No. 788,005. PATENTED APR. 25, 1905.

J. WILKINSON.

CONTROLLER MECHANISM FOR TURBINES.

APPLICATION FILED AUG. 18, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

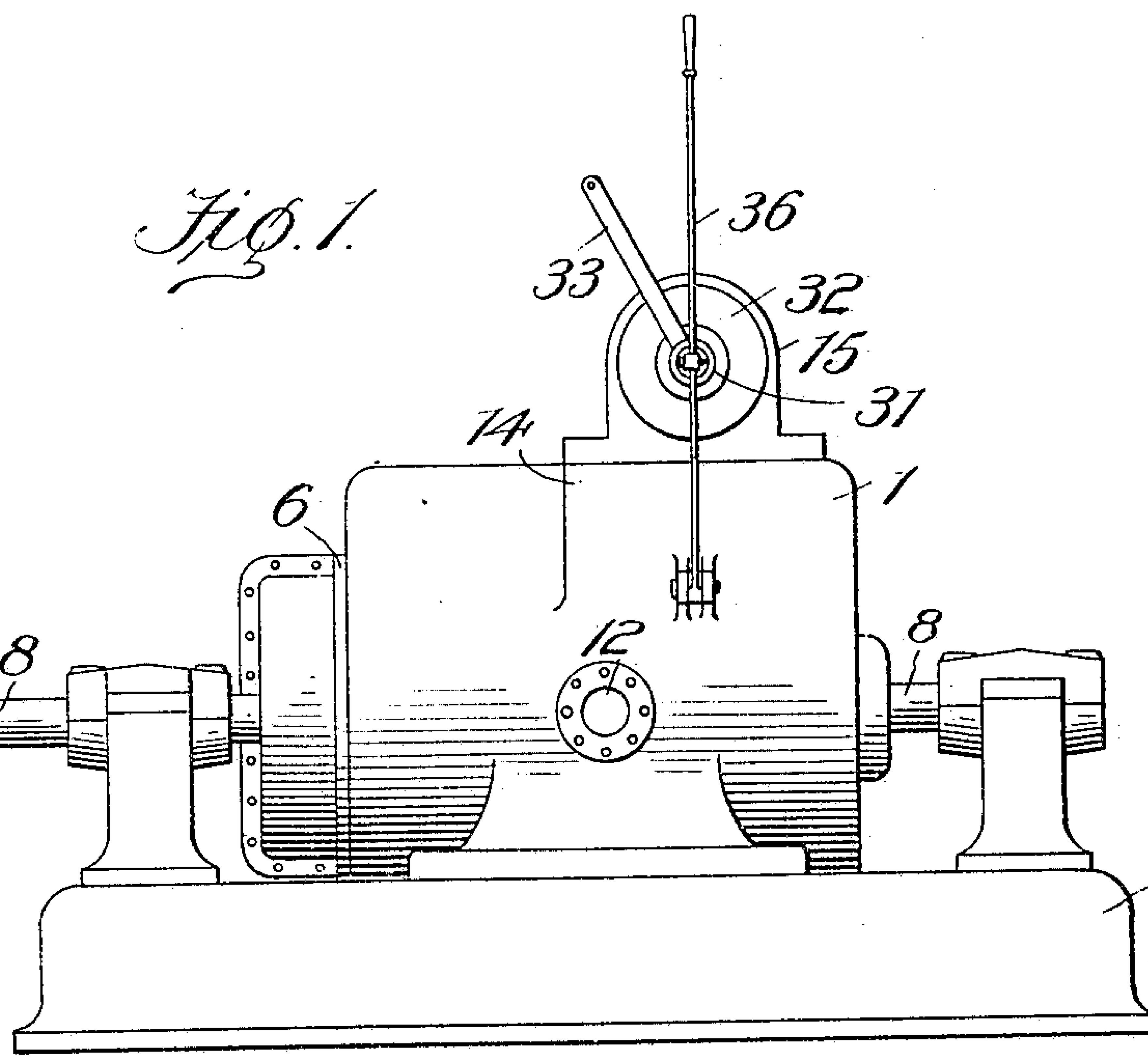


Fig. 2.

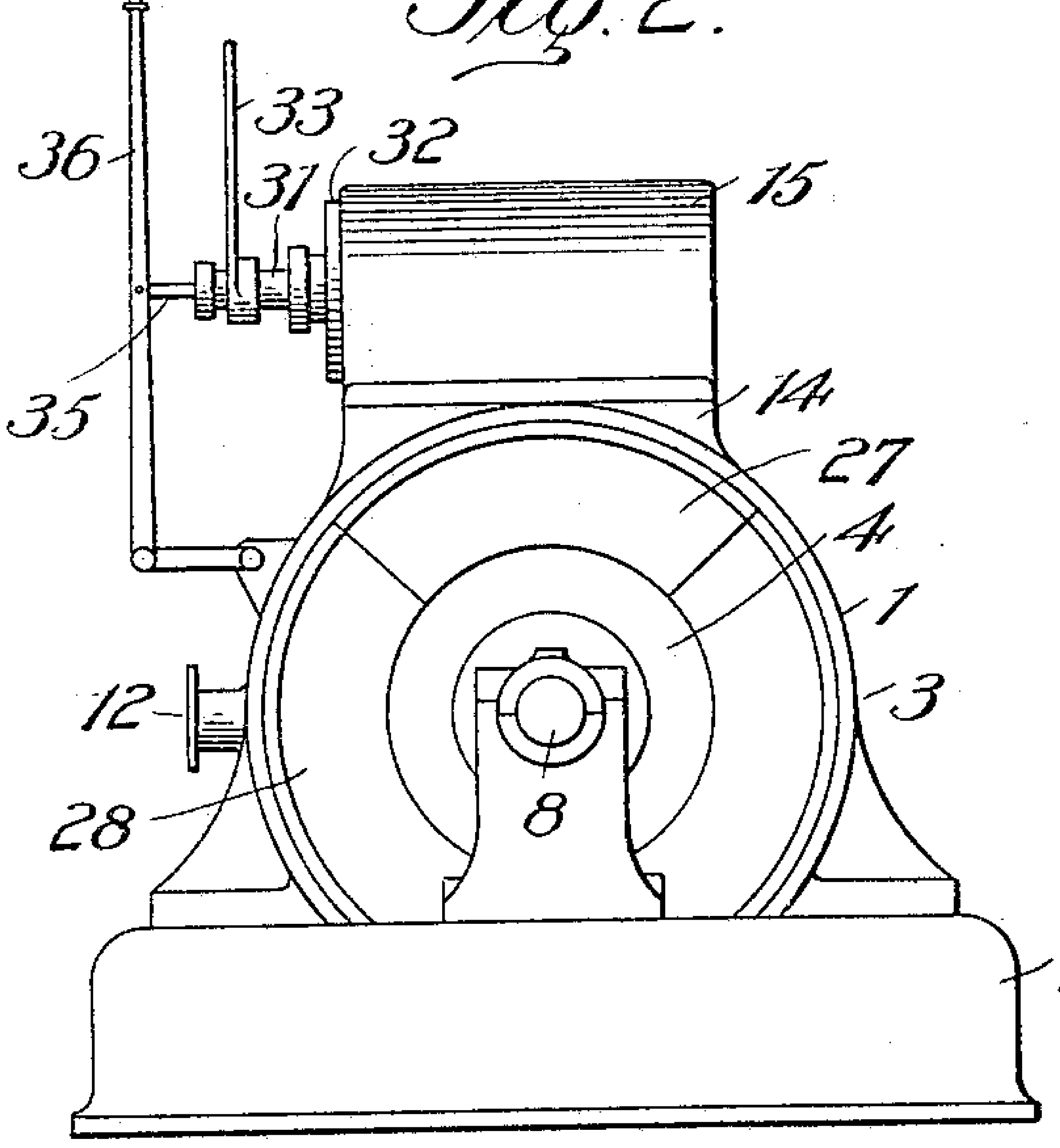


Fig. 6.

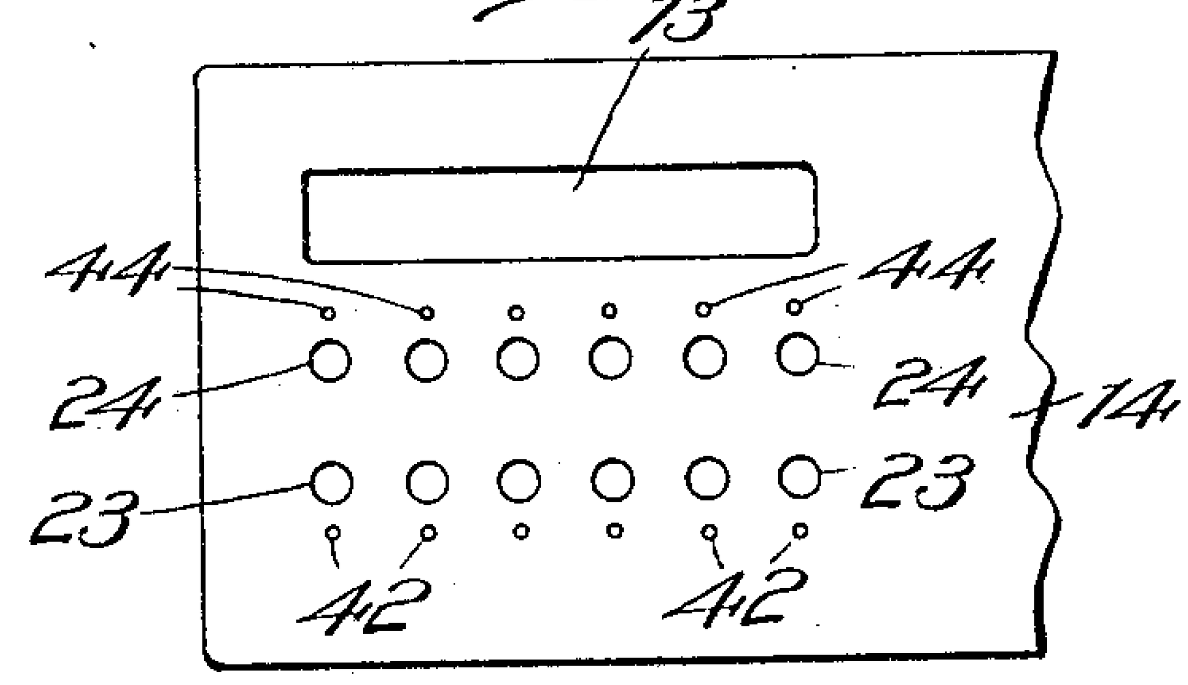


Fig. 5.

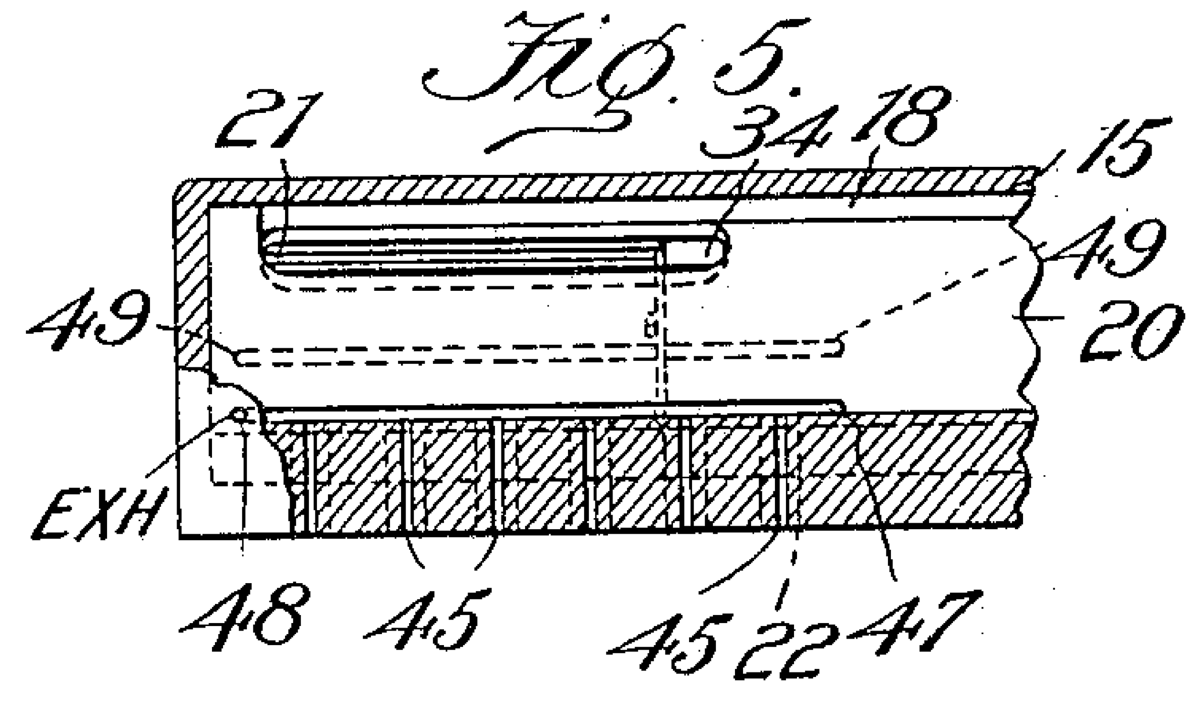
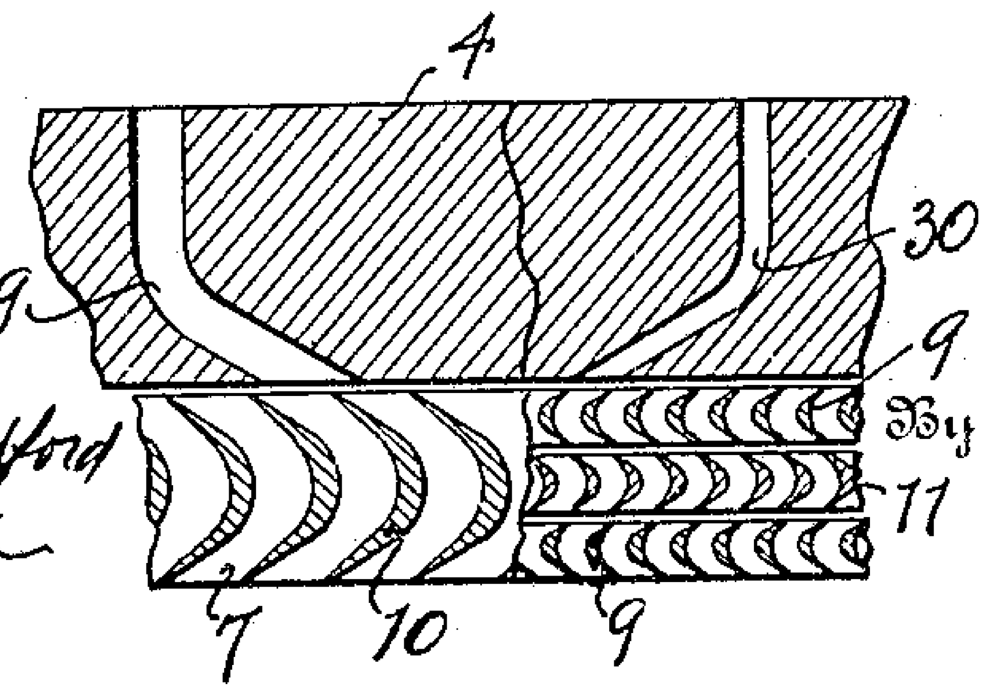


Fig. 7.



Witnesses

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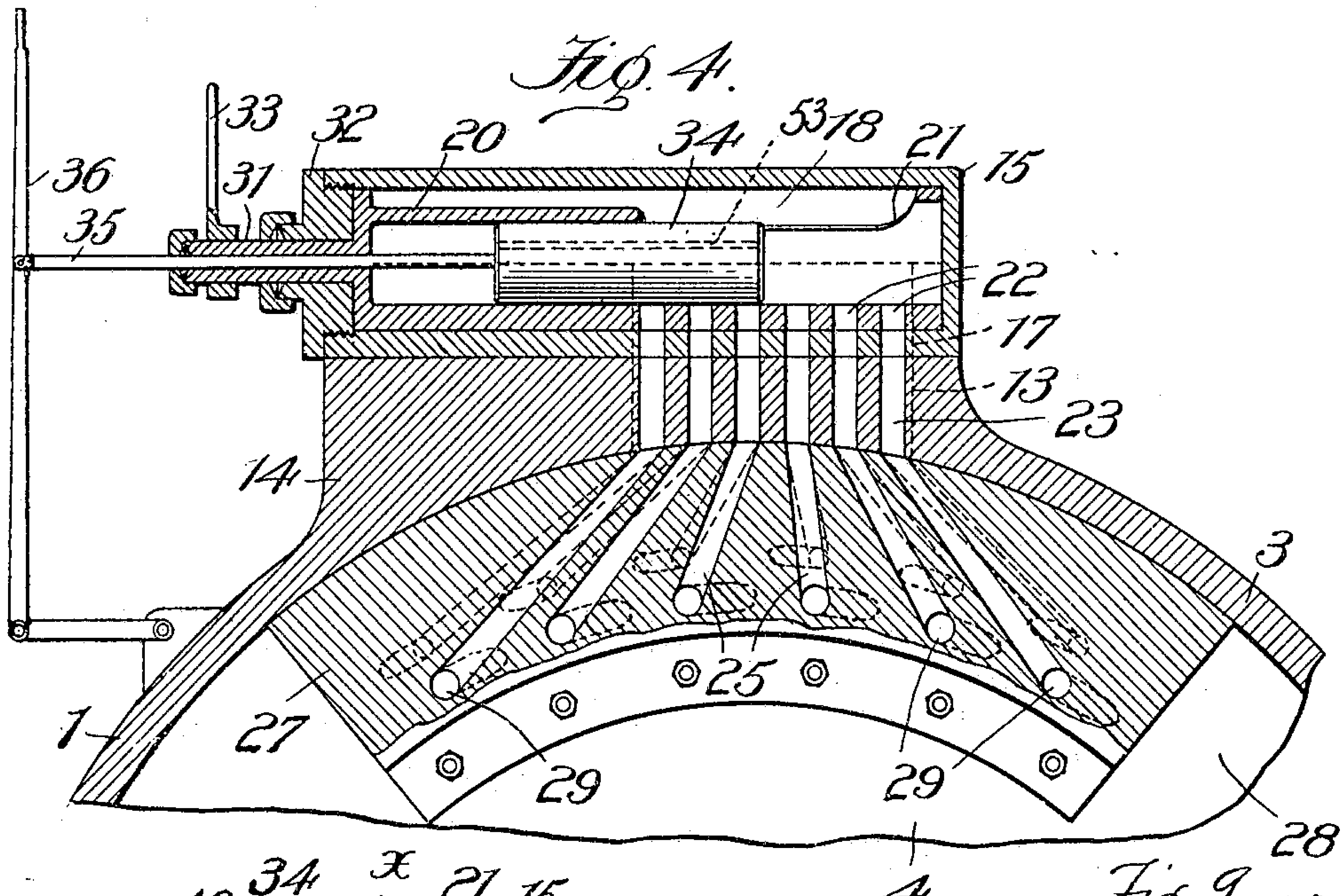
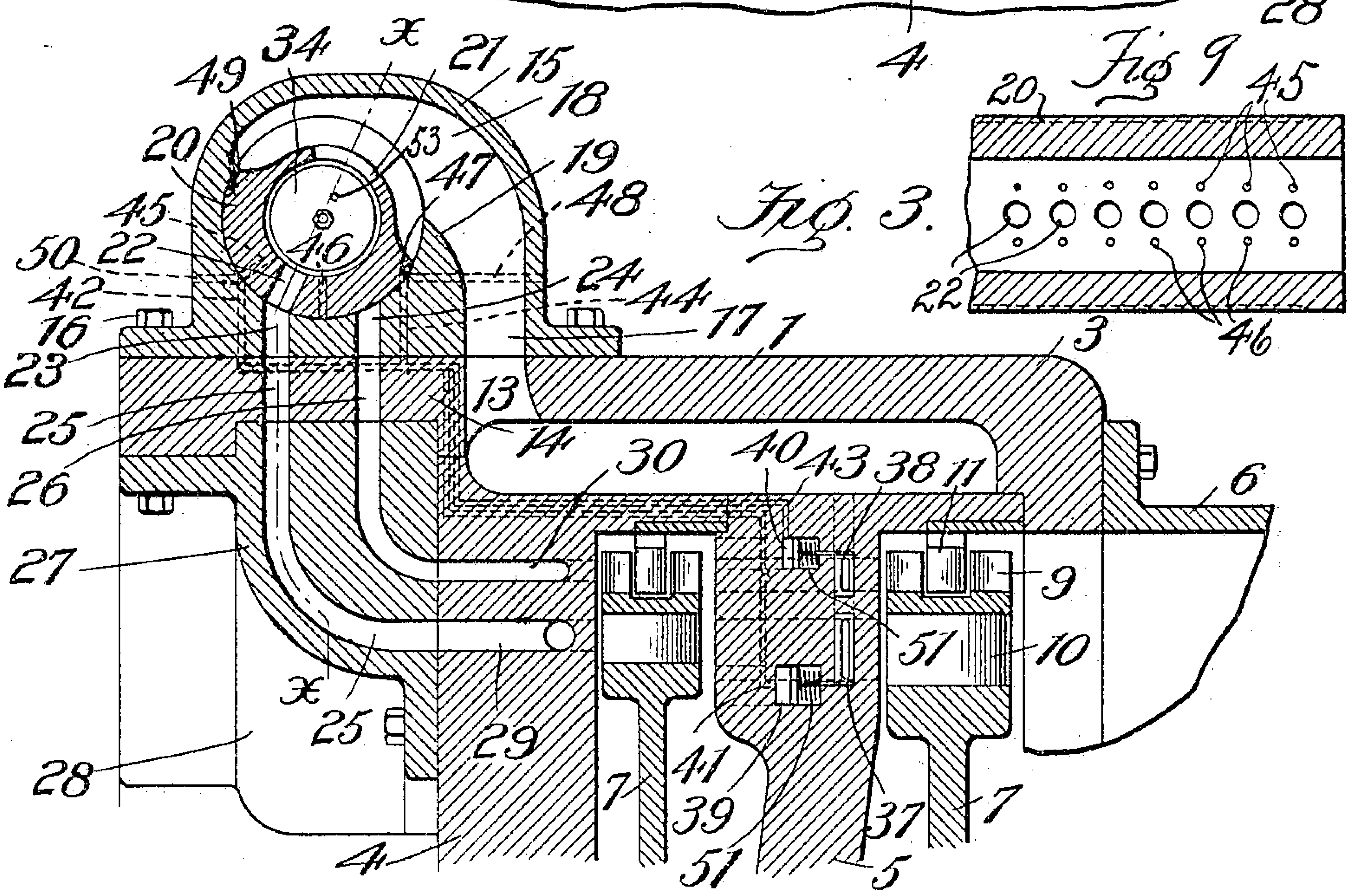
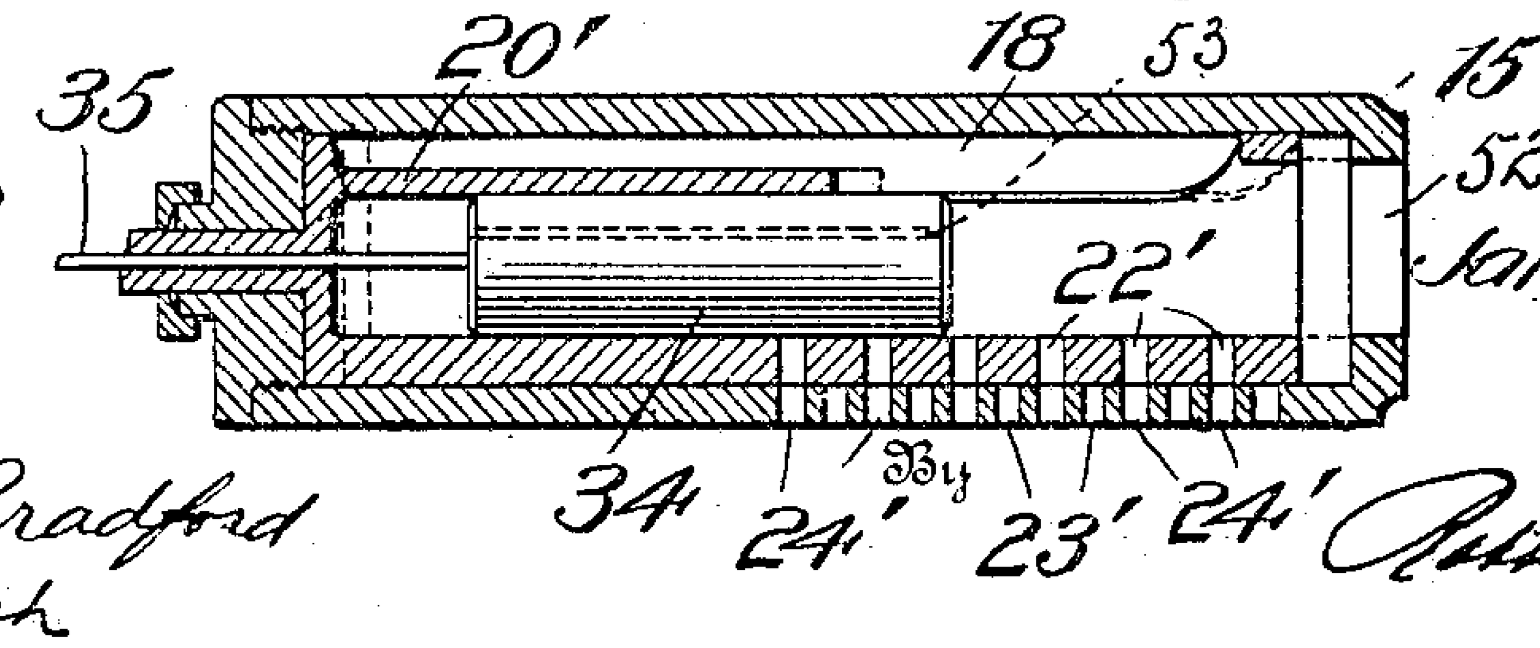
2 SHEETS—SHEET 2.







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UNITED STATES PATENT OFFICE.

JAMES WILKINSON, OF BIRMINGHAM, ALABAMA, ASSIGNOR TO WILKINSON TURBINE COMPANY, OF BIRMINGHAM, ALABAMA, A CORPORATION OF ALABAMA.

CONTROLLER MECHANISM FOR TURBINES.

SPECIFICATION forming part of Letters Patent No. 788,005, dated April 25, 1905.

Application filed August 18, 1904. Serial No. 221,261.

To all whom it may concern:

Be it known that I, JAMES WILKINSON, a citizen of the United States, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented new and useful Improvements in Controller Mechanism for Turbines, of which the following is a specification.

My invention relates to an improvement in mechanism for controlling the supply of motor fluid to an elastic-fluid turbine.

It is an object of my invention to simplify the means for controlling a reversing or two-speed turbine wherein independent nozzles or groups of nozzles operate with different driving effects upon one or more compound bucket-wheels. In turbines of this character it is desirable to provide means capable of independently controlling the admission of motor fluid to the several groups of nozzles. Broadly speaking, such means have been shown and described in Letters Patent Nos. 752,610 and 752,496, and my present invention constitutes an improvement over the constructions there shown and described, in that I utilize a multiported valve to control the admission of motor fluid to one or the other of the groups of nozzles, its position determining the active group and, if desired, volume of fluid admitted thereto. As a preferred construction, however, I use this valve in combination with a controller device which is seated thereon and operates to open or close any desired number of the ports therein, being adapted by its position to vary the volume of fluid admitted to the active working passages.

More specifically, it is an object of my invention to dispense with the plurality of supply-valves which in common practice are utilized to vary the flow of motor fluid through the several supply nozzle-passages and to substitute therefor a multiported controller-valve through which the motor-fluid supply for the whole turbine flows directly into the nozzle-supply passages, the valve being adjustable to determine the groups of nozzles to which pressure is to be supplied and the controller device acting to determine the volume of motor fluid admitted to the active working passages.

My invention comprises other improvements in the details of construction and arrangement of parts hereinafter shown and described, reference being had to the accompanying drawings, forming a part hereof, and in which—

Figure 1 is a side elevation of a two-speed compound turbine equipped with my governing mechanism. Fig. 2 is an end elevation. Fig. 3 is a cross-sectional view through the turbine, broken away to show the nozzles and buckets, enlarged. Fig. 4 is a sectional view through the line *x x*, Fig. 3. Fig. 5 is a longitudinal sectional view through the controller-casing, taken through a row of stage-valve-controlling ports and showing the inner shell in elevation. Fig. 6 is a plan view of the seat for the controller-casing. Fig. 7 is a detail sectional view through the supply-head, broken away to show two oppositely-disposed supply nozzle-passages and rows of buckets. Fig. 8 is a modification illustrating a sliding instead of a rotating valve-shell. Fig. 9 is a transverse sectional view, broken away, of the interior of a controller-valve shell.

The same reference-numerals refer to the same parts throughout.

I have illustrated my improved governing mechanism in connection with a compound high-torque reversing turbine 1, mounted on a bed-plate 2 and comprising an outer shell 3, surrounding the inner casing formed by the supply-head 4, diaphragm-partitions 5, and exhaust-head 6. I dispose in each compartment a bucket-wheel 7, keyed to the shaft 8 and provided with two outer rows of small buckets 9, mounted on the head-blocks of a single inner row of large full-speed buckets 10. A row of stationary intermediates 11 is interposed between each double row of buckets 9, so that the outer working passages formed by the succeeding nozzles and the interposed rotating rows of buckets 9 and intermediates 11 constitute the high-torque reversing-passages; but inasmuch as my present invention does not reside in the details of turbine construction these outer working passages may operate to drive the turbine forward at slow speed or to reverse it at full speed.

The motor-fluid pressure is admitted by a port 12 in shell 3 to an annular chamber between the shell and turbine-casing. Through an elongated port 13, leading from this chamber through a shoulder 14 of the shell, the fluid-pressure is admitted to a controller-casing 15, secured by cap-screws 16 to the flattened top surface of shoulder 14. The controller-casing is provided with a port 17, which registers with port 13 and forms the inlet end of a passage 18, which leads over a shoulder 19, preferably integral with the casing and constituting the seat for the multiported controller-valve 20. This valve is preferably formed as a cylindrical shell 20, the thickness of whose upper wall is reduced to permit access to the motor fluid between the shell and casing, so that it will be held firmly to its seat formed by a semicircular groove along the top of the shoulder 19. A longitudinally-disposed opening 21 in the upper side of the shell corresponds in length with passage 18 and admits the fluid-pressure into the interior of the shell. I provide a row of ports 22 in the lower side of the shell, which register with one or the other of two rows of ports 23 and 24, leading through shoulder 19 and respectively registering with conduits 25 and 26, leading through shell 3 and a block 27, which forms part of the locking-ring 28, by means of which the inner casing is held in place in the shell. These conduits in turn register with nozzle-passages 29 and 30, which lead through supply-head 4, being bent in opposite directions before entering the first stage, so that they discharge motor fluid against buckets 9 and 8, respectively, to drive the turbine, as here shown, in opposite directions. Since the shell 20 has but one row of ports, fluid-pressure can be supplied therethrough to but one row of ports which admit fluid to the nozzles, so that the motor fluid can never be simultaneously admitted to both forward and reversing passages. When it is desired to reverse the turbine, it is only necessary to rotate shell 20 until its ports register with the other row of ports in the controller-casing, and this I effect by providing the shell with an integral tubular spindle 31, which leads through a suitably-packed opening in a screw-plug closure 32 for one end of casing 15. By removing the plug the shell 20 may be inserted or removed from the casing. I secure a handle 33 to spindle 31, by means of which it may be moved.

By the means described the turbine may be reversed and, if desired, the volume of the motor fluid admitted to the active working passages controlled by moving the ports 22 into full or partial register with ports 23 or 24. I prefer to regulate the supply of motor fluid by cutting the several nozzle-passages successively out of service. To this end I provide a controller device adapted to be moved back and forth over the ports 22 to interrupt the admission of pressure to any or all of them. According to the drawings, I have illustrated this controller device as an elongated piston 34, adapted to move pressure-tight within the valve-shell 20, which thus forms a cylinder. This piston is sufficiently long to close all ports 22, which are disposed near an end of the shell, which is long enough to permit it to be moved to uncover them all. This piston is operated by a stem 35, leading out through the tubular spindle 31 and connected to an operating-lever 36. A passage 53, leading longitudinally through the piston, balances the pressure on both ends, so it can be easily moved. The volume of fluid admitted to the turbine corresponds with the number of ports 22 open, and this may be varied by shifting piston 34 by hand or by any other means.

The working passages for the motor fluid hereinbefore referred to comprise the supply and succeeding stage-nozzles and interposed rows of rotating buckets, the construction and arrangement of which not constituting a material part of my present invention may be found shown and described more in detail in my Letters Patent No. 752,496. I may use stage-valves 37 and 38 for the forward and reversing stage-nozzles, operating them by fluid-motors 39 and 40, respectively, which may be of any preferred form—such, for instance, as are described in my Letters Patent above. Conduits 41, which conduct fluid-pressure to motors 39, lead through the turbine-casing, shell 3, and seat 14, where they register with passages 42, leading through the casing 15 and entering the seat for shell 20. Conduits 43, similar to 41, lead from motors 40 to the seat 14, where they register with passages 44, which lead through the seat for shell 20 and on the other side of ports 23 and 24 from ports 42. The shell 20 when adapted to control stage-valves has two rows of small ports 45 and 46, arranged on each side of ports 22 and so disposed that when the latter ports register with ports 23 the ports 45 register with passages 42, while passages 44 register with a channel 47 in the side of the shell, which is then in communication with the atmosphere or an exhaust through a passage 48, leading through casing 13. When the turbine is reversed, the shell 20 is rotated to move ports 22 into alinement with ports 24, when ports 45 will be moved out of register with passages 42 and into alinement with the channel 49, which then communicates with an exhaust-passage 50, while ports 46 will register with passages 44. The admission of motor-actuating fluid-pressure to a conduit will cause the valve or valves controlled thereby to open. Hence the piston 34 will control the operation of stage-valves to open the stage-nozzles in correspondence with the supply-nozzles. The other motors being exposed to the atmosphere may be actuated by internal pressure or by springs 51, or both, to close the valves controlled by them. The channels 47 and 49 only register with their exhaust-ports 48 and 50 in one of their operating positions, these ports being otherwise closed by the shell.

As a modification I have shown in Fig. 8 a sliding valve-shell 20′, whose ports 22′ are arranged to register with either group of ports 23′ and 24′, which are disposed alternately in alinement. By sliding the shell either group may be brought into register with ports 22′, thus reversing the turbine, or the volume of the motor fluid may be controlled according to its position, as hereinbefore described. The motor-fluid pressure is admitted directly to the controller-casing through a port 52 in an end of casing 15. The piston 34 in this construction, as in the other figures, is provided with a longitudinal passage 53 for equalizing the pressure against its ends to balance it.

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

1. In a controller mechanism for a turbine having a plurality of fluid-admission passages, a multiported valve operating to control the opening and closing of said passages in groups, and a controller device to control the admission of motor fluid to the passages of the group not closed under the control of said valve.

2. In a controller mechanism for a turbine having a plurality of groups of motor-fluid-admission passages, a multiported valve to control the admission of fluid-pressure to the groups of passages, and a movable controller device to cut the passages of a group out of service.

3. A controller mechanism for a turbine having a plurality of fluid-induction nozzles, comprising a fluid-pressure-supply chamber for said nozzles and an adjustable device to cut off the admission of fluid-pressure to said nozzles in groups, in combination with means to open or close said other nozzles to vary the motor-fluid supply to the turbine.

4. A controller mechanism for a turbine, comprising a plurality of fluid-pressure-supply passages, a fluid-pressure-supply chamber, a valve to direct the fluid-pressure into a group of said passages, and valve means to control the volume of fluid-pressure discharged by said group of passages against movable buckets within the turbine.

5. In combination with a multiple-nozzle turbine, a controller mechanism which controls the admission of motor fluid to said nozzles in groups, said mechanism comprising a multiported valve adapted to open one group of nozzles to admit motor fluid thereto after closing the other group, and to vary the admission of motor fluid to the nozzles of the open group.

6. In a turbine, a plurality of motor-fluid-induction passages, rotatable buckets, a multiported valve to close part of said passages, and a controller means to vary the volume of motor fluid discharged by the passages not closed by said valve against such buckets.

7. The combination with a turbine comprising a plurality of nozzles and rows of rotating buckets, said nozzles being controlled in groups which discharge motor fluid against said buckets to produce different driving effects, of a controller mechanism for opening and closing said groups of nozzles comprising an adjustable multiported valve-seat and a controller-valve thereon.

8. In a turbine, a plurality of motor-fluid-induction passages, a movable multiported valve-seat adapted to close part of said passages, and a valve on said seat which controls the admission of motor fluid to the ports thereof which register with other of said passages and admit fluid-pressure thereto.

9. In a turbine, a plurality of nozzle-passages, an adjustable valve-seat adapted to close part of said passages, ports in said seat which communicate with other of said passages, and a slide-valve to control the admission of motor fluid to said ports successively.

10. In a turbine, a plurality of nozzle-passages, a motor-fluid-supply chamber with which said passages communicate, a valve in said chamber to maintain a plurality of said nozzle-passages closed, and a second valve to control the admission of motor fluid to other of said nozzle-passages.

11. In a turbine, a plurality of nozzle-passages, a motor-fluid-supply chamber with which said passages communicate, a valve to maintain different groups comprising each a plurality of said nozzle-passages closed, and a second valve to successively open or close other of said nozzle-passages.

12. In a turbine, two groups of nozzles which discharge motor fluid against a bucket-wheel with different driving effects, a set of supply-ports for said nozzles opening into a fluid-supply chamber, an adjustable valve having ports adapted to register with one of said sets of ports and admit motor fluid from said chamber thereto, while it closes the other sets of ports and a controller-valve to vary the volume of motor fluid discharged against a bucket-wheel by the set of nozzles not closed by said adjustable valve.

13. In a turbine, a plurality of groups of supply-passages which discharge fluid-pressure against a bucket-bearing element with different driving effects, and valve means to control the admission of fluid-pressure to said groups independently comprising a controller-valve and an adjustable seat therefor.

14. In a turbine, a plurality of nozzle-passages, a movable valve-shell through a port or ports in which pressure is admitted to a group of said nozzle-passages at a time, and a piston-valve in said shell to open or close said port or ports to vary the supply of motor fluid to said group of nozzle-passages.

15. In a turbine, a plurality of groups of supply-passages which discharge fluid-pressure against a bucket-bearing element with different driving effects, and valve means to control the admission of fluid-pressure to said groups independently comprising a controller-valve and an adjustable seat therefor having ports communicating with the group of passages under control.

16. In a turbine, a plurality of groups of supply-passages which discharge fluid-pressure against a bucket-bearing element with different driving effects, and valve means to control the admission of fluid-pressure to said groups independently comprising a piston-valve and a rotatable multiported seat therefor.

17. In a turbine, a plurality of groups of supply-passages which discharge motor-fluid pressure against a bucket-bearing element with different driving effects, a fluid-pressure-supply chamber for said passages, a valve having a plurality of ports adapted to register with one or another of said groups of passages, and a controller device adapted to successively open or close said ports in the valve.

18. In an elastic-fluid turbine having two sets of nozzle-passages at different distances from the shaft center, a tubular rotary shell communicating with a source of motor-fluid pressure and provided with one or more ports adapted to register with either of said sets of nozzle-passages to admit motor fluid thereto, the other sets of nozzle-passages being closed.

19. In a turbine having a plurality of nozzles acting with different driving effects against a bucket-wheel, a fluid-pressure-supply chamber, a slide-valve, a rotary valve-shell open to said pressure and acting to divert it into one or the other of said nozzles under the control of said slide-valve, said pressure acting to hold said valve-shell to its seat.

20. In a turbine operating by stage expansion and provided with an outer shell surrounding the inner casing, a fluid-supply chamber formed between said shell and casing, a controller-casing communicating with said chamber, a multiported valve-seat in said casing, the ports of which communicate with nozzle-passages, a valve having ports adapted to register with a group of ports in said seat, and a valve to open and close the ports in said first-mentioned valve.

21. A compound turbine having a plurality of working passages comprising supply-nozzles, and nozzles between wheel-compartments, fluid-pressure means to open and close said latter nozzles under the control of a multiported valve which opens or closes the corresponding supply-nozzles.

22. In a turbine operating by stage expansion and having a plurality of working passages, a valve to control the supply of motor fluid to said passages, independent valves to control the fluid's flow through said passages between stages which operate under the control of said first-mentioned supply-valve.

23. In a turbine operating by stage expansion, valves to control the flow of fluid between stages, fluid-pressure actuating means for said valves, and a controller-valve to admit motor fluid to supply nozzles and control the admission of fluid-pressure to the actuating means for said stage-valves.

24. In a turbine operating by stage expansion, supply and stage nozzle passages, stage-valves to open and close the stage-nozzles, fluid-pressure means to operate the said valves comprising motors and fluid-conduits, a controller mechanism comprising a casing with which the supply-nozzles and said conduits communicate, and a rotary multiported valve to control the admission of pressure to the supply and stage nozzles.

25. In a turbine operating by stage expansion, a plurality of groups of working passages comprising supply and stage nozzle passages and interposed rows of rotating buckets which operate with different driving effects, means to open and close said stage-nozzles, and means to control the supply and flow of motor fluid through said working passages comprising a multiported valve acting to control the admission of pressure to all of the working passages and to conduits which control the operation of said stage-valves.

26. A controller mechanism for a multiple-stage reversing turbine comprising a fluid-supply chamber, a circular valve-seat therein, ports in said seat which communicate with supply-nozzle passages, a rotary valve-shell thereon held to its seat by pressure and provided with ports through which pressure is admitted to forward or reversing nozzles, fluid-actuated valves to control the flow of fluid between stages, conduits to conduct fluid to control said valves which open into said circular valve-seat, and two groups of auxiliary ports in said shell which register with the conduits for controlling the forward or reversing stage-valves according to the position of said shell, means to expose the conduits not in communication with said auxiliary ports to the atmosphere, and valve means to control the admission of pressure to the several ports in said shell.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JAMES WILKINSON.

Witnesses:
H. M. HARTON,
NORRILL WELSH.