

No. 677,217.

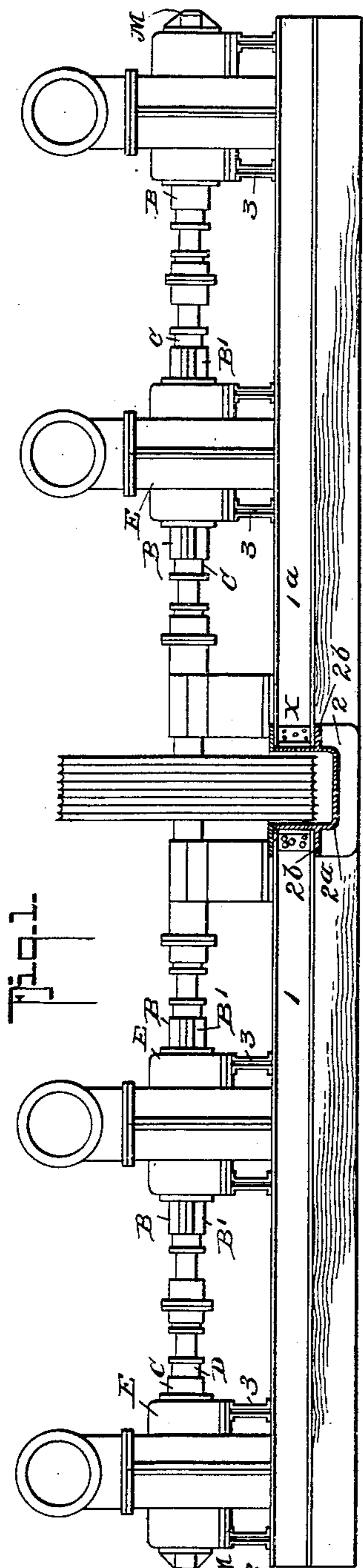
Patented June 25, 1901.

E. M. IVENS.  
PUMP BATTERY SYSTEM.

(Application filed Dec. 13, 1898.)

(No Model.)

4 Sheets—Sheet 1.



WITNESSES:

*H. G. Dieterich*

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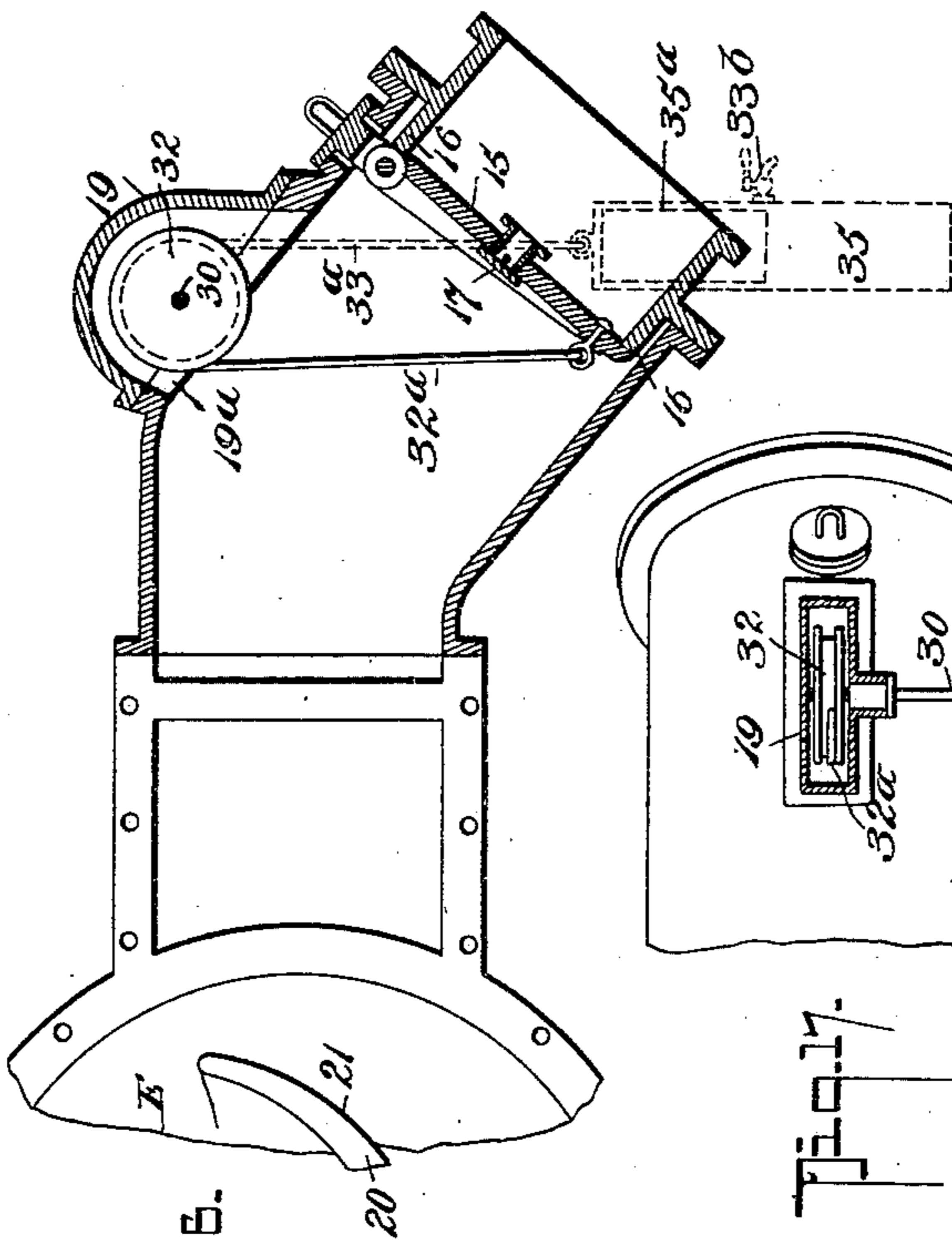


Fig. 18.

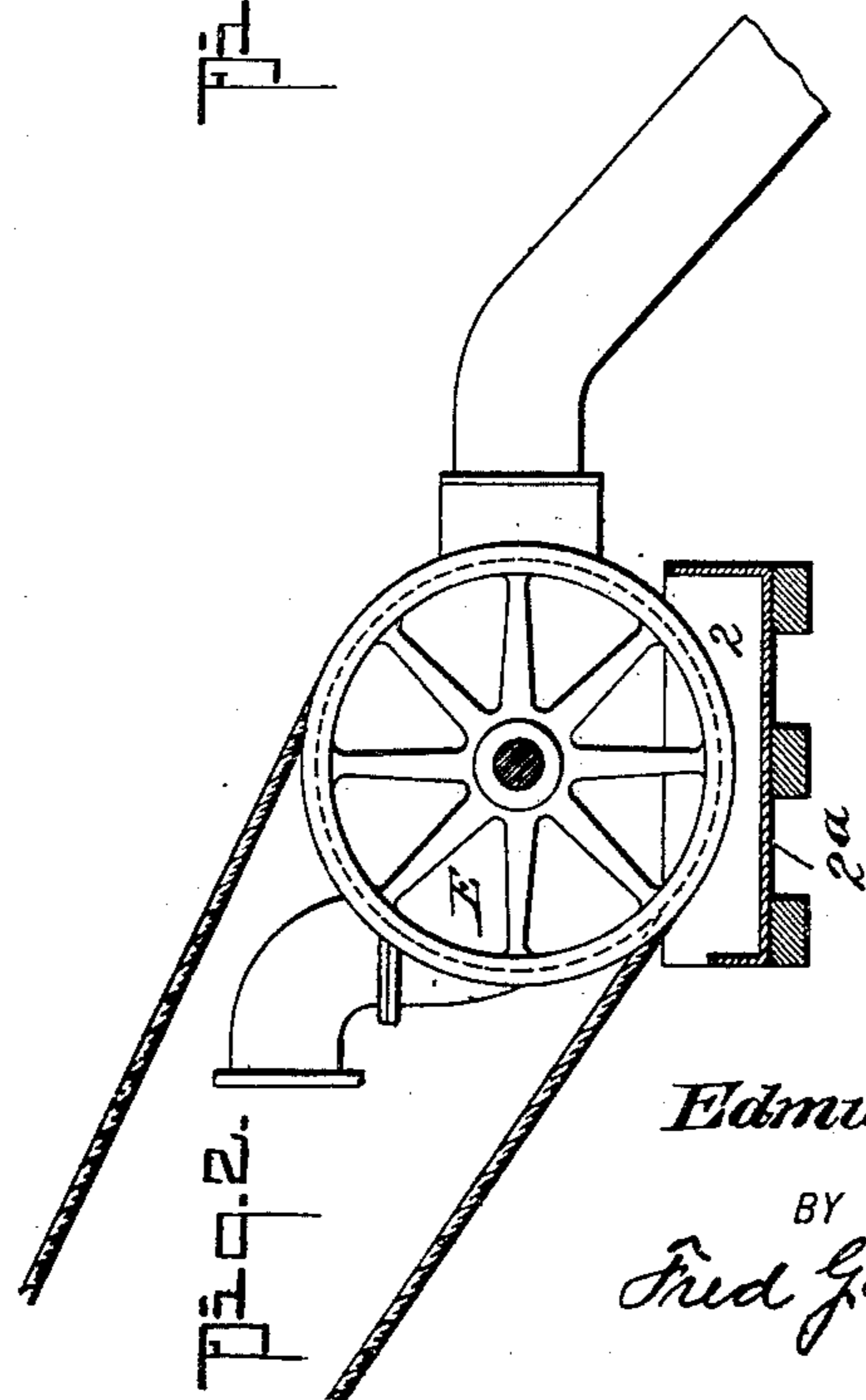


Fig. 2.

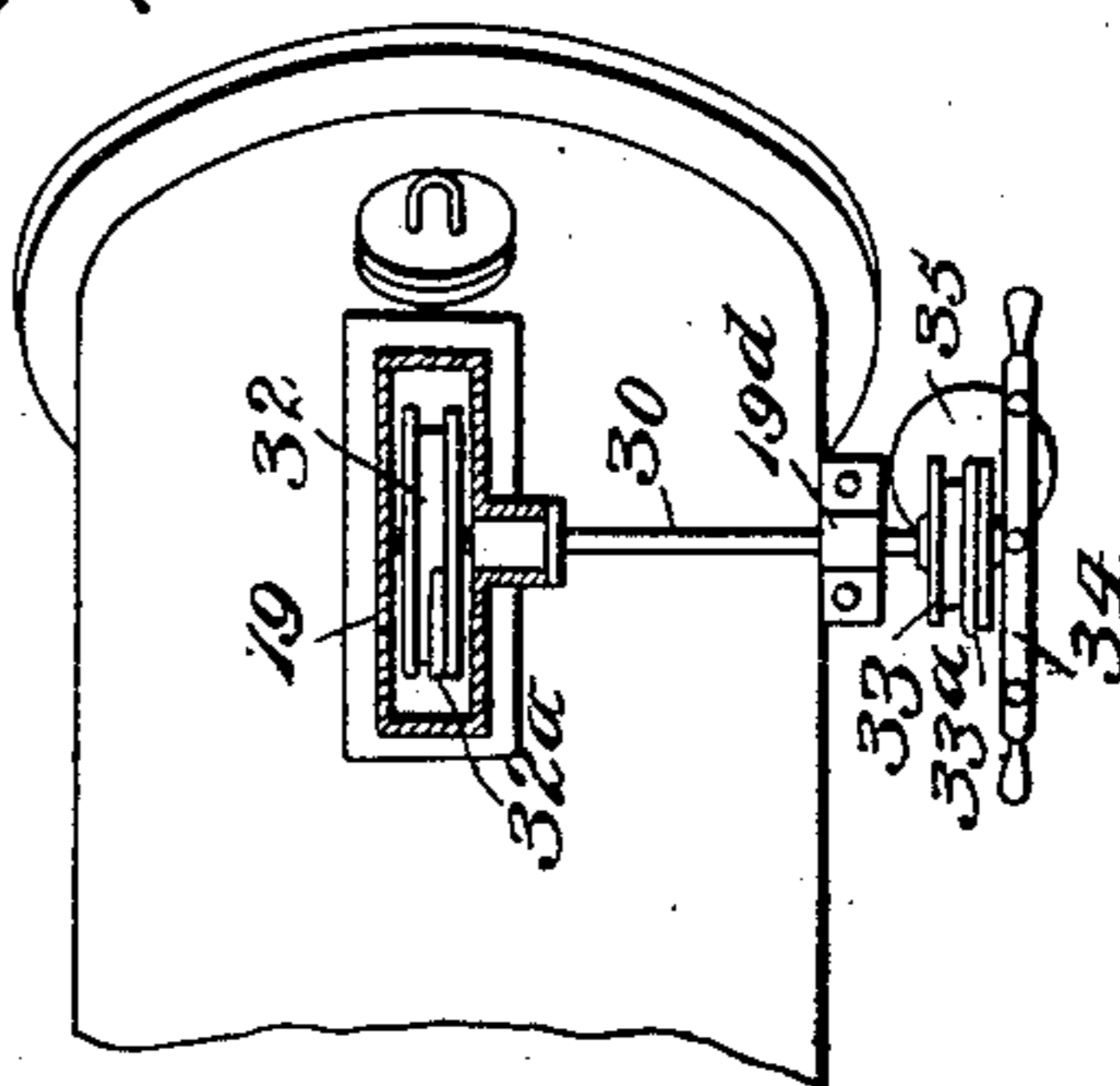


Fig. 17.

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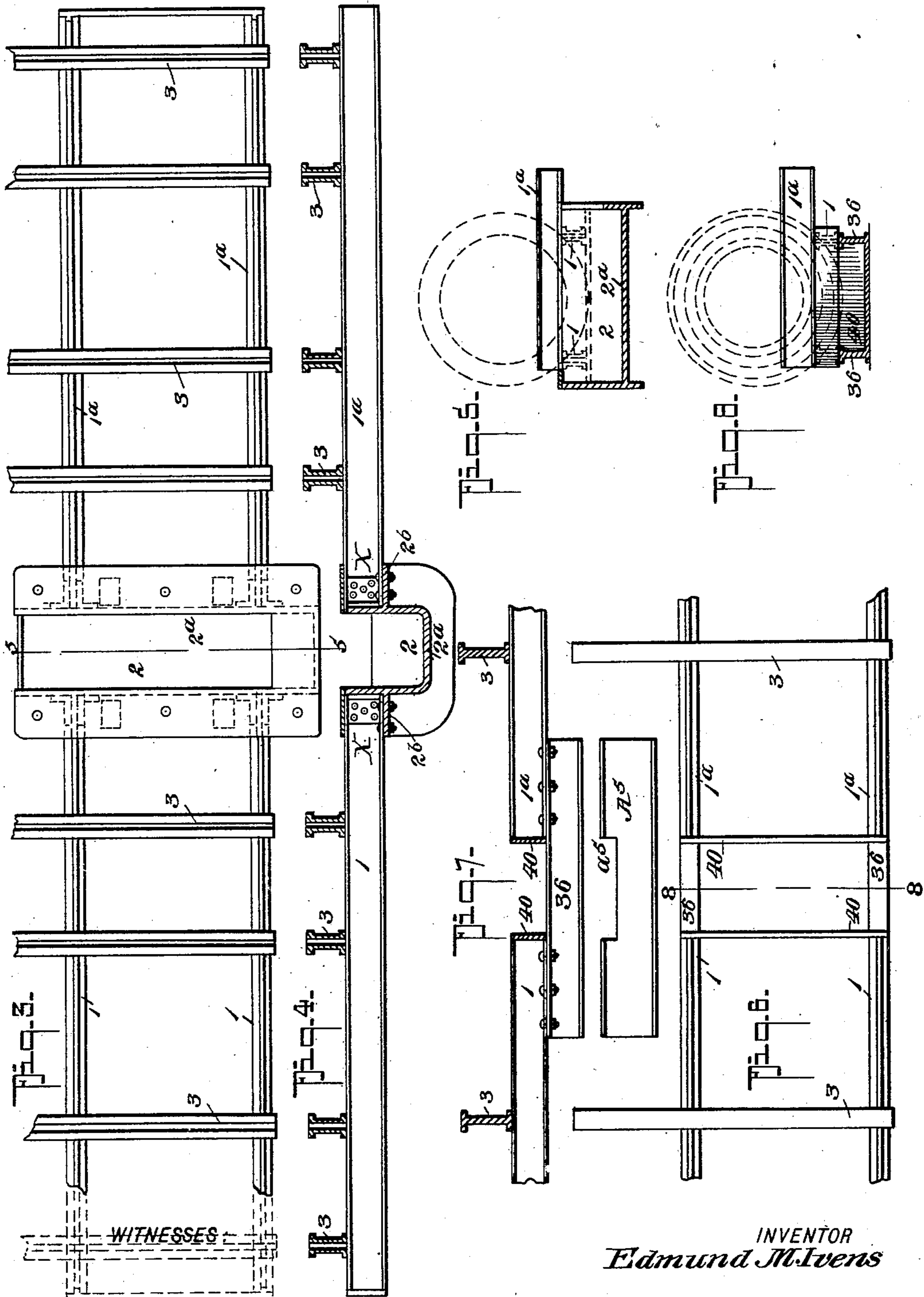
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4 Sheets—Sheet 2.



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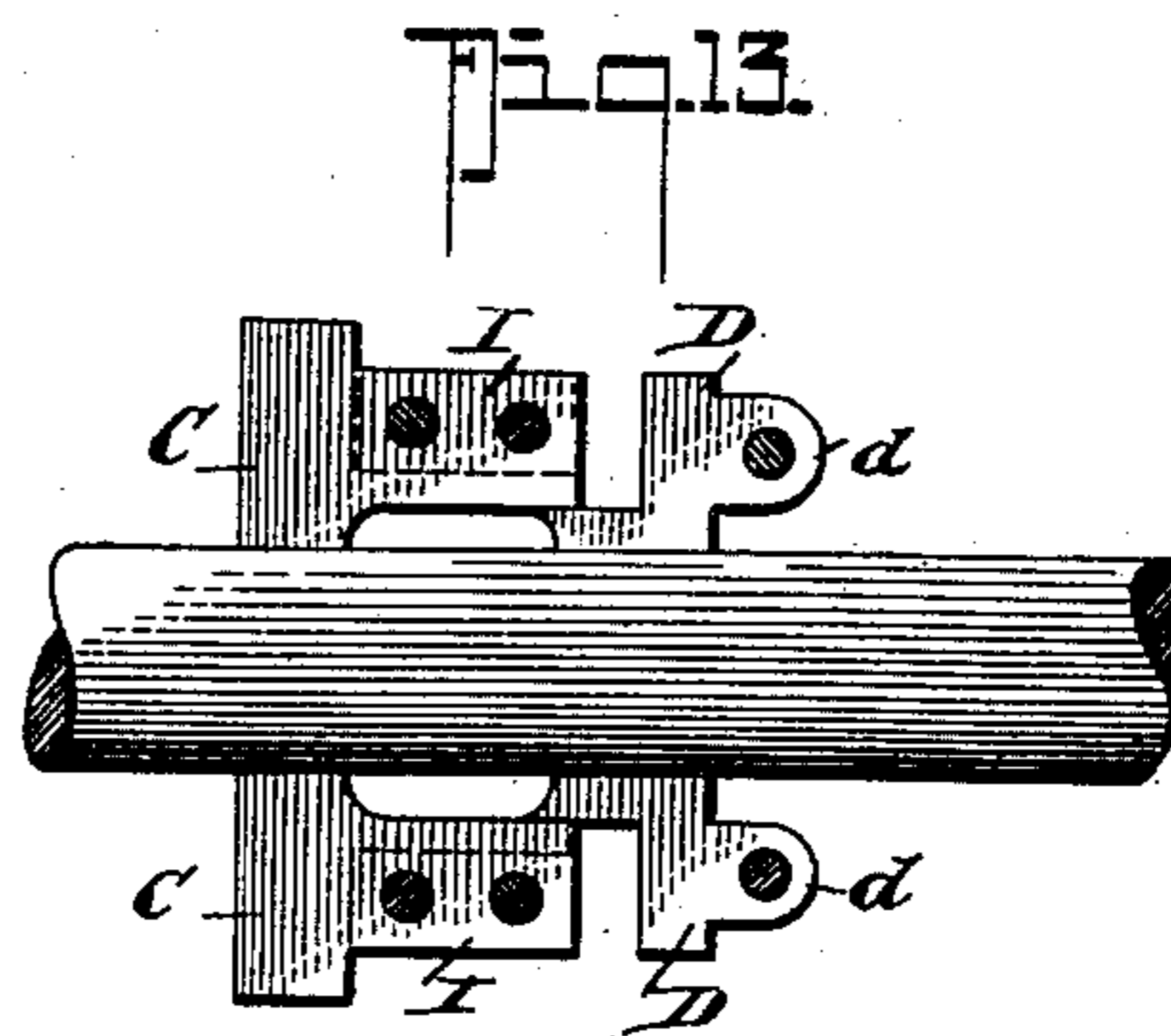
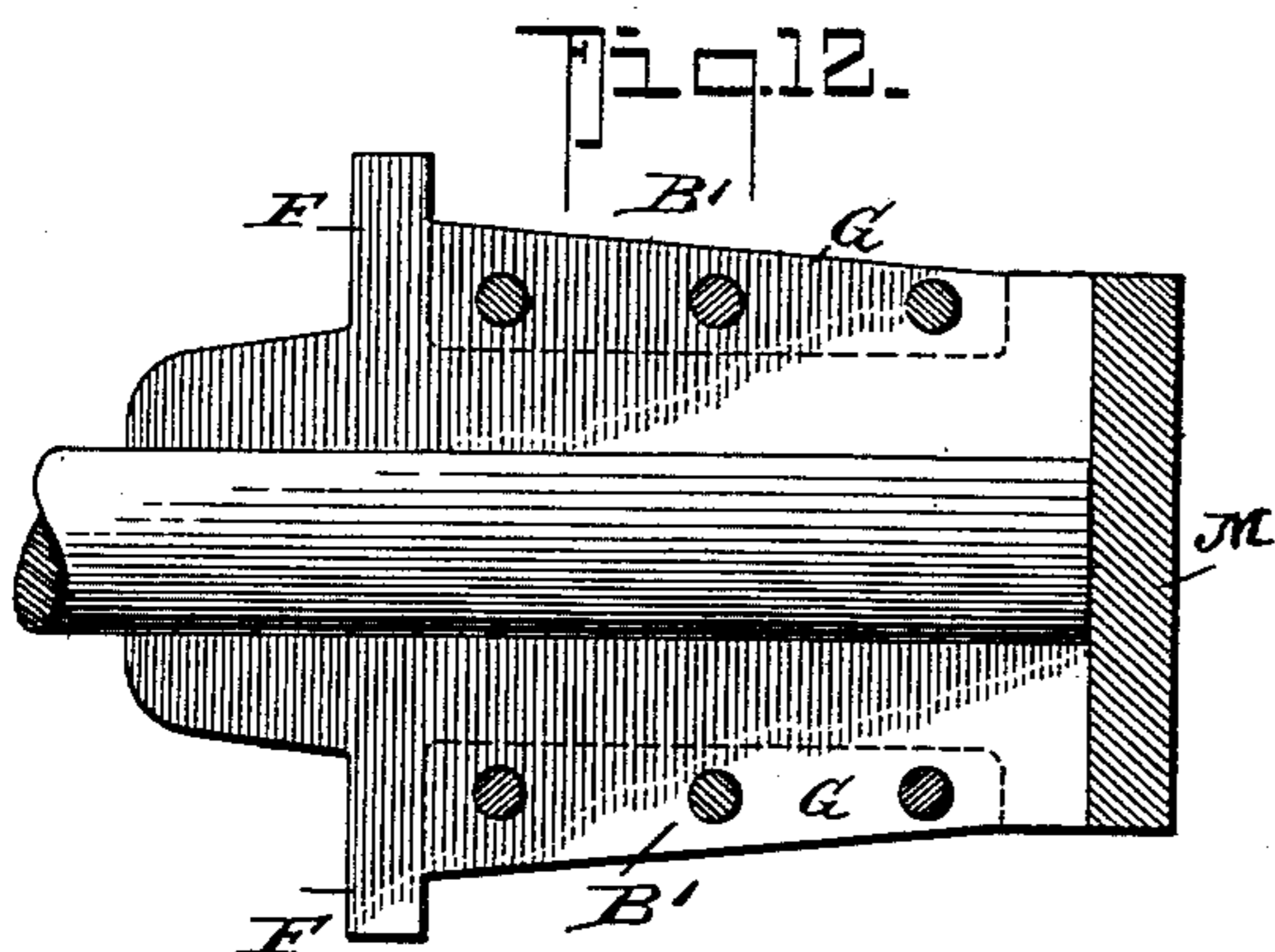
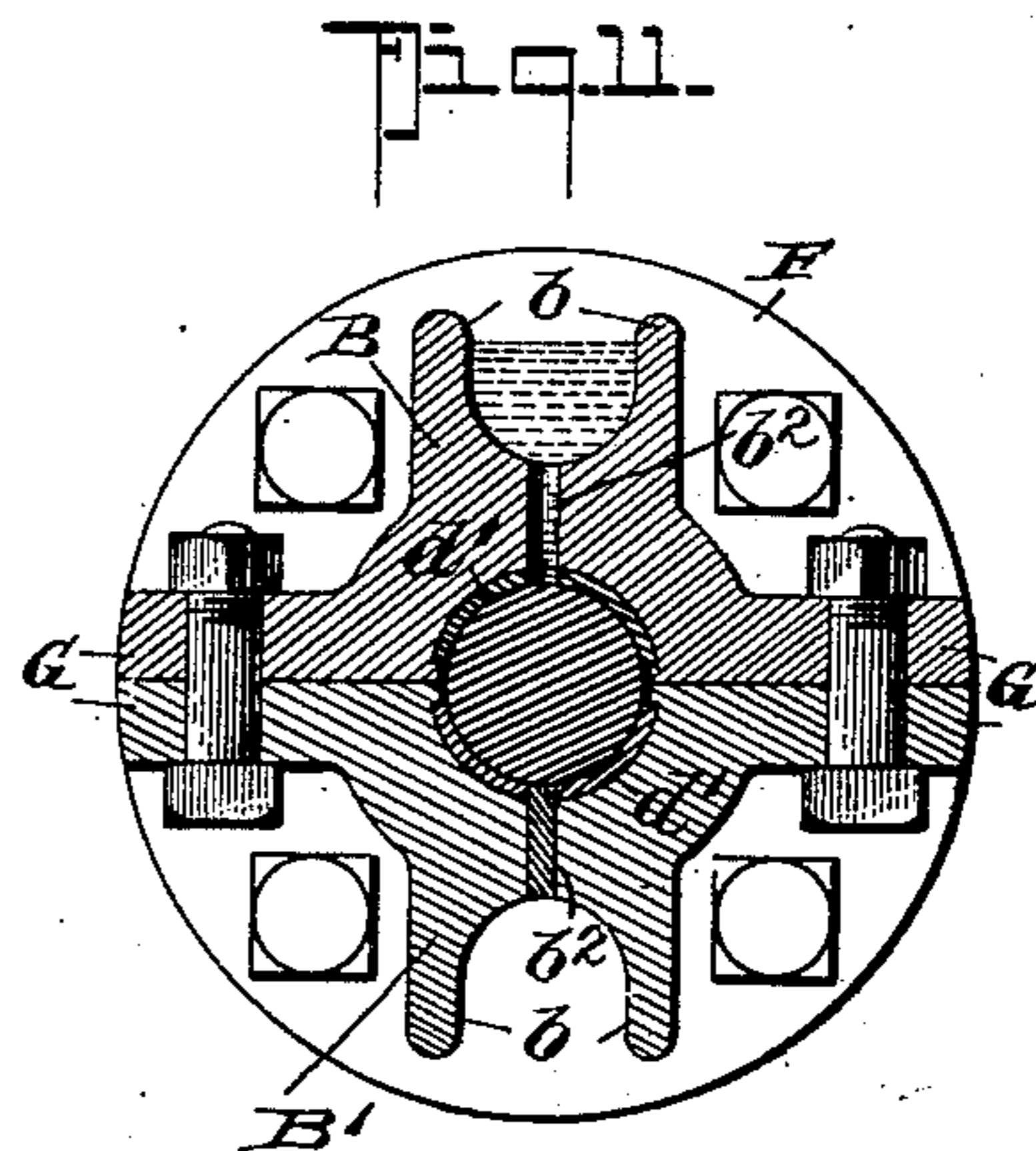
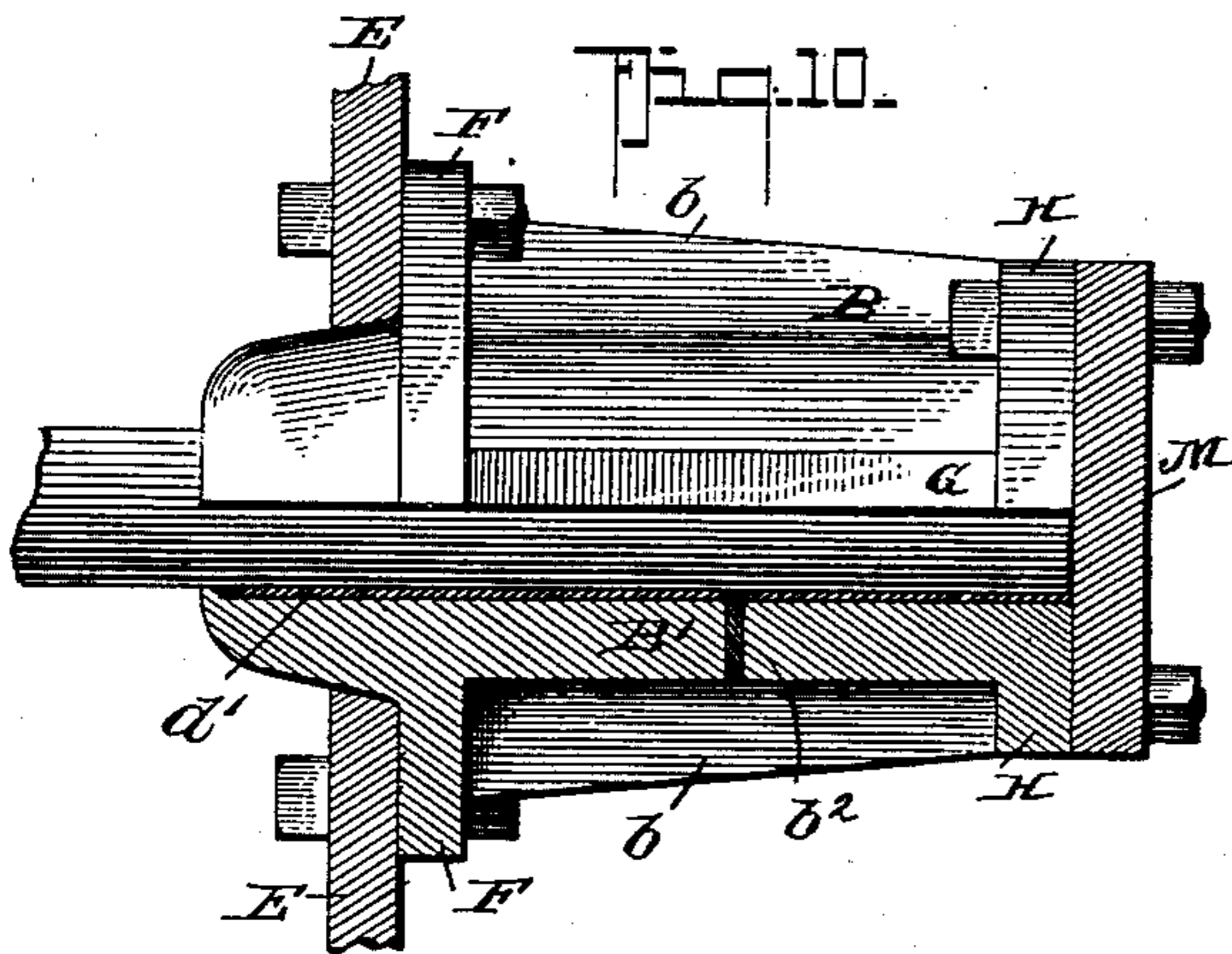
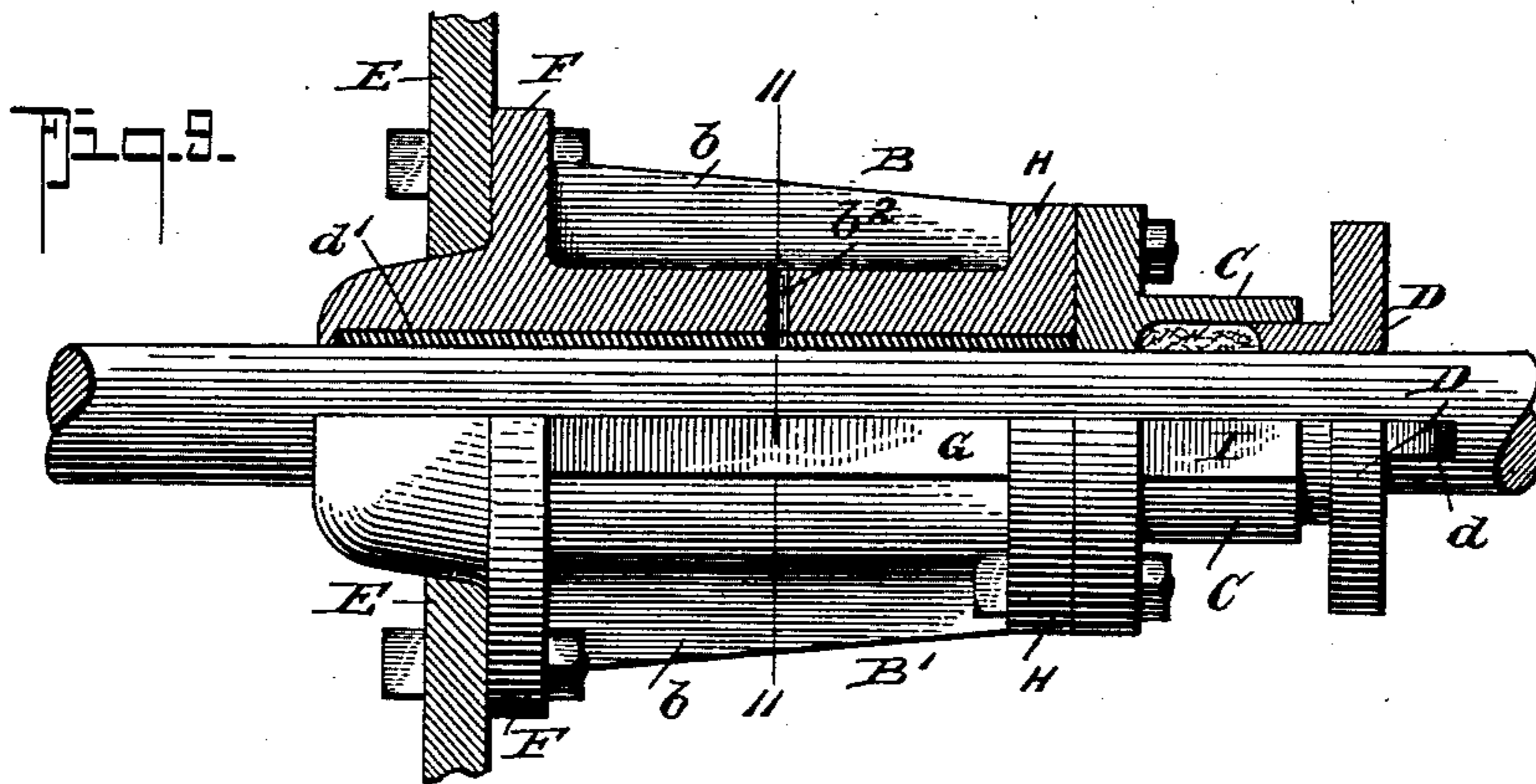
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4 Sheets—Sheet 3.



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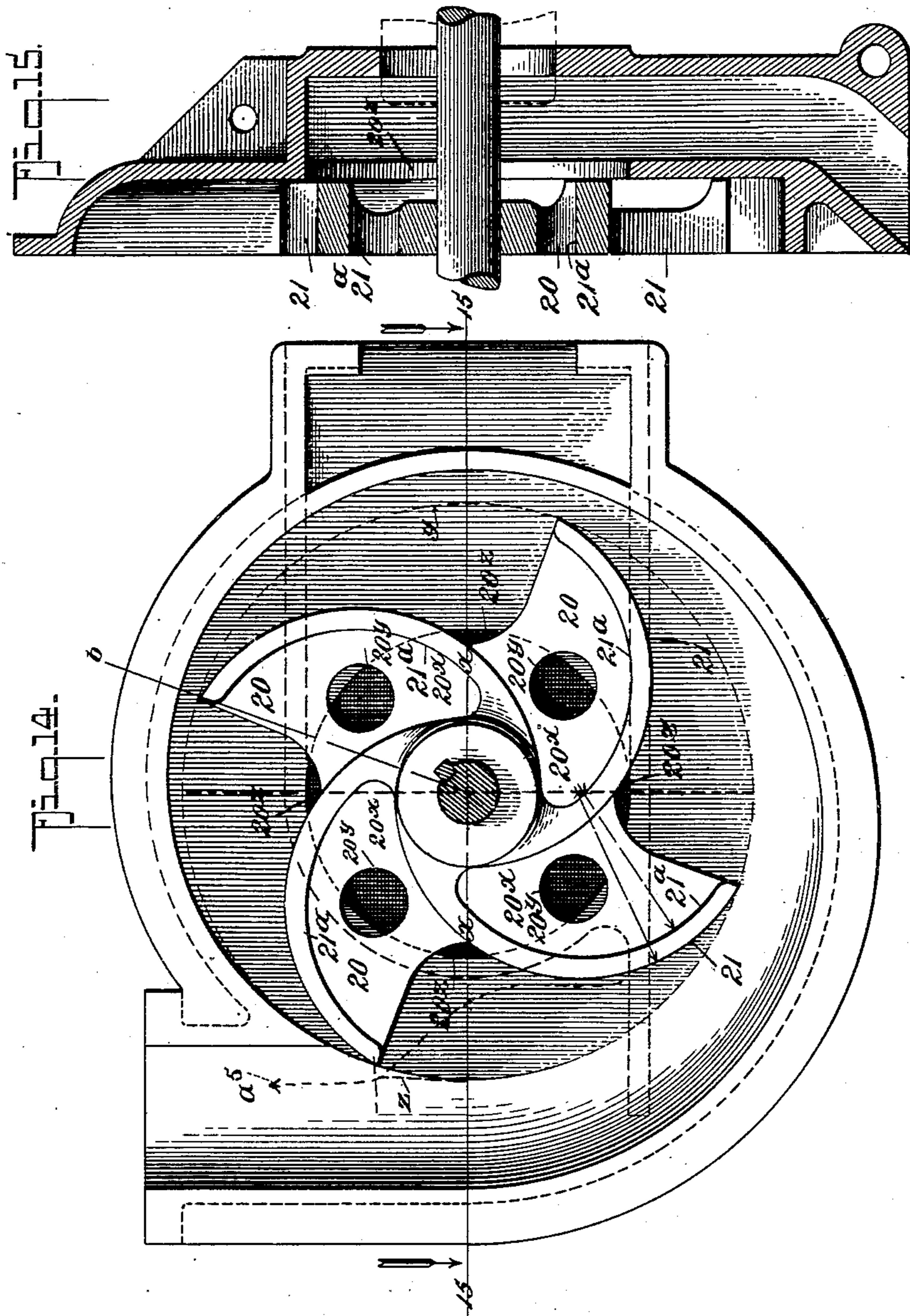
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# UNITED STATES PATENT OFFICE.

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## PUMP BATTERY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 677,217, dated June 25, 1901.

Application filed December 13, 1898. Serial No. 699,161. (No model.)

*To all whom it may concern:*

Be it known that I, EDMUND M. IVENS, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Pump Battery Systems, of which the following is a specification.

This invention relates to an improved battery system of pumps for raising water for irrigation, drainage, dry-docks, &c., the general arrangement of each battery and the structure of the pumps included therein being disclosed in my copending application, Serial No. 677,829, filed April 16, 1898.

My present invention relates more specifically to improvements in the detailed construction of the several parts constituting the complete structure of the system and the pumps forming an interdependent part thereof, whereby the structure of the said complete system is rendered the more economical, from which better results can be obtained than by the form heretofore disclosed, the capacity of the pumps be increased without additional fuel expense, and in which the system will be rendered the more stable.

My invention relates, first, to certain details of construction of the base or bed-support for the pumps; second, in the arrangement of the pumps, particularly referring to the pump-disks and the valve mechanism in the lift or induction pipe, and, third, to the manner of journaling the pump-shafts, all of which coact and combine to improve the system described in my other application before referred to.

The invention consists in the peculiar construction of parts and detailed arrangement thereof, such as will be first described and then specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic elevation of my improved pump battery system. Fig. 2 is a transverse section of the said pump adjacent the driving-wheel. Fig. 3 is a plan view of an improved form of channel-iron supporting-base or bed. Fig. 4 is a side elevation thereof. Fig. 5 is a transverse section on the line 5 5 of Fig. 3. Fig. 6 is a detail plan, Fig. 7 is a side elevation, and Fig. 8 is a transverse section on the line 8 8 of Fig. 6, of a modified

form of the said supporting-base. Fig. 9 is a longitudinal section of one of the middle-pump journal-boxes. Fig. 10 is a similar view of one of the end bearings for the drive-shaft. Fig. 11 is a transverse section on the line 11 11 of Fig. 9. Figs. 12 and 13 are horizontal plans illustrating the lower half of one of the middle and one of the end pump journal-bearings. Fig. 14 is a transverse elevation of one of the pumps, taken on the parting-line of the two half-sections and illustrating the improved construction of the pump-disk. Fig. 15 is a cross-section of one-half of the pump-chamber and the disk portion on the line 15 15 of Fig. 14. Fig. 16 is a longitudinal section of the intake or lift pipe with the vent-valve and the balance mechanism therefor. Fig. 17 is a plan view of the parts shown in Fig. 16.

In my other application referred to a series of pumps are shown mounted upon a base supported upon cribbing, which base consists of a series of bottom longitudinal channel-bars and transverse channel-bars to which the pump-casings are secured, the two sets of channel-bars being securely bolted to form a permanent base.

In the practical application of my invention it is necessary in the construction of a suitable bed for four large pumps each having a diameter of, say, thirty inches to provide longitudinal channel-bars fifty-one feet long. This length of bars is found both inconvenient and expensive to manufacture in single lengths. Furthermore, in the use of a battery of pumps such as described it is sometimes desirable to equip the jack or drive shaft with drive-wheels of different diameters, and in assembling of the parts constituting the complete system it is also desirable on the score of economy or strength to place the drive-shaft as closely to the supporting-body as possible. It has been found necessary when a pumping system has been originally set with a six-foot drive-wheel to remount the pumps on the channel-iron base or bed when it is desired to use a drive-wheel of larger diameter to enable it to clear the bed at the bottom.

In my present arrangement of the bed the same is made, first, in a manner to reduce the cost of construction, and, second, with such

economy of construction to produce a more stable arrangement of the parts.

The longitudinally-arranged channel-bars are made in sections 1 1<sup>a</sup>, the inner or adjacent ends of which are joined to the pit-casting 2, extended transversely to the bars 1 1<sup>a</sup> and at a point directly under the jack or drive shaft. The casting 2 has its bottom dipped sufficiently below the base of the longitudinal bars 1 1<sup>a</sup> to permit the rim of the drive-wheel moving in a plane below the base of the pump. This arrangement of the pit-casting provides for bringing the jack-shaft and the continuations thereof that pass through the pumps low enough to permit the pump-casing being attached directly to the transversely-arranged channel-bars 3, as clearly shown in Fig. 1. The pit-casting 2 is detachably connected to the channel-bars 1 1<sup>a</sup> in any approved manner, but preferably by forming the boxes with lateral horizontal flanges to receive the ends X of the channel-bars, which ends are held to abut the side walls of the pit, as clearly shown in Fig. 4.

The central transverse pit serves a double function of acting as a tie for joining the inner ends of the bars 1 1<sup>a</sup> and also as a dip to permit the drive-wheel being brought to a lower plane than can be possible in the form of bed shown in my other application and when made of sufficient depth permits the use of different-sized drive-wheels, it being understood that pits of different depths can be made to be interchangeably joined to the bars 1 1<sup>a</sup>. To protect the rope-drive, the pit is made solid at the bottom, the sides, and the front to keep water from the rope; but its rear end facing the engine is made with a depression or opening to allow for the free play of the belt or rope.

It is my practice when a larger driver-wheel than eight feet is required on a battery of pumps having, say, diameters of thirty inches each to lower the pit or casting down under the channel-bars 1 1<sup>a</sup> sufficiently to keep the central line of pumps as low as possible and not require raising the same for a larger rope-drive.

In my application, Serial No. 677,829, filed April 16, 1898, a special form of shafting and clutch mechanism is provided, whereby the several pumps can be separately set in or out of an operative condition without affecting the others and without stopping the drive-shaft. To facilitate such operation of the several pumps and to admit of the ready disconnecting of any one or more sets of the journal bearings or boxes in the complete series during the running of the system for repairs and through adjustment of parts, I have provided a system formed of sectional journal-boxes particularly adapted for my form of pump-battery, the construction of which is illustrated in detail in Figs. 9 to 13. The journal-boxes are all made in halves, and the several parts of such boxes are so made as to

be readily interchangeable if used either for the middle or end pumps of the battery. Each box comprises semicircular bottom and top sections B B', the two having a combined diameter substantially that of the shaft-openings in the end walls of the pump-casing, through which one end of the said journal-boxes pass when set for use, as shown. The pump end of the box-sections B B' each have flanges F, whereby the boxes can be conveniently made fast to the side E of the pump-casing. Each section has a horizontal flange G, whereby the two sections can be securely bolted to each other. The outer ends of the sections B B' terminate in flanges H, to which the flange of the stuffing-box half-sections C are adapted to be bolted, said sections C also having a horizontal flange I, whereby they can be bolted to each other.

D D indicate the half-section gland members, which fit the boxes C and which are also provided with securing-flanges d'. The entire box is planed and turned to make an airtight fit.

d' indicates the babbitt packing or bearing faces.

By constructing the boxes in the manner stated the top members can be easily removed and the shaft mounted in its position resting on the lower half-box sections. The end bearings on the outer pumps are formed in the same manner, except they consist of the box-sections B B' only, the stuffing-boxes and glands C D being omitted. In its end bearing-boxes the flange ends H of the members B B' are bolted to the cap-plate M. It is manifest that this end box B B' can be used as an inner journal-box by simply removing the cap M and shoving the box and gland members C D to connect therewith, as will be clearly understood by reference to Figs. 12 and 13.

In transverse section the parts B B' have flanges b, which when turned uppermost act as oil-holders and when turned down serve as bracket-supports, the lubricant-opening passage b<sup>2</sup> in the latter position being held plugged.

Having described the detailed construction of the bed or supporting-base and the manner of mounting the pumps thereon, I shall now proceed to describe the improvements relating to the pump-disks and the vent-valve devices, which form an essential feature of this invention.

In the present form the disks may also be made of two sections; but they differ from the disks disclosed in my other application in the following respect: The annexed drawings show the arrangement of a disk particularly adapted for a four-wing double suction-pump, the said disk having four wings, the exact shape and the correlation of the several parts thereof in combination with the induction and eduction openings being important factors in the present construction of my pump.

By referring now to Fig. 14 it will be seen the wings 20 of the disk are each arranged eccentrically to the axis of the said disk, and each wing has its impact or outer face 21 curved on a true circle, the center of which lies on an imaginary line (indicated by  $x$ ) taken diametrically through the axis of the disk, and the inner end of the surface 21 extends beyond the central axis of the disk and begins at a point where the line intersects the said hub, while the outer end of the several disks 21 terminate at the full diameter  $y$  of the entire disk, the said outer end of each wing, however, overlapping the inner or head portion of the surface 21 of the adjacent wing, as indicated by the line  $b$  in Fig. 14.

The web portions 20<sup>x</sup> of the wings 20 have apertures 20<sup>y</sup>, that lie in a plane with the inlets 20<sup>z</sup> at each side of the disk. By forming the wings in the manner described it will be observed that I provide, as it were, an open disk to allow for a free passage of sand, &c., through the inside and upon each side of the web portions of the wings. By forming the disks in the manner described it is not necessary that they should fit closely against the sides of the pump-shell, as in my form of pump the wings can thereby have their edges faced, as also the inside of the shell. This permits the wings working close to but not touching either side of the shell, it being obvious that by providing a disk of this character the passing water will tend to keep the face edges of the wings and the adjacent sides of the shell free of sand and other gritty substances.

As shown, the full diameter of the disk and the radii upon which the surface 21 of the wings 20 are struck are relatively such that the outer ends of the wings stop short of the diametrical line  $x$ —say, for example, five inches—making, as it were, each wing that much short of a semicircle. The inner surface 21 of the curved portions of the wings are also struck upon circles eccentrically to the axis of the disk and preferably slightly eccentric to the circle upon which the surface 21 is struck, whereby to provide a gradually-increased thickness of the curve or striking portion of the wings from their outer extremities toward their hub portions.

By providing a disk having its wings arranged eccentrically as described and shown, and extending the said wings a distance less than a semicircle, which distance, in a pump having wings ten and one-half inches wide and nine inches in diameter, would in practice be approximately five inches, say, on the line  $z$  of Fig. 14.

By employing a pump having the wings constructed as shown, I provide a greatly-increased opening between the several wings of the disk and also insure a more uniform throwing of the water, as thereby the water has a freer outlet in the direction indicated by the arrow  $a^5$ , and an abrupt abutment and

contracted opening, which would be present were the surfaces 21 extended to a half-circle as indicated by dotted lines in Fig. 14, 70 being thereby avoided.

While I have shown a disk with four wings, it is obvious a greater or less number of wings can be provided. By arranging the wings and their impact-surfaces 21 as described and shown each wing, while operating under the usual centrifugal action, by reason of its peculiar construction also becomes a cam or eccentric, which serves to create an additional force to the established centrifugal force, and thereby greatly increases the capacity of the pump, the running of which is also thereby made proportionately the more easy and economical.

In my application Serial No. 662,487 particular mention is made of the improved form of valve operating in the lift-pipe. This form of valve, while applicable for use on all sizes of my improved pump, is more especially employed in pumps of large capacity. When used in such size of pump, the valve of necessity is of considerable weight and under some conditions its weight in a measure retards the velocity of the inflow toward the pump. To overcome this and to make the valve a perfectly-balanced one at all stages of the operation of the pump and also to provide a simple means whereby said valve can be properly adjusted for setting the pump when the water column is off for the purpose of cleaning the lift-pipe and removing obstructions beneath the valve, I have provided a simple automatically-operated balancing mechanism connected with the valve, which mechanism is clearly illustrated in Figs. 16 and 17, in which 15 indicates the horizontal drop-valve, adapted when down to engage the seat 16 of the lift-pipe and close off same from the pump, said valve having the same general construction, including the supplemental vent-valve 17, as the one described and claimed in my other application, last referred to.

In the practical operation of the form of valve above referred to the air is first exhausted from under the said valve through the central vent under it, which exhausting of air removes the air-cushion previously held between the water-head and the under side of the valve. This manner of relieving the air-cushion under the valve permits a full volume of water force to engage the valve and raise it. In the form of valve shown, however, the water column will be impeded in its velocity and free flow proportionately to the varying degree of the force of the water rising column in the lift-pipe by the varying gravitation of the valve to or from the closing as it (the valve) rests upon the top of the water column. This varying gravitation of the valve during the running of the pump in the present construction is entirely overcome, as the valve at all times will be held at its wide-open position during the flow of

the water in the lift even during its minimum velocity or force. This is effected by a counterbalance mechanism, which automatically adjusts itself during the operation of the pump and which is also adapted to be hand-manipulated to adjust the valve when the pump is inert.

The valve-holding section of the lift-pipe has a housing 19 on its upper face, communicating with the valve-chamber 19<sup>a</sup>, and in this housing is journaled one end of the winding-shaft 30, the other end of which is mounted in a bearing 19<sup>d</sup> on the exterior of the lift-pipe, and such shaft carries two sheaves of like diameter, one of which, 32, is disposed within the housing 19, while the other, 33, is on the outer end of the shaft, which end is also provided with a hand-wheel 34.

32<sup>a</sup> is a rope or chain having one end secured to the sheave 32 to wind thereon and its other end hung pendent of the chamber 19<sup>a</sup> and connected to the outer end of the main valve, and 33<sup>a</sup> indicates a rope having one end secured to and adapted to wind on the sheave 33 in the direction reverse to the winding of the rope or chain 32<sup>a</sup>, said rope 33<sup>a</sup> having a weight secured to its lower end, consisting of a solid portion 35 and chambered portion 35<sup>a</sup>, adapted to receive water or other balancing weighting means, whereby a proper adjustment of the balance-weight can be conveniently obtained. When provided with a water-holder, as shown, said holder has a waste-cock 33<sup>b</sup>, which permits of a quick adjustment of the water-balance required.

In the practical construction of my invention the two pulleys 32 33 are relatively of such diameters that in operation as the chain or rope 32<sup>a</sup> winds upon the pulley 32 the chain or rope 33<sup>a</sup> will correspondingly unwind, the connection of the chain 32<sup>a</sup> with the pulley 32 being such that when the main valve is closed the said pulley 32 will be free of chain or rope winding and the pulley 33 at the same time have a full winding.

The counterweight devices are so balanced that when the parts are in the conditions just described the weight 35 will exercise great influence on the valve 15, but not sufficient to lift it, the adjustment being such that at the starting of the pulley little or no water-pressure is necessary to elevate the valve and hold it to its full-open position and sufficient during the movement of the said valve to its open position to take off the weight of the valve from the water column as it rises.

The hand wheel or shaft is to operate the valve when the column of water is off and to permit the dislodgment and removal of obstructions under the valve, which when loosened will be either drawn down on the lift-pipe or suction and if not can be pulled out through the manhole in the lift-pipe.

It should be stated that while the improved balancing devices will operate to balance the main valve even when made without a sup-

plemental vent member the use of such vent member serves to effect a more perfect and positive operation of the lift of the valve and its consequent balance for the reason that as the cushion of air below the valve is drawn out in advance of the rise of the water-head a more direct and uniform action of the water or rise of column of water against the valve is effected, thereby admitting of a more perfect adjustment of the balancing devices than can be obtained without the vent-valve, as in such form of main valve the rise of water would be irregular and jerky at the starting of the pump.

In Figs. 6, 7, and 8 I have illustrated in plan, in side view, and in cross-section a modified construction of the channel frame or bed. This form of supporting-bed is particularly adapted for use in connection with four very large size pumps. In this construction instead of providing a cast pit the opening or pit portion for the lower edge of the drive wheel or journal end is made by mounting the base-irons 1 1<sup>a</sup> at their inner ends upon supplemental longitudinal or I beams 36, which form, practically, continuations of the channel bars or beams 1 1<sup>a</sup>. For heavy work this form of base is more rigid than the cast center, as the base-beams span the openings of the pit and can be conveniently bolted to the other beams or channels. The pit is formed by the side castings or plates 40, which also act as end fastenings to the longitudinal beams, the balance of the pit in this form being made of sheet-iron. When it is desired to use a very large drive-wheel—say of ten feet diameter—the supplemental or tie longitudinal I-beams are made of a greater height, as indicated at A<sup>5</sup> in Fig. 7 of the drawings, and the upper edges of said beams are notched, as indicated by a<sup>5</sup>.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A pump battery system of the character described; comprising a drive-shaft having a central jack or wheel portions; one or more pumps on each end of the shaft; a foundation for each set of pumps consisting of longitudinal beams; a pit disposed transversely under the jack-shaft or wheel portion, said pit comprising a casting having closed sides bottom and ends, and having means for joining the adjacent ends of the longitudinal foundation-beams, substantially as shown and described.

2. In a pump battery system of the character stated; the combination with the channel-bars 1 1<sup>a</sup> and the transverse bars 3; of the cast pit 2, having closed sides, bottoms and ends, and lateral seat-flanges 2<sup>b</sup>, at a point below its upper edge, all being arranged substantially as shown, whereby the upper ends of the sides thereof form abutting portions for the adjacent ends of the bars 1 1<sup>a</sup>, and the flanges form connecting supports for the

channel-bar ends, as and for the purposes set forth.

3. A journal-box or bearing for pump battery systems as described; comprising inter-  
5 changeable half-sections B B', having annular flanges F, at one end; similar flanges H, at the other end, and horizontal flanges G; stuffing-box and gland members formed of half-sections, said stuffing-box and gland sections  
10 having flanges, whereby to connect with each other, and the stuffing-boxes having flanges adapted to connect with the flanges H, on the sections B B', substantially as shown and described.

15 4. In a centrifugal pump of the character described, the combination with the induction or lift pipe and the drop-valve located therein; of counterbalance mechanism located externally of the valve-pipe and connected with  
20 the drop-valve, said mechanism being arranged to progressively take up the weight of the drop-valve as it is pushed up by the water-pressure below it, as set forth.

5. In a centrifugal pump; in combination  
25 with the lift or induction pipe and the valve hinged therein to move to a closed position by gravity; of a counterbalance mechanism for taking up the varying weight of the valve as

the same is elevated by the water-balance, for the purposes described. 30

6. The combination in a centrifugal pump of the character stated, with the inlet-pipe and the hinged valve therein, adapted to move to a closed position by gravity; of counterbalance mechanism, comprising a winding-  
35 shaft having a pair of sheaves, one of said sheaves being incased within the lift-pipe; a rope fastened to said sheave and to the valve; a rope fastened to the other sheave to adjust the weight secured thereto; the weight-rope  
40 and the valve-rope being wound in opposite directions upon the sheaves, substantially as shown and described.

7. In combination, in a centrifugal pump of the character stated; with the lift-pipe and  
45 the gravity-valve therein; a windlass having a sheave and lift-rope connected with the valve, and a counterbalance secured thereto, said counterbalance including a weight having a fluid-holding chamber and an outlet-  
50 faucet, all being arranged substantially as shown and described.

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Witnesses:

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