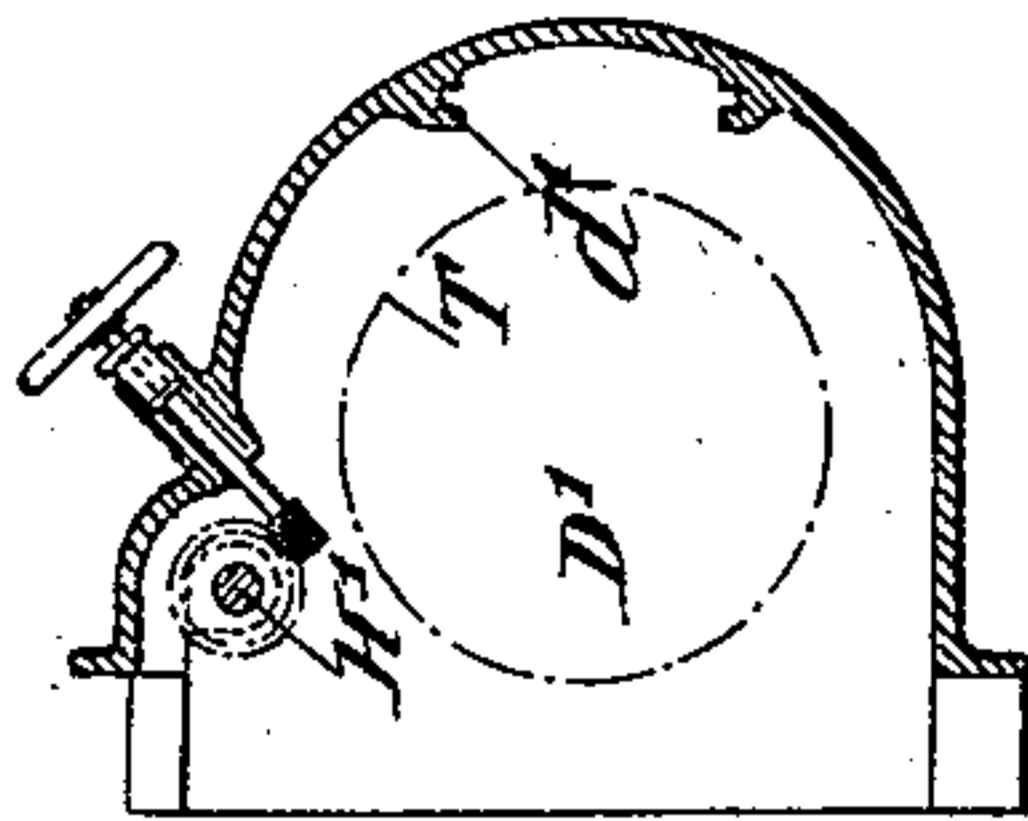


Fig. 16.

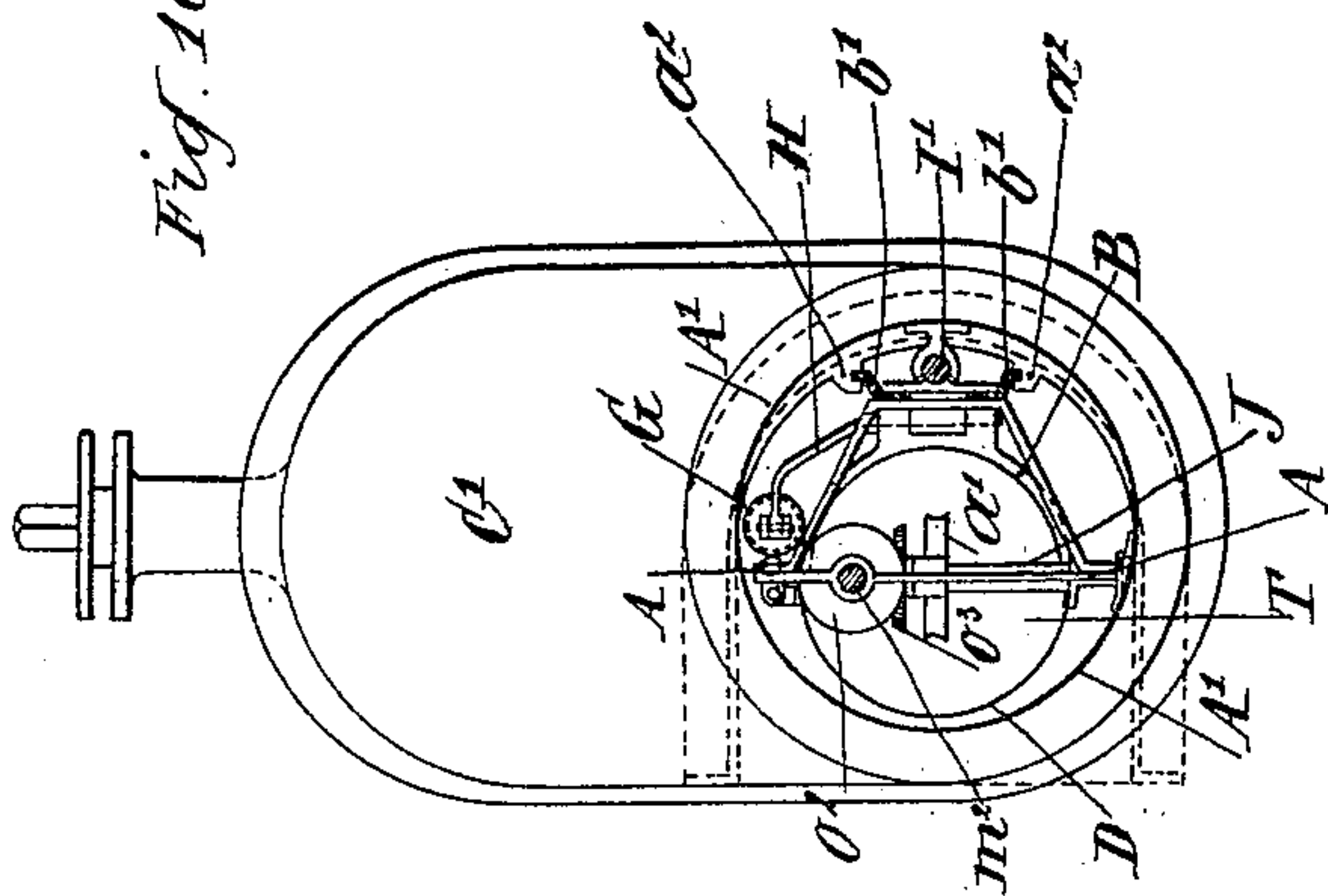
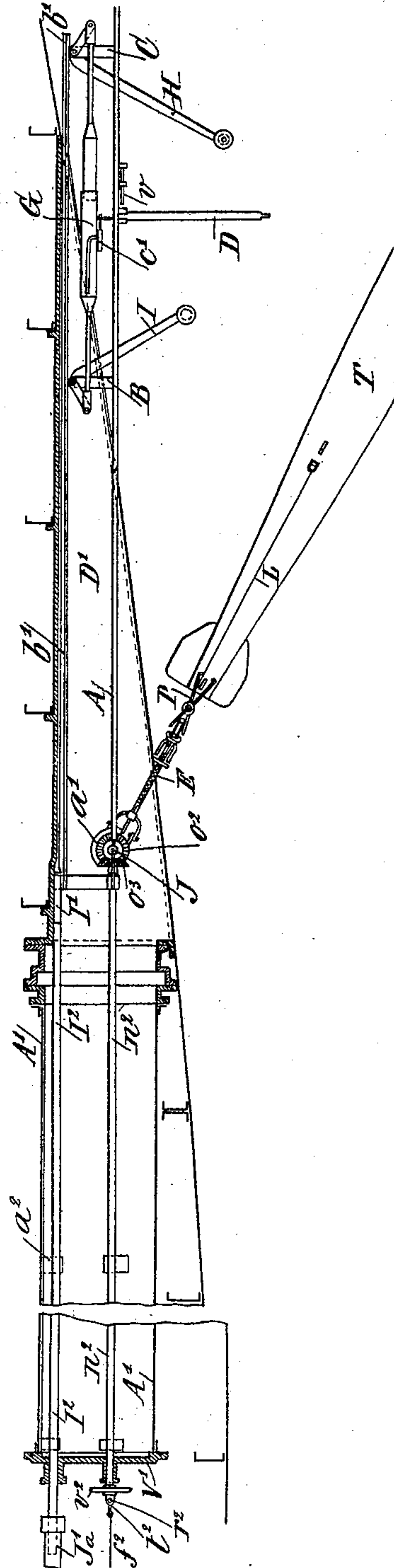


Fig. 19.



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# UNITED STATES PATENT OFFICE.

STEPHANE DRZEWIECKI, OF PARIS, FRANCE.

## TORPEDO-LAUNCHING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 621,640, dated March 21, 1899.

Application filed August 11, 1898. Serial No. 688,395. (No model.)

*To all whom it may concern:*

Be it known that I, STEPHANE DRZEWIECKI, engineer, a citizen of the Republic of France, residing at Villa Damont, Rue des Bauches, Paris, in the Republic of France, have invented certain new and useful Improvements in Submarine-Torpedo-Launching Apparatus, of which the following is a specification.

This invention relates to submarine-torpedo-launching apparatus; and its object is to permit of self-moving torpedoes being launched under water in any desired direction during the chasing, pursuit of, or retreating from any ship, which may be a large or small one, flat with the water-level or rising up above.

The torpedo-launching apparatus constructed according to this invention is combined with an anchoring or immersing apparatus, forming the torpedo-carrier.

The torpedo-launching apparatus proper is mainly composed of a metal frame, in which the torpedo is placed longitudinally, of a movable arm engaging by its front end the tail of the torpedo, and pivoting by its rear end around a vertical axis arranged near the rear of the frame, and of a lever mechanism operated by compressed air for launching the torpedo. This arrangement of mechanism constituting the torpedo-launcher is lowered from the boat into the water by means of an anchoring or immersing mechanism, hereinbefore mentioned, and is retained in a position parallel to the diametrical plane of the ship and with its point in a forward direction.

At the moment of launching the torpedo by the application of compressed air the launching-levers move the torpedo (engaged by the movable arm) laterally away from the ship. The torpedo, owing to the resistance opposed to it by the water during the ship's motion, is caused to turn around toward the rear by pivoting around the axis of the movable arm until it comes into the line of sight or range. At this moment it is released from its engagement with the movable arm by the action of an automatic mechanism which also at the same time operates the air-inlet lever, thus causing the torpedo to move off in the desired direction by the action of its propeller. The form of anchoring or immersing apparatus or torpedo-carrier must naturally depend on the ship in which it is employed, and it may be

arranged either at the exterior or in the interior of the ship. In the latter case it is arranged in a special tube.

In order that the invention may be clearly understood and readily carried into effect, and to explain the arrangement, construction, and operation of my improved torpedo-launching apparatus, I will refer to the accompanying drawings, in which—

Figures 1 and 2 are respectively a side elevation and a transverse section of a part of a torpedo-boat to which my improved torpedo-launching apparatus is applied and showing the anchoring or immersing means which I prefer to use. Figs. 3, 3<sup>a</sup>, 4, and 4<sup>a</sup> are respectively a side elevation and a plan of the torpedo-launching apparatus proper. Figs. 5 and 6 are transverse sections taken on the lines 5 5 and 6 6, respectively, of Figs. 3 and 3<sup>a</sup>. Fig. 7 is a plan similar to that shown by Fig. 4, but showing the torpedo in the position it would occupy at the moment of leaving the launching mechanism or carrier. Figs. 8, 9, and 10 are a side elevation, a plan, and a transverse section, respectively, of a modification of the anchoring or immersing mechanism shown in Figs. 1 and 2. Figs. 11 and 12 are an elevation and an end view, respectively, of another modification of anchoring or immersing mechanism. Fig. 13 is a longitudinal elevation of my improved launching arrangement in connection with a submerged torpedo-tube. Figs. 14 and 15 are a side elevation and a plan, respectively, of the launching-tube proper drawn to a larger scale. Figs. 16, 17, and 18 show transverse sections taken, respectively, on the lines 16 16, 17 17, and 18 18 of Fig. 14; and Fig. 19 is a plan similar to Fig. 15, but with the torpedo shown in the position it would occupy at the moment of leaving the launching mechanism.

The torpedo T for launching is placed, Figs. 1, 2, 3, 4, 5, and 6, in a metal frame A, one extremity of which—say the front one—terminates in a point *a* and the other extremity, *b*, the rear one, being straight or flat-ended. The torpedo T is maintained in position in the said frame A, which serves as a housing for it, by means of two fixed semi collars or yokes B and C, which connect together the two horizontal members of the said frame, and by another but movable collar or yoke D, arranged



in an opposite direction to and between the former two collars or yokes B and C and placed near the end of the air-reservoir of the torpedo T. These two collars B and C are rigid and, as already indicated, they are connected to the frame A in a fixed position, and they are arranged to take up a position against the side of the ship when the apparatus is lowered into the water. The movable yoke or collar D, placed at the opposite side—that is to say, at the outside—consists of a thin flexible steel strip fixed by its lower end to the frame A and engaging by an eyepiece  $d$  in two similar eyepieces  $d'$   $d^2$ , fixed to the upper branch of the frame. A pin or bolt  $v$  is passed through the three eyepieces  $d$   $d'$   $d^2$ , and so holds the semi outer yoke or collar D in position, and in consequence thereof the torpedo T is firmly held between the said three yokes or collars B, C, and D. In addition to this the tail part  $t$  or extremity of the hollow shaft forming the rear end of the torpedo is engaged by the extremity of a movable arm E, hereinafter more particularly described. The said pin or bolt  $v$  is connected to the head of a plunger  $c$ , adapted to move in a small cylinder  $c'$ , to which leads a flexible tube F, in connection with any convenient air-compressor for supplying compressed air to such cylinder. Normally no compressed air is admitted in the small cylinder  $c'$ , which communicates with a larger cylinder G through a pipe  $c^2$ . The large air-cylinder G is arranged parallel to the small cylinder and is fixed by its bottom to a rod  $G'$ , pivoted to the small arm of an elbow-lever H, which is carried by a pivot-pin  $h$ , provided on the collar C.

The large air-cylinder G is provided with a plunger  $g$  and piston-rod  $g'$ , which latter is pivoted to the small arm of another elbow-lever I, mounted on a pivot-pin  $i$  in the fixed or inner yoke or collar B. The two elbow-levers H and I are arranged symmetrically, and the long arms thereof are placed in line with each other and rest with their respective extremities  $h'$  and  $i'$  on the air-reservoir of the torpedo T. These elbow-levers H and I are intended, as hereinafter explained, to expel the torpedo T from the frame A directly the bolt is withdrawn from the loose outside yoke or collar D, whereupon the torpedo swings around a vertical axis or pivot J, which is that of the tail-engaging lever-arm E. The vertical pivot J is capable of turning in the horizontal branches of the frame A and is arranged in proximity to the flat rear portion  $b$  of the said frame. The pivot is furnished with a loose sleeve  $j$ , carrying a fork, to the prongs  $j'$  and  $j^2$  of which are hinged corresponding prongs  $e$  and  $e'$  of another fork connected with the tail-engaging arm E. This arm consists of a tube which at its other end has fixed to it a rod  $e^2$ , engaging by its free end in the hollow shaft  $t$  of the torpedo T. On the vertical pivot J and level with the tail-engaging arm E is keyed a cam  $a'$ , against

which abuts the head of a rod  $b'$ , loosely inserted in the tubular arm E. The said rod  $b'$  terminates at its forward end in a plate or fin  $b^2$ , which is inserted in and passes through a slot  $e^3$ , provided in the movable arm E. A coiled spring  $r$ , interposed between the fixed rod  $e^2$  and the loose rod  $b'$ , keeps this latter in constant contact with the cam  $a'$ . Upon the outer ends of the plate or fin  $b^2$  rests two claws  $k'$   $k^2$  of a rocking lever K, capable of oscillating on an axis  $k$ , but constantly pulled rearward by a coiled spring  $r'$ , connected to a bracket  $s$ , carried by the tail-engaging arm E, the spring being provided with means by which to regulate its tension. The rocking lever K is also provided with two laterally-arranged heel-pieces  $t'$  and  $t^2$ , which normally keep closed the two branches  $p'$  and  $p^2$  of pincers or grippers P, the jaws of which,  $p^3$  and  $p^4$ , retain between them the upper portion of the vertical wing T' of the tail end of the torpedo T. These jaws  $p^3$  and  $p^4$  terminate in curved overlapping beaks so arranged as to completely encircle the wing T' when closed, thus preventing the torpedo T from becoming detached from the arm E. The rocking lever K is further provided with a finger  $k^3$ , which passes upward between the branches  $p'$  and  $p^2$  of the pincers or grippers P, mounted on a vertical support  $p$ , and also with a prolongation  $p^5$ , to the upper end of which is fixed a longitudinal rod L, provided at its free end with a stirrup  $l$ , having a tongue-piece  $l'$ , which engages the operating-lever  $m$  of the air-inlet for the torpedo T. The propeller of the torpedo T is, moreover, held between two bars  $n$   $n$ , rigidly fixed on the frame A, and which bars oppose the rotation of the propeller during the retention of the torpedo in the frame.

Before proceeding to describe the mechanisms for lowering and immersing the torpedo-carrier I will first explain the action of the torpedo-launcher proper, the parts of which have been hereinbefore described.

Suppose the torpedo T has been placed and fixed in the frame A in the manner already stated, and that the said frame has been lowered and anchored in the manner indicated by Figs. 1 and 2—that is to say, the torpedo is fully immersed in the water. In order to launch the torpedo, the same must first be disengaged from the frame A, so as to enable it to swing around its vertical pivot J and thereupon be disengaged from the movable arm E, of which it forms a prolongation. The first of these operations consists in causing compressed air to enter the small cylinder  $c'$ , so driving out the plunger  $c$ , which then removes the locking pin or bolt  $v$  and releases the movable yoke or collar D. At the end of its stroke the plunger  $c$  opens the inlet into the connecting-pipe  $c^2$ , and through it admits the compressed air into the large cylinder G, where it presses both against the bottom of such cylinder and against the piston  $g$ , thus causing them to move in opposite



directions. This action has for its object to swing around the elbow-levers H and I, and thereby cause them to press simultaneously by their respective ends  $h'$  and  $i'$  against the torpedo T and drive it away from its frame A. The torpedo on leaving the frame swings around the vertical axis J, Fig. 7, which serves as a pivot to it through the intermediary of the movable arm E, with which it is connected.

It should be observed that the action of driving the torpedo out of its frame only starts the angular evolution of such torpedo, the movement being continued by the resistance the water offers to the body of the torpedo T.

The second part of the operation consists in adjusting the cam  $a'$  for the required position of firing. This may be effected by the aid of a sighting device or alidade V, which is connected to the vertical pivot J or by any other convenient device arranged in a suitable part of the ship and properly connected to the launching mechanism. Whatever means may be adopted, once the cam is adjusted it forms a rest to the rod  $b'$  of the movable arm E until the moment when the said rod arrives at the end of the curved part of the cam  $a'$ , Fig. 7. At that moment the said rod  $b'$ , owing to the action of the spring  $r$ , becomes displaced in the movable arm E in the direction of the arrow  $x$  and disengages from the rocking lever K, and so permits this latter under the action of its spring  $r'$  to move in the direction of the arrow  $x'$ , Fig. 3, by swinging around the axis  $k$ .

This swinging movement effects the disengagement of the heels  $t'$  and  $t''$  from the branches  $p'$  and  $p''$  of the pincers or grippers and moves the finger  $k^3$  between the said branches, thereby forcing them open in case of anything preventing their opening unaided. Furthermore, it pulls the longitudinal rod L, which, owing to its stirrup  $l$ , with tongue  $l'$ , swings around the lever  $m$  of the air-inlet, so causing the ordinary and well-known propelling mechanism to start working. In this state the torpedo T is freed from its ties and at once moves off in the direction determined by the position of the cam  $a'$ .

Having now explained the action of launching, I will proceed to describe the means of immersing the torpedo.

The torpedo-launcher proper is suspended in such a manner as to permit of its being lowered vertically for the purposes of immersion or of anchorage of the torpedo carried by it, and also to permit of rehoisting either an unlaunched torpedo or the empty frame after launching the torpedo in order to charge it with another torpedo.

Figs. 1 and 2 show the preferred arrangement of anchoring mechanism. This arrangement consists in connecting the frame A to a jib-frame O, hinged at  $o o$  to the ship's side or rail and at  $o' o'$  to the said frame A. A cable Q, attached at  $q$  to the jib O and passing over the pulley  $q'$  on the davit Q', permits of moving the jib O from the position shown

in dotted lines, Figs. 1 and 2, to that shown by full lines, which represent the position of anchoring. Two cables or tow-ropes R and R' keep the frame A in position.

The modified arrangement shown in Figs. 8, 9, and 10 represents the frame A suspended by two beams M and N, hinged on the one hand to the said frame A and on the other hand to two davits M' and N' on the side or deck of the ship. The hinges are disposed in such a manner as to work in the plane of the frame A, as shown by dotted lines, Fig. 8. Furthermore, the davits M' and N' are capable of being turned on their pivots so as to enable the frame A to be placed above the ship's side or rail. (See dotted positions, Fig. 9, and at the right of Fig. 10.) The operation of anchoring is effected by releasing the cable Q, attached to the frame A, and which passes over the pulley  $q'$  in connection with one of the davits M' N'. The tow-ropes R and R' maintain the frame A in its position of anchorage.

The modified arrangement of anchorage represented in Figs. 11 and 12 is more especially suitable for use with torpedo-launchers on vessels rising high above the water-level. It will here be seen that the frame A is suspended from two hinged lever-arms  $L^2 L^3$ , the pivots  $l^2$  and  $l^3$  of which latter pass through the hull of the ship above water-line. These pivots terminate in the interior of the vessel in crank-levers connected together by a connecting-rod  $T^2$ . It is obvious that by actuating the said connecting-rod the two crank-levers turn together in their plane of evolution, and thus move the frame A from its position of rest (shown in dotted lines) into that of anchorage. (Shown in full lines.) Tappets or stops may be employed to limit the extent of movement of the levers M' and N'. If preferred, the movement of the frame A may be obtained through the medium of a rope or cable Q.

It should be observed in all these various modifications that the cam on the vertical pivot J of the movable arm E is connected with the sighting device or alidade V by a rod J', articulated on the vertical pivot J by means of a universal joint or by any other convenient means.

A further modification is shown in Figs. 13 to 18, which for use in connection with a launching-tube A', is arranged in the interior, Figs. 14 and 15, of the ship above the water-line parallel to the diametrical plane of the ship and along the sides thereof toward the bow. The tube A', which is of sufficient length to contain the frame A of the torpedo-launching apparatus, is closed at its rear end by a cover V', adapted to be taken off, and closed at its front end by a sluice-valve C' or by any other similar means and which separates such tube from the spoon or shield D', formed as a prolongation of the tube A' and opening laterally through an elongated aperture in the side, to which it is connected in



any suitable manner. The lateral aperture in the side and spoon is ordinarily closed by an obturator  $E'$  in connection with a system of levers or lever mechanism  $F'$ , Fig. 18, forming an articulated parallelogram, which permits of the lateral removal of the said obturator from the aperture. This may be effected, for example, by means such as shown at  $H'$ , Fig. 17, one of the parts being connected to the axis of one of the levers  $F'$ , and the other part may be provided with a hand-wheel situate in the interior of the vessel. The launching-tube  $A'$  is provided internally with guides  $a^2$ , Fig. 16, between which moves a slide  $b^3$ , extending from the rear  $b^4$  to the inner yoke or collar  $C$  of the frame. Similar guides  $d'$  are provided in the spoon or shield  $D'$ , in which the frame  $A$  can be slid endwise from the tube  $A'$  into the said spoon or shield after the sluice-valve has been opened. For the purposes of this operation a rod  $I'$ , fixed to the rear end of the frame  $A$  and passing through the cover  $V'$  of the launching-tube  $A'$ , is connected by a screwed portion to a tubular piston  $I^2$ , equal in length to the full stroke of the frame  $A$ . The tubular piston  $I^2$  enters a cylinder or pump-barrel  $J'^a$ , Figs. 13, 14, and 19, adapted to be placed in communication with a compressed-air reservoir of any suitable construction by means of a tube connection  $j^3$ . The compressed air thus introduced into the cylinder  $J'^a$  does not act against the extremity of the piston  $I^2$ , but acts against the bottom  $i^2$  of the said piston, which under these conditions is not liable to become deformed. The action produced on the piston  $I^2$  by the compressed air brings about the displacement of the frame  $A$  from the tube  $A'$  into the spoon or shield  $D'$  until the lateral tappets  $k^4$  strike against stop  $l^2$ , arranged in the interior of the spoon or shield  $D'$ . On the vertical portion  $b^4$  of the frame  $A$  is fixed a tubular rod  $m^2$ , passing through the cover  $V'$  of the tube  $A'$ , and to such rod is connected by means of a screwed portion a tube  $n^2$  of equal length to the full stroke of the frame  $A$ . This tubular rod  $m^2$  serves, on the one hand, as a means by which to operate the cam  $a'$ , which regulates the point of departure of the torpedo  $I$ , and, on the other hand, for introducing compressed air into the cylinders  $c'$  and  $G$ , the first of which cylinders effects the unbolting of the movable yoke or collar  $D$ , while the second of these cylinders effects the movement of the pushing-out or elbow levers  $H$  and  $I$ , and also causes the frame  $A$ , after the launching of the torpedo, to return from the spoon  $D'$  back into the launching-tube  $A'$ . To this end the tubular rod  $m^2$  is provided between the vertical rear part  $b^4$  and the vertical pivot  $J$  with a bevel-wheel  $o^2$ , in gear with a similar wheel  $o^3$ , keyed to the hub of the cam  $a'$ . Thus if the said tubular rod is rotated by any convenient means—say, for instance, a hand-wheel  $v^2$ —a corresponding movement is imparted to the cam  $a'$ , and this latter can

therefore be placed to accord with any desired angle for launching.

In the front end of the tubular rod  $m^2$  is attached a flexible tube  $t^3$  for supplying the compressed air to the cylinders  $c'$  and  $G$ , which on their side are connected with the same tubular rod  $m^2$  by another flexible tube  $t^4$ . A tap or cock  $r^2$ , arranged near the hand-wheel  $v^2$ , permits of supplying at a given signal compressed air to both these cylinders.

In order to enable the frame  $A$  to be returned from the spoon or shield  $D'$  into the tube  $A'$ , a thin steel rope  $f^2$  is attached to the extremity of the tubular rod  $m^2$ , and such rope may be hauled in by a suitable tackle or by any other convenient means. The general operation of this arrangement is easily understood. First, the sliding cover  $E'$  of the spoon or shield  $D'$  is removed and the sluice-valve  $C'$  opened. Then the frame  $A$ , carrying the torpedo  $I$ , is advanced into the spoon or shield through the action of compressed air introduced into the cylinder  $J'^a$ , and at the word "Fire" the tap or cock  $r^2$  is opened to admit compressed air into the tubular rod  $m^2$ , at the same time keeping the hand-wheel  $v^2$  thereof in the position indicated by the person on the bridge. It should be observed that such position of the hand-wheel  $v^2$  may be effected either by mechanical means directly from the bridge or by electrical means in connection with an electrical indicator. It should further be noted that the swing of the torpedo  $T$  around the vertical pivot  $J$  and its disengagement from the movable arm  $E$  are effected in the manner already explained with regard to the function of the torpedo-launcher proper and that such manner of operating remains the same without any modification whatever. In order to recharge the apparatus, the frame  $A$  is brought back into the tube  $A'$  and the sluice-valve  $C'$  closed. Then the water is expelled from the tube  $A'$ . The piston  $I^2$  and the tube  $n^2$  are unscrewed, so as to disconnect the same and to allow of the cylinder  $J'^a$  being taken off. Next the cover  $V'$  of the tube  $A'$  is removed and the frame  $A$  taken out by running it on rollers suitably disposed. Then a fresh torpedo is introduced, and the same operations are carried out in a reverse order, so as to place the frame  $A$ , charged with such torpedo, again into the launching-tube  $A'$ .

What I claim is—

1. In an apparatus for launching submarine torpedoes, the combination of a frame for holding the torpedo, means for supporting said frame in the water adjacent to the ship, connections between said frame and ship for raising and lowering the same, mechanism controlled from the ship for causing the torpedo to swing outwardly from the frame, and mechanism for automatically releasing the torpedo from the frame, when the torpedo is moved into the line of sight, substantially as described.

2. In an apparatus for launching subma-



rine torpedoes, the combination of a frame, a vertical rod journaled therein, means for holding the torpedo longitudinally in said frame, connections between the vertical rod and the tail of the torpedo whereby said torpedo is pivotally connected to the frame at its tail end, means for releasing the torpedo-body from the frame, means for causing the said torpedo to swing outwardly from the frame into the water, and mechanism for automatically releasing the tail end of the torpedo from its pivotal connection with the frame when the said torpedo has swung into the line of sight, substantially as described.

3. In a torpedo-launching apparatus, the combination with a frame for supporting the said torpedo in the water adjacent to the ship, yokes on said frame for holding the torpedo longitudinally therein but free to move outwardly therefrom, an intermediate confining device for rigidly holding the torpedo in place on the frame, and means controlled from the ship for releasing said intermediate confining device to permit the torpedo to move outwardly from the frame, substantially as described.

4. In a torpedo-launching apparatus, the combination with a frame for supporting the said torpedo in the water adjacent to the ship, yokes on said frame for confining the said torpedo longitudinally therein but free to move outwardly therefrom, an intermediate confining device for rigidly holding the torpedo in place on the frame, means controlled from the ship to release said confining device to permit the torpedo to move outwardly, tail-engaging devices pivotally mounted on the frame, and mechanism controlled from the bridge or deck of the ship, whereby said tail-engaging devices may be caused to automatically release the torpedo from its pivotal connection with the frame when it has swung into the line of sight, substantially as described.

5. In a torpedo-launching apparatus, the combination of a frame adapted to be lowered into the water adjacent to the ship, means for holding the torpedo rigidly in said frame, mechanism for releasing the said confining means to permit the torpedo to swing outwardly from the frame, and pivotal connection between the tail of the torpedo and the frame, so constructed that when the torpedo is swung outwardly from the frame it will automatically release the said torpedo when it has swung into a predetermined line of sight, substantially as described.

6. In a torpedo-launching apparatus, the combination of a frame adapted to be lowered into the water adjacent to the ship, means for confining the torpedo rigidly in said frame, mechanism for releasing the said confining means to permit the torpedo to swing outwardly from the frame, pivotal connections between the tail of the torpedo and the frame, so constructed that when the torpedo is swung outwardly from the frame it will automatically release the said torpedo when it has

swung into a predetermined line of sight, and means controlled by said releasing mechanism for automatically opening the valve for the motive fluid to operate the propelling mechanism of the torpedo, substantially as described.

7. In a torpedo-launching apparatus, the combination with the frame adapted to be lowered into the water adjacent to the ship, of a torpedo disposed longitudinally of said frame, yokes on said frame for confining the torpedo forward and aft, and a band intermediate of said yoke having one end fixed to the bottom of the frame and the other end detachably connected at the top of the frame and confining the torpedo to the frame, with means controlled from the ship for releasing said band to permit the torpedo to be moved outwardly from the frame, substantially as described.

8. In a torpedo-launching apparatus, the combination with the frame adapted to be lowered into the water alongside of the ship, of a torpedo disposed longitudinally of said frame, yokes on said frame for confining the torpedo forward and aft, a band intermediate of said yoke having one end fixed to the bottom of the frame and the other end detachably connected at the top of the frame, and acting in conjunction with the yokes to confine the torpedo to the frame, a bolt connection between said upper end of the band and the frame, levers having arms pressing upon the torpedo, mechanism for withdrawing said bolt to release the band, and mechanism controlled by said bolt-releasing mechanism to cause the levers to forcibly eject the torpedo from the frame when the band is released, substantially as described.

9. In an apparatus for launching submarine torpedoes, the combination of the frame, with means for supporting said frame in the water adjacent to the ship, a torpedo longitudinally disposed in said frame, means for rigidly holding the torpedo therein, devices for releasing said torpedo to permit it to swing outwardly from the frame, a vertical pivot-rod on the frame, a tail-engaging arm having one end normally in engagement with the tail of the torpedo, and releasable connections between the other end of said tail-engaging arm and the pivot-rod adapted to release the tail of the torpedo when the latter arrives at a predetermined position as it swings outwardly from the frame, substantially as described.

10. In an apparatus for launching submarine torpedoes, the combination of a supporting-frame for the torpedo, adapted to hold a torpedo in the water adjacent to the ship, connections between said frame and torpedo controlled from the ship and adapted to release the torpedo to permit it to be swung outwardly, a vertical pivot-rod on the frame connected at the upper end to a sighting device from the ship, a tail-engaging arm having one end connected to the vertical pivot-rod and the other end engaging the tail of the torpedo, a slidable



member carried by said arm and having one end controlled by the movement of the vertical pivot-rod, gripping devices adapted to engage the wing of the torpedo and hold the same in vertical position, connections between said gripping device and the movable member of the tail-engaging arm for releasing the said gripping device from engagement with the wing of the torpedo when the arm is swung so as to bring the torpedo in line of sight, substantially as described.

11. In an apparatus for launching submarine torpedoes, the combination of a supporting-frame for the torpedoes, adapted to hold a torpedo in the water adjacent to the ship, connections between said frame and torpedo controlled from the ship and adapted to release the torpedo to permit it to be swung outwardly, a vertical pivot-rod on the frame connected at the upper end to a sighting device upon the ship, a tail-engaging arm having one end connected to the vertical pivot-rod and the other end engaging the tail of the torpedo, a slidable member carried by said arm and having one end controlled by the movement of the vertical pivot-rod, a gripping device adapted to engage the wing of the torpedo and hold the same in vertical position, connections between said gripping device and the movable member of the tail-engaging arm for releasing the said gripping device from engagement with the wing of the torpedo, and connections between said movable member and the controlling-valve of the torpedo, whereby when the arm is moved to such position as to bring the torpedo in the line of sight as it swings outward from the frame, the gripping device and the tail-engaging arm will be released from the torpedo and the controlling-valve on said torpedo opened to start the propelling mechanism, substantially as described.

12. In an apparatus for launching submarine torpedoes, the combination of a frame adapted to support the torpedo in the water adjacent to the ship, means for rigidly holding the torpedo therein, mechanism for releasing the body of the torpedo from said frame, a pivotal connection between the tail of the torpedo and the frame, devices interposed between said pivotal connection and the wing of the torpedo for normally holding the same in engagement with the vertical pivot as the torpedo is swung outwardly from the frame, and mechanism controlled by the movement of said arm for releasing the tail of the torpedo therefrom, when said torpedo assumes a predetermined position, substantially as described.

13. In an apparatus for launching submarine torpedoes, the combination of a frame with connections between the ship and the frame for supporting it in position adjacent to the ship, means for holding the torpedo in longitudinal position in said frame and engaging the body of the torpedo, mechanism controlled from the ship for releasing said

confining means to permit the torpedo to swing outwardly from the frame, a pivotal connection between the tail of the torpedo and the frame, means interposed between the said pivotal connection and the wing of the torpedo for holding the same in vertical position, and an alidade on the ship connected with the pivotal connection and adapted to set the latter to release the tail-engaging device when the torpedo swings in the line of sight determined by said alidade, and means interposed between the tail-engaging device and the controlling-valve of the propelling mechanism on the torpedo, whereby when the torpedo swings in the line of sight it will be automatically released from engagement with the frame and started in the direction of the line of sight, substantially as described.

14. In a torpedo-launching apparatus, the combination of the frame, adapted to support the torpedo in the water adjacent to the ship, yokes on one side of the frame engaging the body of the torpedo, a confining-band or a collar on the opposite side of the frame interposed between said yokes, a bolt detachably securing the end of said band to the frame, a fluid-actuated piston mounted on the frame and connected to said bolt, and means for subjecting said piston to pressure controlled from the ship, with mechanism for pushing the torpedo outward from the frame, whereby when the piston is moved the band is released to permit the torpedo to move outward, substantially as described.

15. In a torpedo-launching apparatus, the combination of the frame adapted to support the torpedo in the water adjacent to the ship, of yokes on the frame engaging the body of the torpedo, a flexible confining-band having its lower end secured to the frame and its upper end detachably connected to the frame, a bolt detachably securing the latter end of said band to the frame, a fluid-actuated piston mounted on the frame and connected to said bolt, and means for subjecting said piston to pressure controlled from the ship, with mechanism for pushing the torpedo outward from the frame, whereby when the piston is moved, the band is released and the torpedo is moved outwardly from the frame, substantially as described.

16. In an apparatus for launching submarine torpedoes, the combination of a frame for supporting the torpedo in the water adjacent to the ship, connections between said frame and ship, means for confining the torpedo longitudinally in the frame, mechanism controlled from the ship for releasing the torpedo from its longitudinal confinement to the frame and causing the said torpedo to swing outwardly therefrom, a vertical pivot-rod journaled on the frame and extending to the deck or bridge of the ship and provided with an alidade at its upper end, an arm between said rod and the tail of the torpedo, a sliding rod on said arm, a cam on the rod into contact with which the sliding rod is normally pressed,



and devices intermediate of said sliding rod and the wing of the torpedo arranged to grip and hold the same in vertical position on the frame, said cam being adapted to release the sliding rod at a point determined by the line of sight ascertained by the alidade, whereby the torpedo will be released from its pivotal connection with the frame when it swings into the line of sight, substantially as described.

17. In an apparatus for launching submarine torpedoes, of a frame for supporting the torpedo in the water adjacent to the ship, a torpedo in said frame pivotally connected thereto at its tail end, and yokes for longitudinally confining the body of the torpedo to the frame but free to swing outwardly therefrom, an intermediate band connected to the frame at one end, lugs on the frame between which the other end of the band is secured, a bolt passing through the lug and said end of the band for detachably holding the same in place, whereby the torpedo is clamped in the frame, a compressed-air cylinder having a piston therein connected to said bolt, a supply-pipe to said cylinder leading from the ship, a second compressed-air cylinder mounted on the frame and communicating with the first cylinder, bell-crank levers fulcrumed on the frame and each having one of its arms bearing upon the body of the torpedo and the other arm connected to and adapted to be operated by this air-cylinder, whereby upon admission of air to the first cylinder the bolt is withdrawn and the confining-band released by the movement of the piston in said cylinder, and then air from said cylinder is admitted to the second cylinder, to cause the bell-crank levers to bear upon and force the torpedo outwardly from the frame, substantially as described.

18. In an apparatus for launching submarine torpedoes, the combination of a frame for supporting the torpedo in the water adjacent to the ship, of a tail-engaging device consisting of a vertical pivot-rod, a tubular arm engaging the said pivot-rod and the shaft of the torpedo, a rod slidably mounted in said arm, a lever fulcrumed on the tube, grippers for engaging the wing of the torpedo consisting of two movable members pivotally supported on the tube and having claws adapted to close upon and overlap the wing, projections on the lever for engaging the opposite ends of said movable members to normally close the claws, connections between the said levers and the sliding rod to maintain the lever in position to keep the claws closed, means for moving said lever to disengage the movable member of the grippers, substantially as described.

19. In an apparatus for launching submarine torpedoes, the combination of a frame for supporting the torpedo in the water, adjacent to the ship, of a tail-engaging device consisting of a vertical pivot-rod, a tubular arm engaging the said pivot-rod and likewise the shaft of the torpedo, a rod slidably mounted

in said arm, a lever fulcrumed on the tube, grippers for engaging the wing of the torpedo consisting of movable members pivotally supported on the tube having claws adapted to close upon and overlap the wing, projections on the lever for engaging the opposite ends of said movable members to normally close the claws, connections between the said levers and the sliding rod to maintain the lever in position to keep the claws closed, and a spring connected to said lever and to a fixed part, normally tending to draw the lever out of engagement with the movable members of the grippers to release the same, substantially as described.

20. In an apparatus for launching submarine torpedoes, the combination of a frame for supporting the torpedo in the water adjacent to the ship, of a tail-engaging device consisting of a vertical pivot-rod, a tubular arm engaging the said pivot-rod and the shaft of the torpedo, a rod slidably mounted in said arm, a lever fulcrumed on the tube, grippers for engaging the wing of the torpedo consisting of two movable members pivotally supported on the tube having claws adapted to close upon and overlap the wing, projections on the lever for engaging the opposite ends of said movable members to normally close the claws, connections between the said levers and the sliding rod, a cam on the pivot-rod normally holding the sliding rod in position to cause the lever to keep the grippers in engagement with the wing of the torpedo, a spring bearing against said sliding rod to move the same when released by the cam as it is turned to a predetermined position, an arm extending from said lever and engaging a projecting fin or plate on the sliding rod to hold the lever normally in position to clamp the grippers, substantially as described.

21. In an apparatus for launching submarine torpedoes, the combination of a frame for supporting the torpedo in the water, adjacent to the ship, a tail-engaging device consisting of a vertical pivot-rod, a tubular arm engaging the said pivot-rod and likewise the shaft of the torpedo, a rod slidably mounted in said arm, a lever fulcrumed on the tube, grippers for engaging the wing of the torpedo consisting of two movable members pivotally supported on the tube having claws adapted to close upon and overlap the wing, projections on the lever for engaging the opposite ends of said movable members, to normally close the claws, and connections between the said levers and the sliding rod, a cam on the pivot-rod normally holding the sliding rod in position to cause the levers to keep the grippers in engagement with the wing of the torpedo, a spring bearing against said sliding rod to move the same when released by the cam as it is turned to a predetermined position, and a finger projecting from said lever between the movable members of the grippers on the opposite side of the grippers from



the claws for forcing the said claws open to insure disengagement of said claws from the torpedo.

22. A submarine-torpedo-launching apparatus for use in connection with ships of any kind, comprising a rigidly-constructed frame adapted to be immersed or anchored vertically and at the time of launching the torpedo against one of the sides of the ship, a torpedo placed longitudinally in said frame, a movable arm engaging the rear end of the torpedo and pivoted in the rear end of said frame, means for disengaging the torpedo from the frame and starting the horizontal swinging movement of the movable arm together with the torpedo held thereon, such movement being completed by the resistance opposed by the water to the torpedo, and a cam connected with a sighting device on the ship and adapted to effect the interruption of the attachment between the torpedo and movable arm precisely at the moment when the torpedo during its horizontal swinging movement arrives in the line of sight, substantially as specified.

23. In a torpedo-launching apparatus, the combination of a torpedo-carrier frame comprising two rigid yokes or collars B and C and a movable yoke or collar D bolted to the said frame, a vertical pivot J, a movable arm E, mounted on said pivot and attached to the torpedo located in the frame, pincers or grippers P engaging the wing of the torpedo, and levers H and I adapted to press against the torpedo and cause it to swing around the pivot J when required, substantially as described.

24. In a submarine-torpedo-launching apparatus, the combination of the frame A for holding the torpedo, rigid yokes B and C for rigidly holding the torpedo, a movable yoke D engaging the torpedo on the outward side, the cylinders  $c'$  and G to which compressed air is supplied in succession, connections between the first of such cylinders and the movable yoke or collar D, and connections between the second cylinder and the levers H and I, to eject the torpedo T from the frame A and to start the horizontal motion of the torpedo, and arm E mounted on a pivot J and attached to the torpedo, the said movement being completed by the resistance of the water, substantially as described.

25. In a submarine-torpedo-launching ap-

paratus, the combination of the frame A for holding the torpedo, a movable arm E hinged to a sleeve  $j$ , the pivot J upon which said sleeve is loosely mounted, a rod  $b'$ , a cam  $a'$ , a spring for pressing the rod  $b'$  into contact with the cam, a lever K normally held in a determined position by the rod, pincers or grippers P acted on by the lever to cause them to engage the wing of the torpedo, whereby when the rod is released by the cam set at a predetermined position, the lever will open the grippers, substantially as described.

26. In a submarine-torpedo-launching apparatus, the combination of the frame A holding a torpedo, a vertical pivot J, a movable arm E on said pivot, a cam  $a'$  fixed to said pivot for determining the moment of liberation of the torpedo connections between said cam and movable arm engaging the torpedo, and a sighting device or alidade V in connection with the vertical pivot J for setting the cam  $a'$  to the required position for liberating the torpedo at the moment of coming into the proper position for discharging, substantially as described.

27. In a submarine-torpedo-launching apparatus, the combination of the frame A for holding a torpedo, means of suspension for the said frame from one of the sides of the ship, and means for raising and lowering said frame vertically to the plane of the frame, substantially as described.

28. In an apparatus for launching submarine torpedoes, the combination of a frame for supporting the torpedo in the water adjacent to the ship, means for detachably holding said torpedo in said frame, mechanism controlled from the ship, for releasing the torpedo-body from the frame and initially moving the said torpedo outwardly from the frame, and mechanism interposed between the torpedo and the ship for automatically starting the torpedo when it is swung into the line of sight by the resistance of the water substantially as described.

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

STEPHANE DRZEWIECKI.

Witnesses:

LEWIS FRANCKEN,  
EDWARD P. MACLEAN.