No. 817,590. PATENTED APR. 10, 1906.

U. A. RUTLEDGE.

STEAM TURBINE.

APPLICATION FILED JULY 25, 1905.

4 SHEETS—SHEET 1.

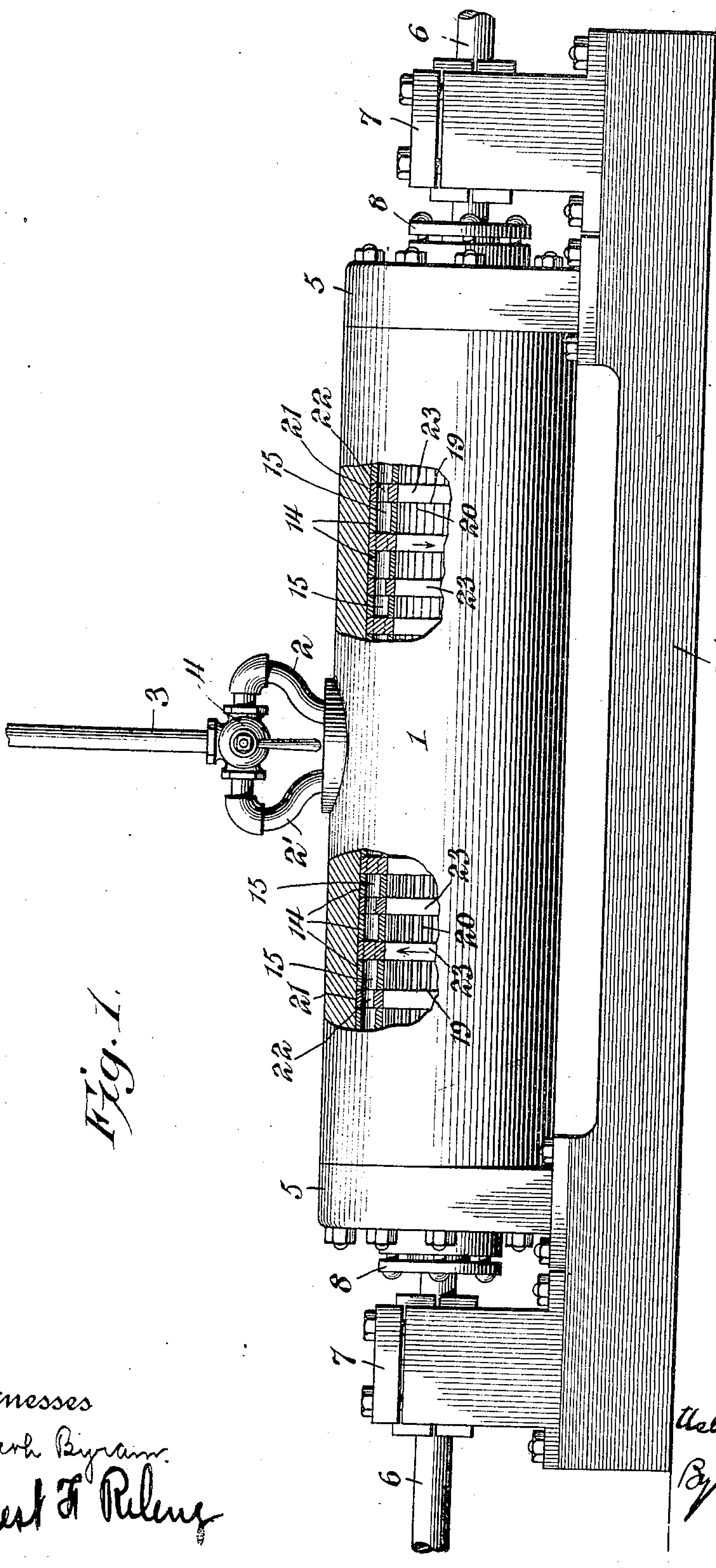

Fig. 1.

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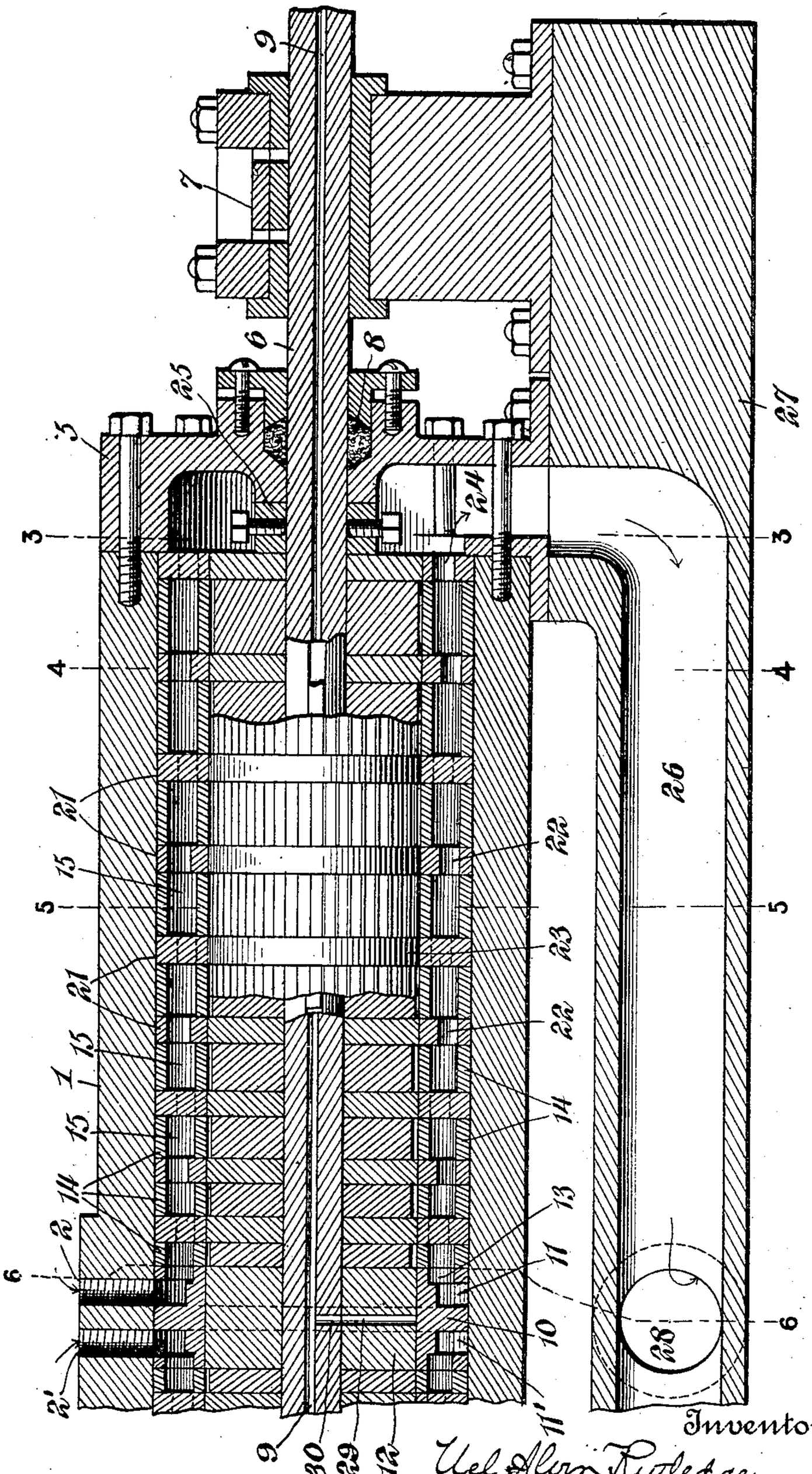
4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 4

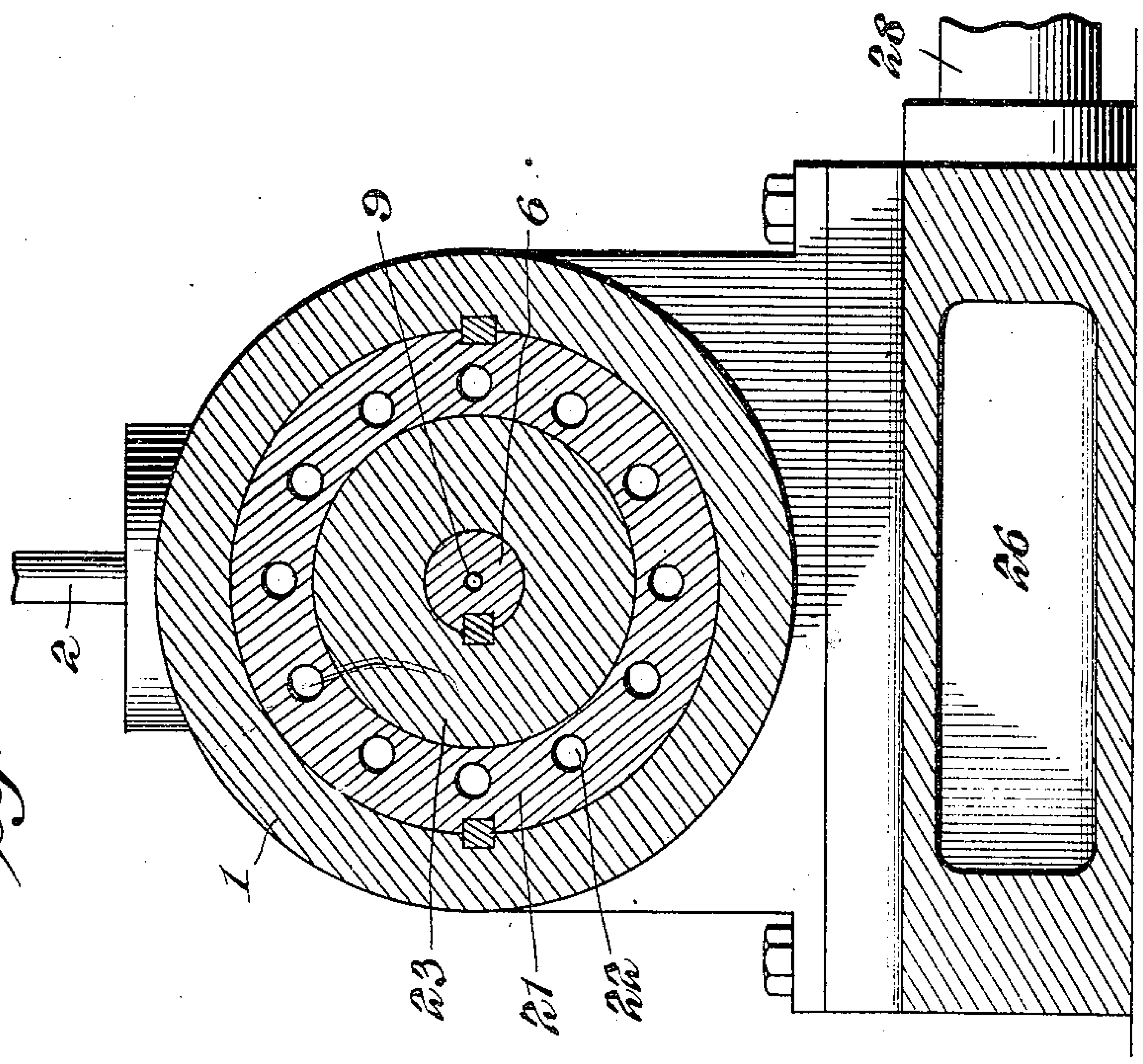
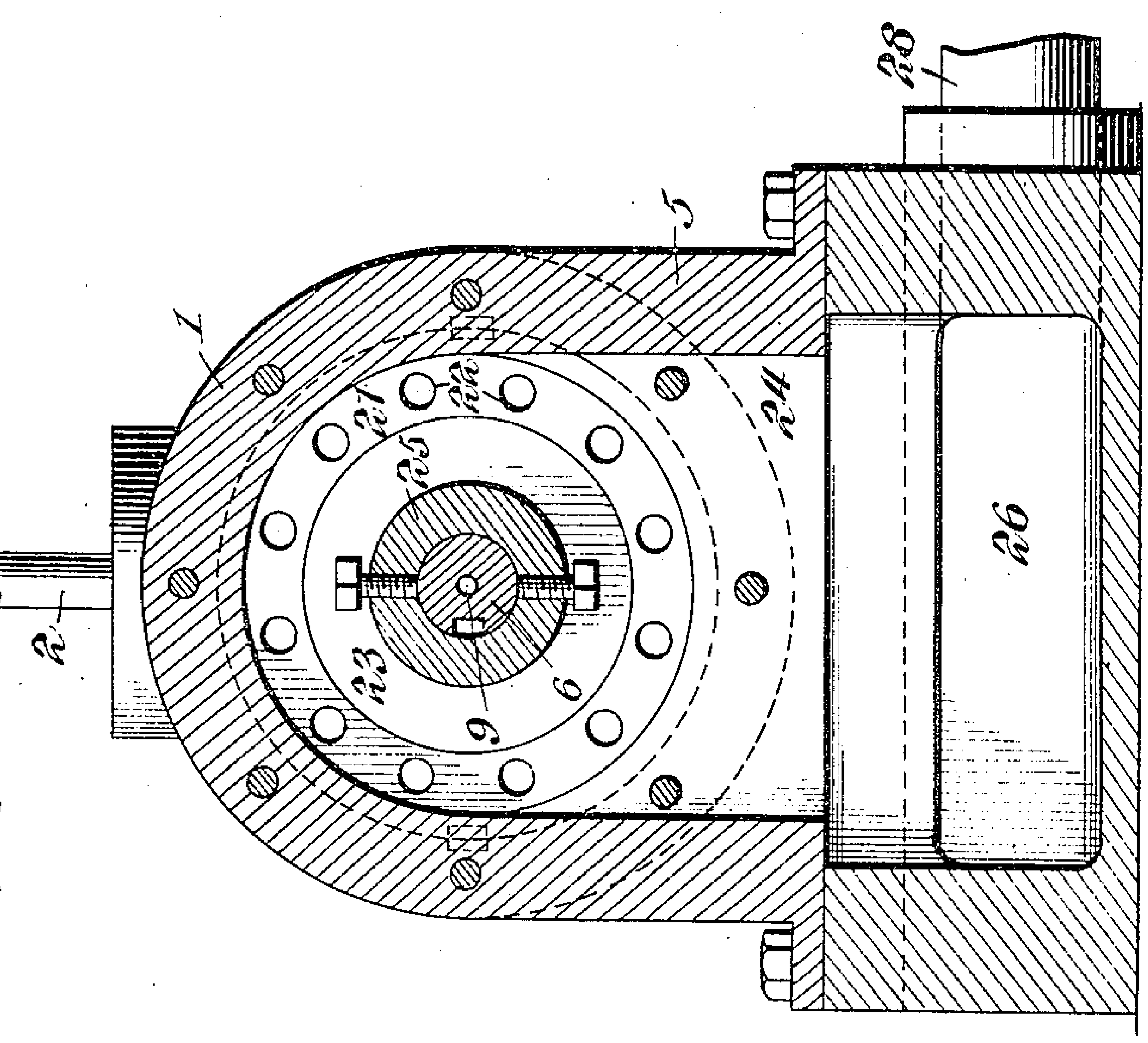


Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 6.

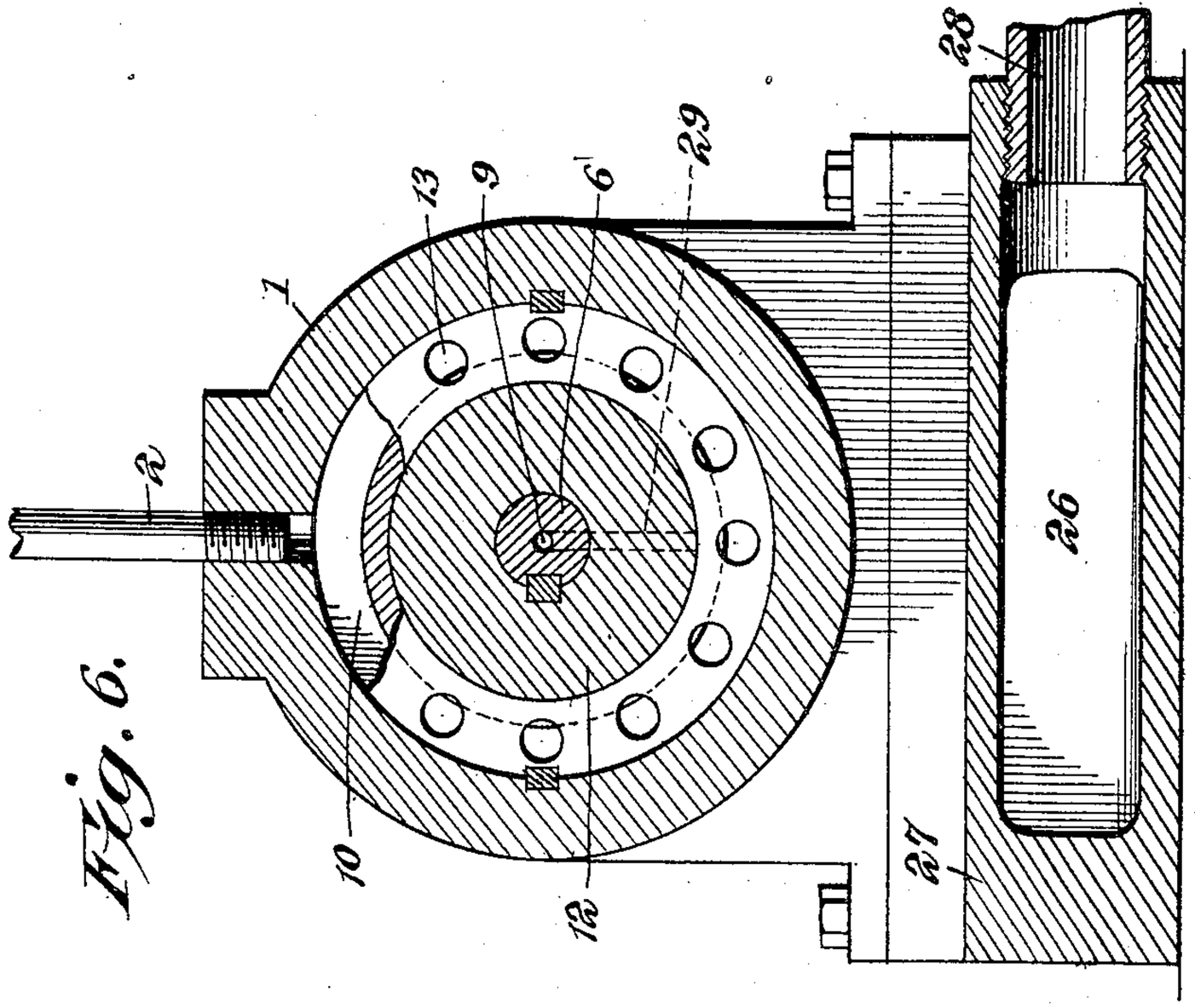
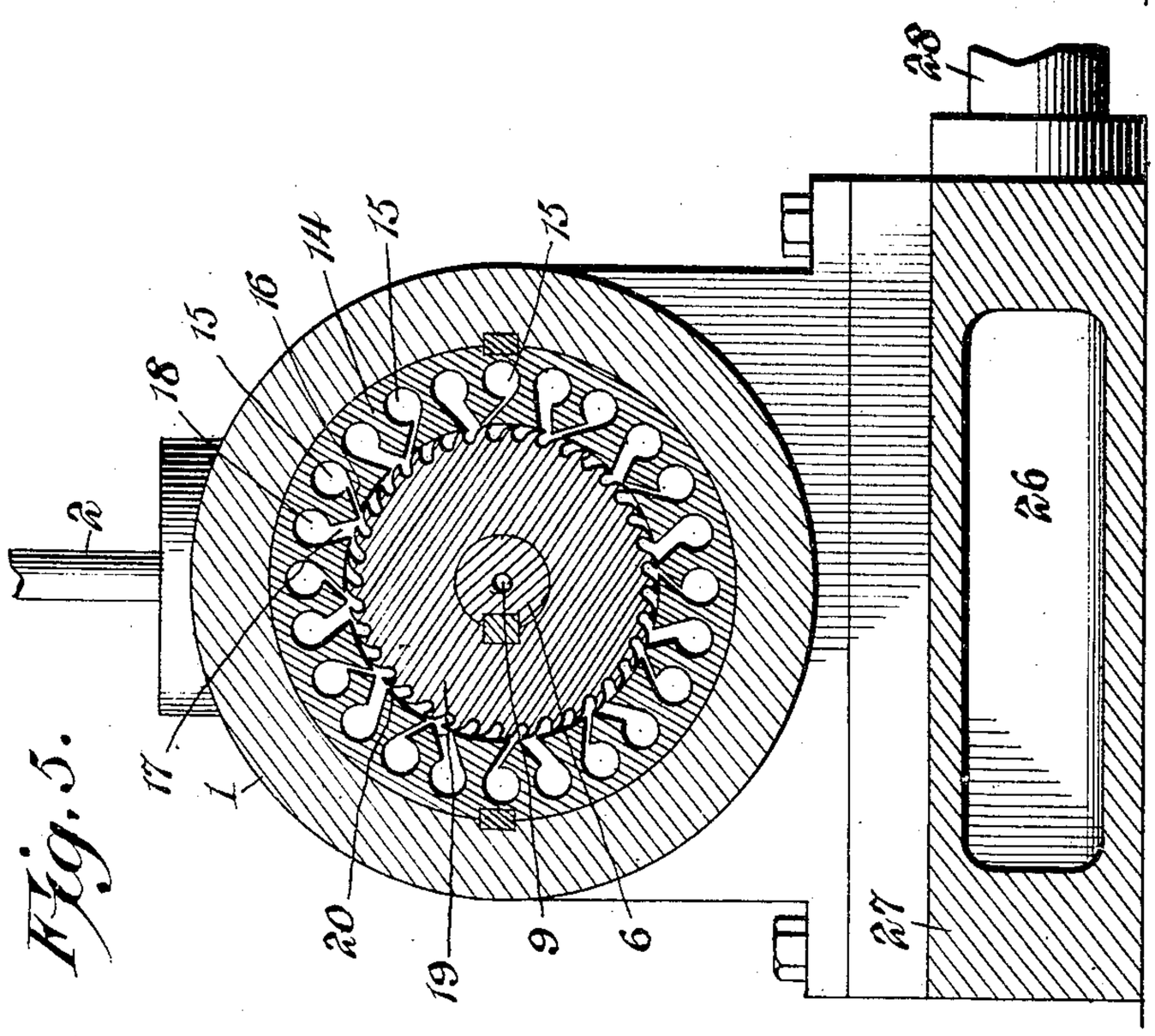


Fig. 5.



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UNITED STATES PATENT OFFICE.

UEL ALVIN RUTLEDGE, OF BERKLEY, VIRGINIA.

STEAM-TURBINE.

No. 817,590. Specification of Letters Patent. Patented April 10, 1906.

Application filed July 25, 1905. Serial No. 271,144.

To all whom it may concern:

Be it known that I, UEL ALVIN RUTLEDGE, a citizen of the United States, residing at Berkley, in the county of Norfolk and State of Virginia, have invented certain new and useful Improvements in Steam-Turbines, of which the following is a specification.

This invention has relation to steam-turbines; and it consists in the novel arrangement and construction of its parts, as hereinafter shown and described.

The object of the invention is to provide an engine of the type indicated which is adapted to be operated by steam or other pressure fluid and which is so constructed that by turning the steam in one end thereof its piston is caused to rotate in one direction, while by turning the steam in the other end thereof the piston is caused to rotate in the opposite direction.

The invention consists, primarily, of a cylinder having a shaft extending longitudinally of the center thereof and being suitably supported in journal-bearings and adapted to rotate. The said cylinder is provided with a suitable steam-inlet and steam-outlet. The interior of the said cylinder is circular, and within the said cylinder and keyed to the walls thereof is fixed a series of steam-pressure collars, which gradually increase in thickness from the steam-inlet to the steam-outlet of the cylinder. The said steam-pressure collars are of a special construction, which will be hereinafter described. Interposed between the steam-pressure collars are steam-guides, which are adapted to convey the steam from one collar after it has performed its work at that collar to the next adjacent collar, where it is again permitted to exert its pressure upon the piston. The pistons or buckets are arranged upon the shaft and are adapted to rotate therewith. The said buckets are located within the steam-pressure collars, and the pressure from the steam when in said collars is exerted upon the vanes or blades of the said buckets when it rebounds into the cavities provided in the said steam-pressure collars, and from the said cavities the steam passes through perforations in the conveyer-collars to the next adjacent steam-pressure collar. The said pistons gradually increase in thickness from the steam-inlet toward the steam-outlet of the cylinder—that is to say, the piston is of the same thickness as the collar within which it is incased. Interposed between the said pistons are disks, which fit snugly within the conveyer-collars and are of the same thickness as the said collars, all of said collars being of uniform thickness throughout. Just below the steam-inlet of the cylinder is located a division-piece, also keyed to the said shaft. The said division-piece is provided with circumferential grooves having lateral outlets through which the steam passes from the steam-inlet of the cylinder to the collar incasing the first piston.

The engine is made in two parts of similar construction, the only difference being that the pistons in one part are oppositely disposed to the pistons in the other part. It will thus be seen that by admitting steam into one half of the engine the shaft is caused to rotate in one direction, while by admitting the steam to the other half the shaft is caused to rotate in the opposite direction. The engine is provided with a suitable exhaust-port, which communicates with the steam-outlets of both halves of the cylinder by means of passages which lead through the engine-base.

In the accompanying drawings, Figure 1 is a side elevation of the engine with parts of the cylinder thereof broken away. Fig. 2 is a vertical longitudinal sectional view of one end of the engine. Fig. 3 is a transverse sectional view of the engine cut on the line 3 3 of Fig. 2. Fig. 4 is a transverse sectional view of the engine cut on the line 4 4 of Fig. 2. Fig. 5 is a transverse sectional view of the engine cut on the line 5 5 of Fig. 2, and Fig. 6 is a transverse sectional view of the engine cut on the line 6 6 of Fig. 2.

The engine consists of the cylinder 1, which is provided with the steam-inlets 2 and 2′. The steam-pipe 3 is connected with the steam-inlets 2 and 2′ and is provided with a three-way cock 4, (of ordinary construction,) by the manipulation of which steam may be conveyed from the steam-pipe 3 into either the steam-inlet 2 or 2′. The end of the cylinder 1 is closed by means of the head 5, which is suitably bolted to the cylinder end. The shaft 6 passes through the center of the head 5 and extends longitudinally through the cylinder 1. The said shaft 6 is journaled in suitable bearings 7, and the head 5 is provided with the ordinary stuffing-box 8. The center of the shaft 6 is provided with an oil-channel 9, through which oil is introduced into the interior of the cylinder 1 for the purpose

of lubricating the parts. Located within the cylinder 1 and at the middle thereof is the division-piece 10, which is provided on each side of its middle with a circumferential groove 11 and 11′. The groove 11 registers with or is directly below the steam-inlet 2, while the groove 11′ registers with or is directly below the steam-inlet 2′. As both halves of the cylinder are of similar construction with the exception of the opposite arrangement of the pistons, as hereinbefore indicated, a description of one half of the engine will answer for both. The division-piece 10 is keyed to the inner walls of the cylinder 1, and is thereby made stationary therewith. The block 12 is keyed to the shaft 6 and fits snugly within the division-piece 10. The said block 12 is of the same thickness as the said division-piece 10. The lateral openings 13 lead from the groove 11 into the pressure-compartments of the first pressure-collar 14. All of the collars 14 are keyed to the inner walls of the cylinder 1 and are of similar construction except that they gradually increase in thickness from the steam-inlet toward the steam-outlet of the said cylinder 1. A description of the construction of the pressure-collar 14 is as follows: It is provided with a series of laterally-extending pressure-compartments 15 15, each of which is provided with a small tangentially-extending channel 16, which has its outlet in the inner periphery of the said collar. At the point where the channel 16 enters the inner periphery of the collar 14 the larger channel 17 also enters and leads back into the conveying-compartment 18. The piston 19 is fixed to the shaft 6 and is provided on its periphery with the vanes or blades 20. The piston 19, incased within its collar 14, is of the same thickness as its respective collar. Consequently the said pistons 19 increase gradually in thickness from the steam-inlet to the steam-outlet of the cylinder 1. Interposed between the collars 14 14 are the conveyer-collars 21 21. The said conveyer-collars are also fixed to the inner walls of the cylinder 1 and are provided with the laterally-extending channels 22. The channels 22 of the first collar 21 register with the channels 13 of the division-piece 10 and lead to the compartment 16 of the first pressure-collar 14. With respect to the arrangement of the remaining collars 21 the ends of the channels 13 thereof at one side of the collar register with the compartment 18 of one collar 14 and the other end of the said channels 22 register with the pressure-compartment 15. It will thus be seen that all of the compartments 15 of the collars 14 are not in alinement throughout the length of the cylinder 1, but are in staggered arrangement—that is to say, that the compartments 15 of the first collar 14 are opposite or in alinement with the compartments 18 of the next adjacent collar 14, and so on throughout the series. The disks 23 fit snugly within the collars 21 and are of the same thickness as the said collars. Said disks are keyed to the shaft 6 and rotate therewith. The channels 22 of the end disk of the series communicate with the compartment 24, provided in the cylinder-head 5. The ring 25 encircles the shaft 6 and is interposed between the inner wall of the cylinder-head 5 and the last disk 23 of the series. The passage 26 extends through the engine-base 27 and communicates at one end with the compartment 24 and at its other end with the exhaust-outlet 28. The block 12 is provided with an oil-channel 29, which registers at one end with the laterally-extending oil-duct 30, which in turn communicates with the oil-channel 9 of the shaft 6. By means of the said channel 9, duct 30, and channel 29 oil may be introduced through the shaft 6 into the interior of the cylinder 1 for the purpose of lubricating the parts.

The operation of the engine is as follows: Presuming that steam is led into the cylinder 1 through the inlet 2, it (the steam) fills the groove 11 of the division-piece 10. The steam then passes through the lateral opening 13 and enters simultaneously all of the pressure-compartments 15 of the first collar 14. The steam then passes down through the channels 16 and strikes the blades 20 of the piston 19, incased within the said collar, thus exerting its pressure upon the blades of the said piston and causing the same to rotate. The steam then immediately rebounds, passes up through the channels 17 into the compartments 18. From the compartments 18 the steam passes through the channels 22 of the next adjacent collar 21 and enters the compartments 15 of the next adjacent collar 14, wherein the operation above described is repeated, and so on throughout the series of collars and pistons until the steam finally enters the compartments 24 of the cylinder-head 5 and passes through the passage 26 of the engine-base 27 to the exhaust-outlet 28.

The object in gradually increasing the thickness of the collars 14 and the pistons 19 from the steam-inlet to the steam-outlet of the cylinder 1 is to provide space to compensate for the expansion of the steam in passing through the cylinder 1, so that the force of the volume of steam operating upon the several pistons 19 may be uniform throughout.

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

1. In a turbine, a rotating piston, a collar surrounding and receiving said piston and fitting snugly about the entire periphery of the same, said collar having a fluid-medium-pressure compartment with a channel leading therefrom to the inner periphery of the

collar, said collar also having a medium-conveying compartment with a channel leading thereto from the inner periphery of the collar.

2. In a turbine, a rotating piston, a collar surrounding and receiving said piston, said collar having a fluid-medium-pressure compartment with a channel leading therefrom to the inner periphery of the collar, said collar also having a medium-conveying compartment with a channel leading thereto from the inner periphery of the collar, the capacity of the last said channel being greater than that of the first said channel.

3. In a turbine, a rotating piston, a collar surrounding and receiving said piston and fitting snugly around the entire periphery of the same, said collar having a fluid-medium-pressure compartment with a channel leading therefrom to the inner periphery of the collar, said collar also having a medium-conveying compartment with a channel leading thereto from the inner periphery of the collar, the capacity of the last said channel being greater than that of the first said channel.

4. In a turbine, a series of rotating pistons, a collar receiving each piston, each said collar having a fluid-medium-pressure compartment with a channel leading therefrom to the inner periphery of the collar, each said collar also having a fluid-medium-conveying compartment with a channel leading thereto from the inner periphery of the collar, the pressure-compartments of one collar being located in alinement with the conveying-compartment of the next adjacent collar throughout the series and a means for passing the fluid medium from the conveying-compartment of one collar to the pressure-compartment of the next adjacent collar and so on throughout the series.

In testimony whereof I affix my signature in presence of two witnesses.

UEL ALVIN RUTLEDGE.

Witnesses:

JNO. W. NASH,

R. S. MARSHALL.