

925,089.

S. GRUND.  
REVERSIBLE STEAM TURBINE.  
APPLICATION FILED MAR. 23, 1909.

Patented June 15, 1909.  
3 SHEETS—SHEET 1.

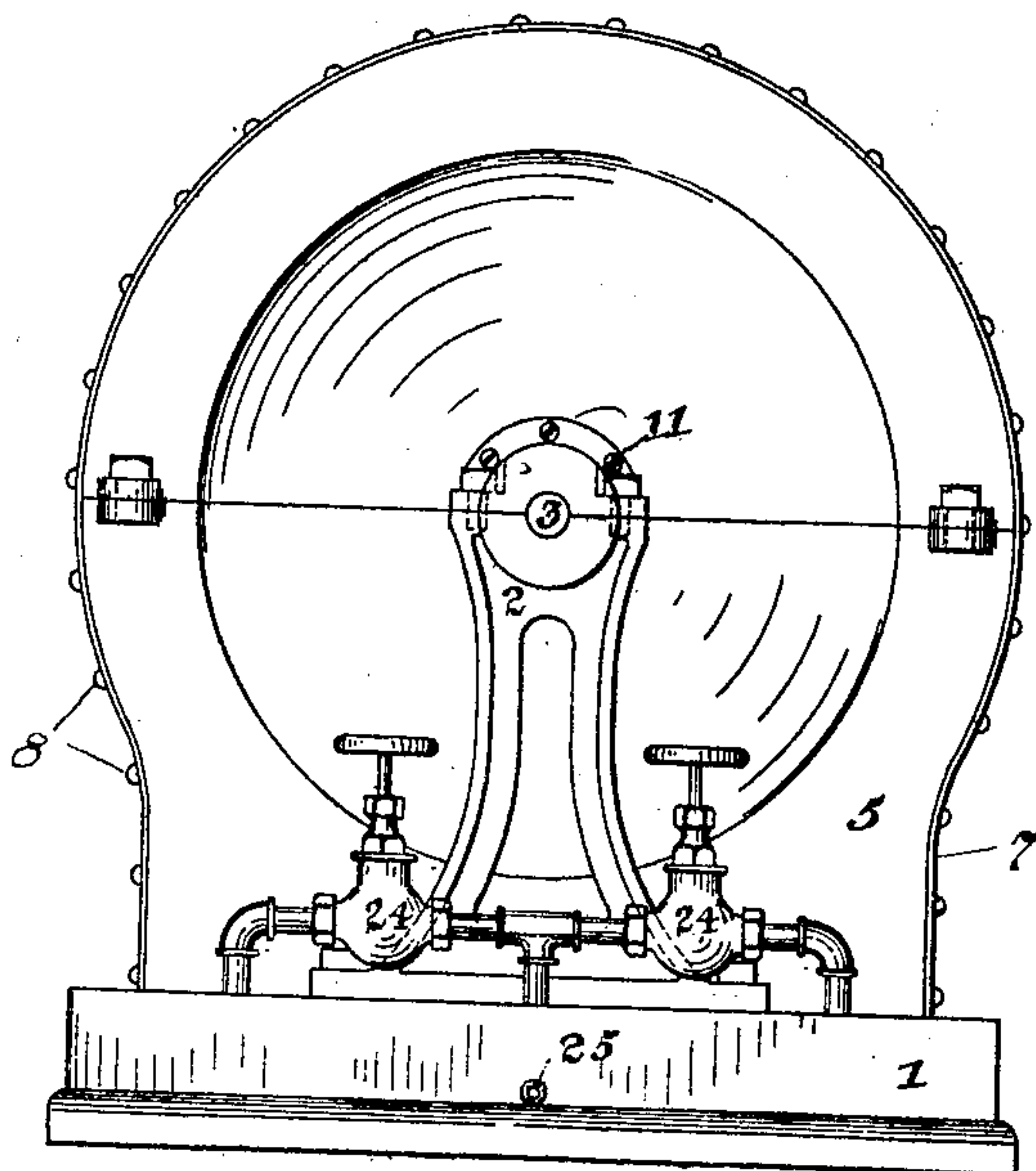


Fig. 1.

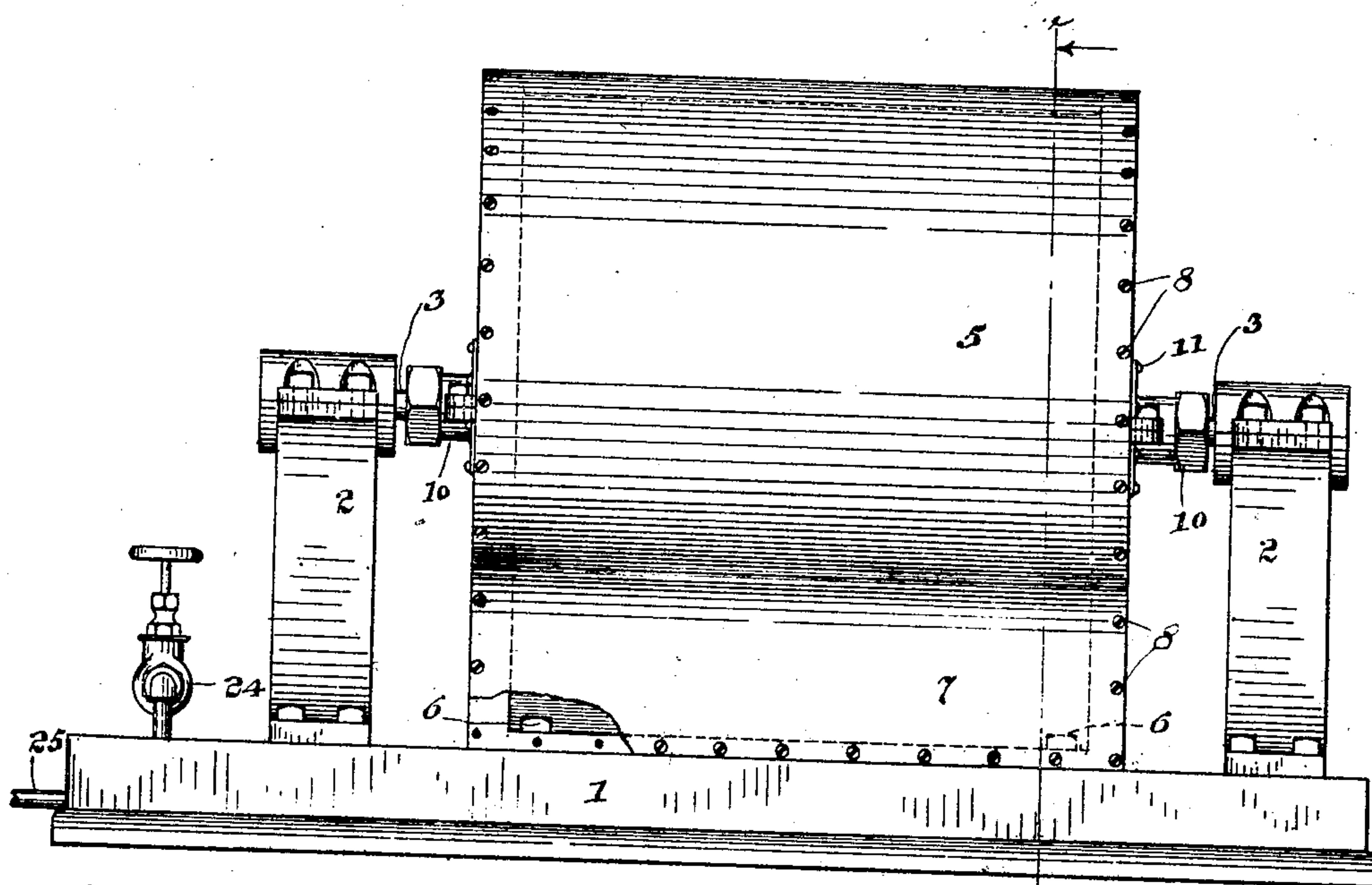


Fig. 2.

Witnesses:  
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W. B. Smith

Inventor:  
Simon Grund  
by *John R. H. H.*  
his Attorney

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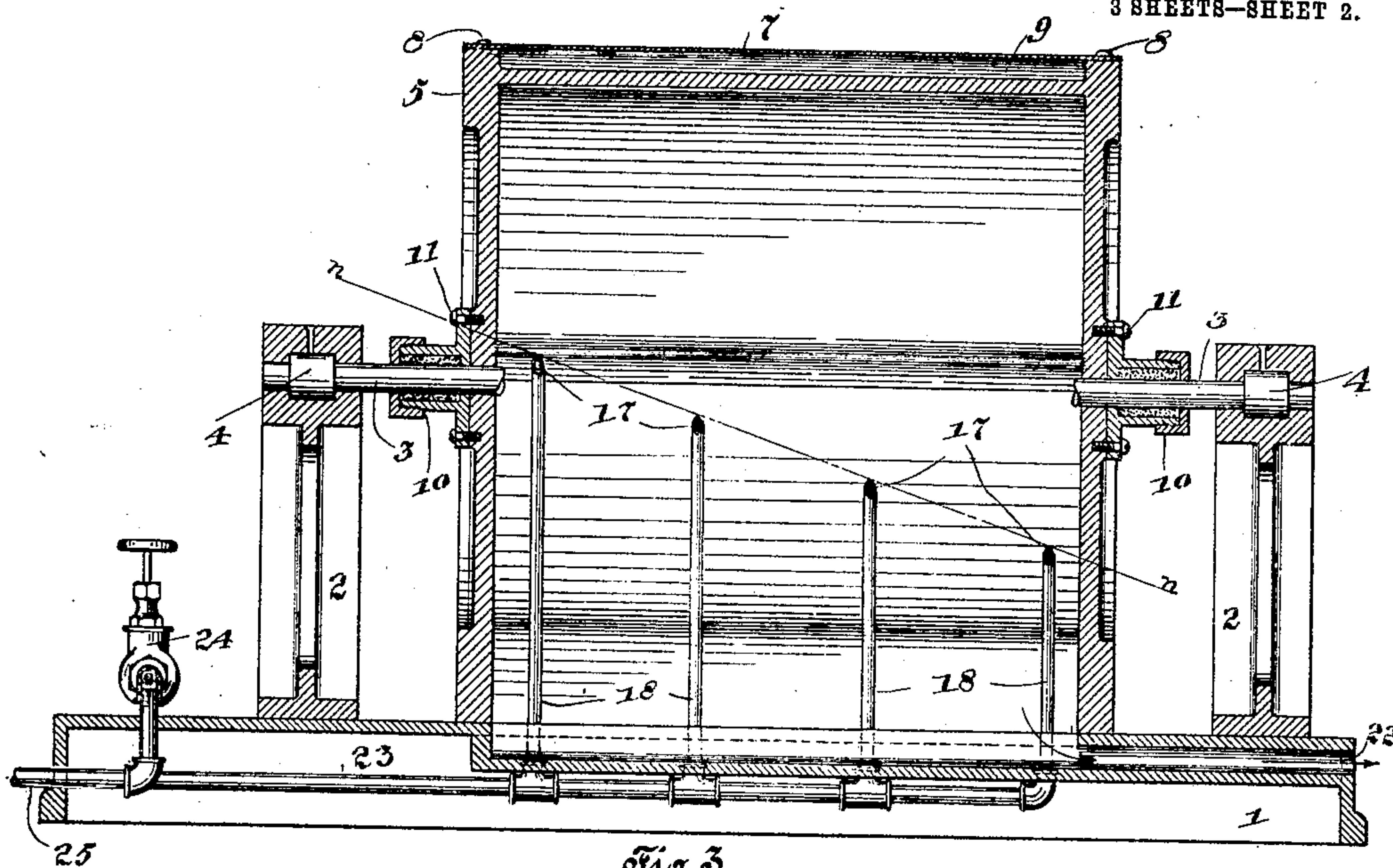


Fig. 3.

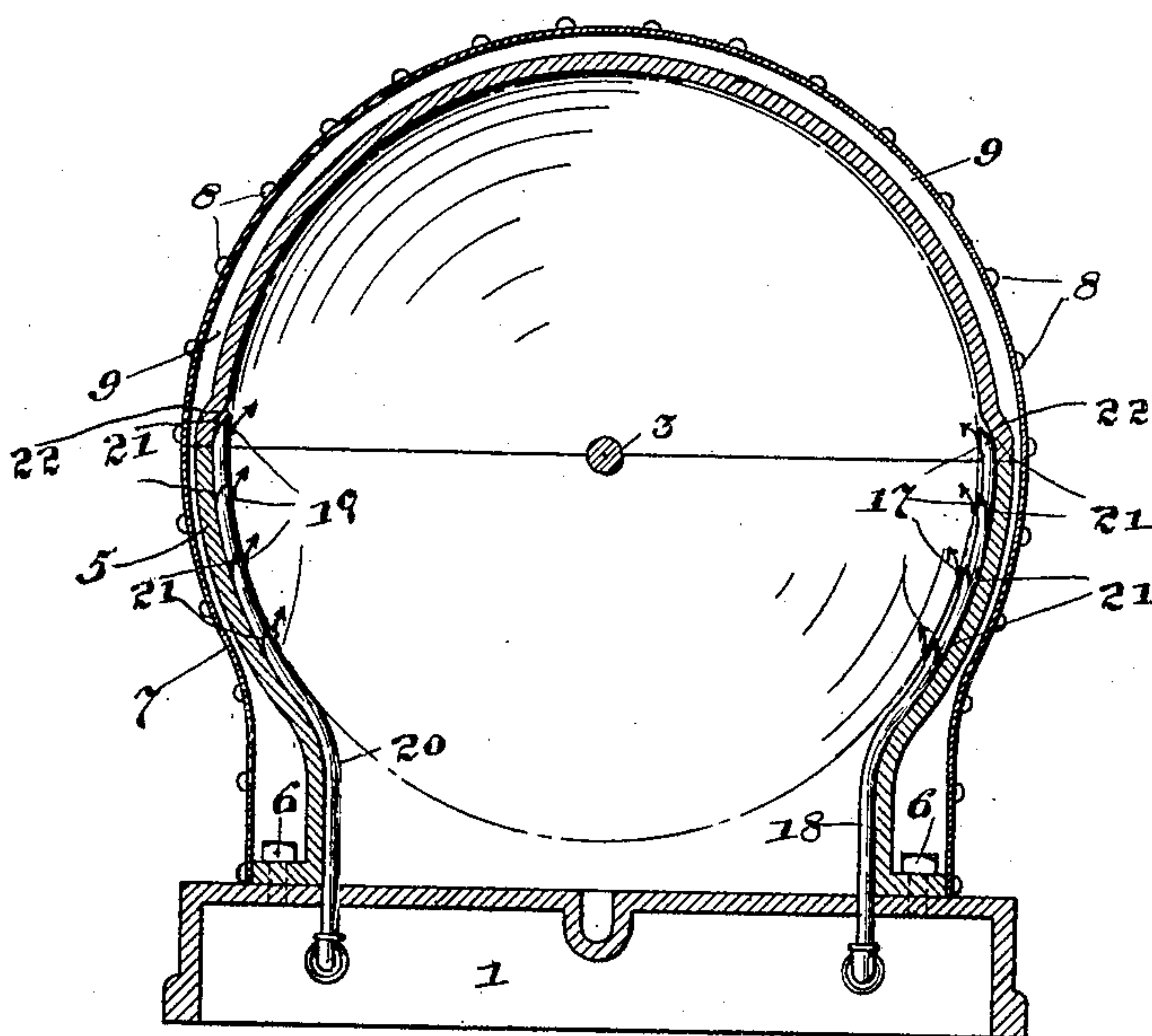


Fig. 4.

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W. C. Smith

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Simon Grund,  
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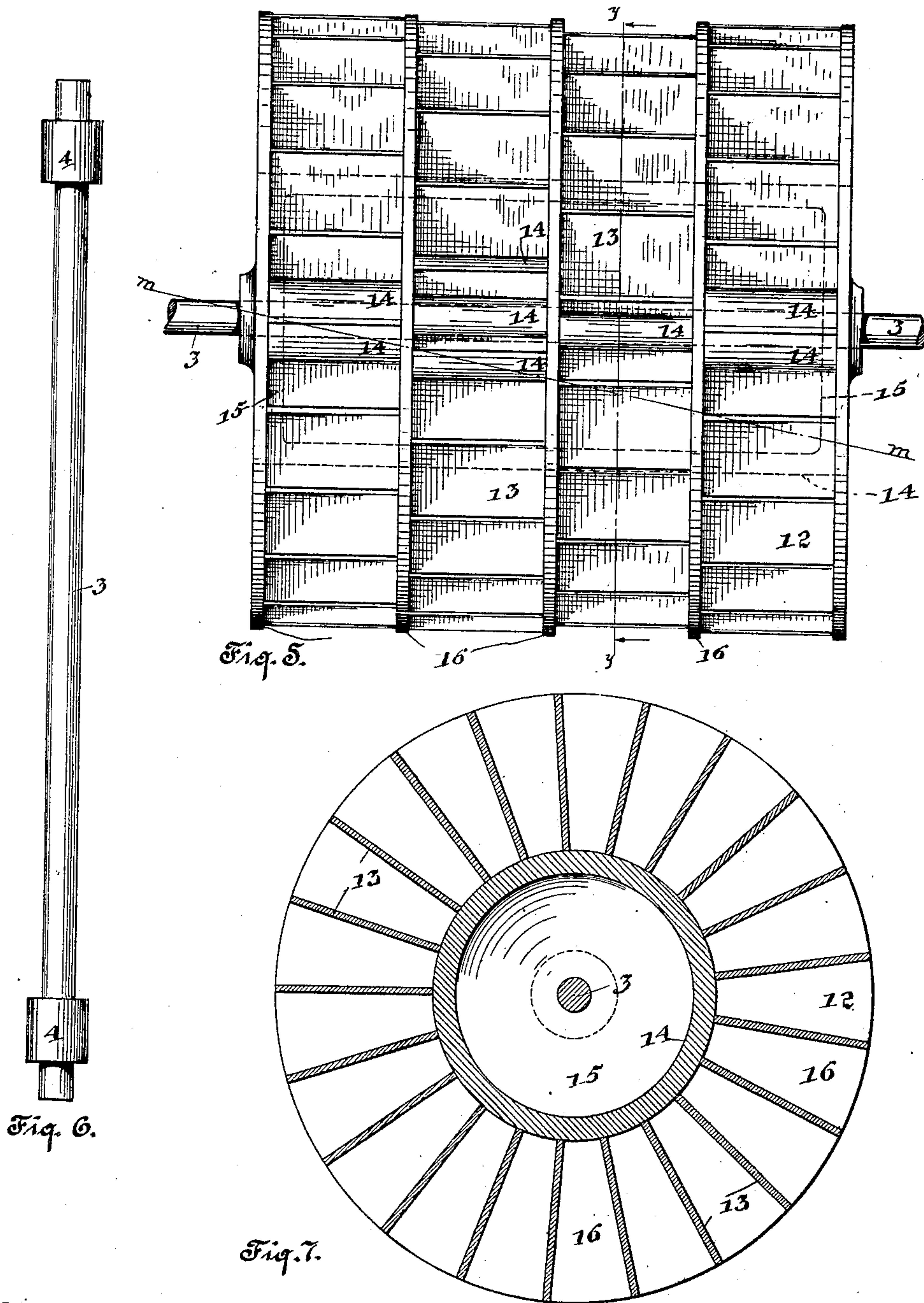


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3 SHEETS—SHEET 3.



Witnesses:  
H. St. Guffy  
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# UNITED STATES PATENT OFFICE.

SIMON GRUND, OF CHICAGO, ILLINOIS.

## REVERSIBLE STEAM-TURBINE.

No. 925,089.

Specification of Letters Patent.

Patented June 15, 1909.

Application filed March 23, 1909. Serial No. 485,231.

*To all whom it may concern:*

Be it known that I, SIMON GRUND, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented a certain new and useful Reversible Steam-Turbine Engine, of which the following is a specification.

My invention relates to a steam turbine engine, the object being to design the blades of the rotor of the turbine and to arrange the steam intake pipes in such a manner as to render the engine reversible.

A further object of my invention is to arrange the ports of the intake pipes obliquely to the plane of the axis of the rotor, and also to arrange the radial blades of the rotor obliquely thereto but at a more acute angle than said ports, whereby a constant torque is produced at high speeds.

Other objects will appear hereinafter.

My invention consists in the novel construction and arrangement of parts all as will be hereinafter fully described and particularly pointed out in the appended claims.

My invention will be more readily understood by reference to the accompanying drawings forming a part of this specification, and in which,

Figure 1 is an end elevation of my reversible turbine engine in its preferred form, Fig. 2 is a side elevation thereof, Fig. 3 is a central vertical longitudinal section of the engine, showing the same with the rotor removed, Fig. 4 is a substantially vertical transverse section taken on line *x x* of Fig. 2, Fig. 5 is a side elevation of the rotor showing the oblique arrangement of the blades thereof, Fig. 6 is a detail elevation, and Fig. 7 is a transverse section of the rotor taken on line *y y* of Fig. 5.

Referring now to the drawings 1 indicates the engine base and 2 bearing standards mounted thereon. The engine shaft 3 is journaled in the standards 2, and collars 4 are formed thereon to prevent longitudinal movement thereof.

The rotor housing 5 is mounted on the base 1 and secured thereto by means of the screws 6, the axis of the same being coincident with the axis of the shaft 3. The housing 5 comprises a sheet metal jacket 7 which is secured to the main body of the same by means of a plurality of screws 8, a non-conducting air space 9 being formed which is designed to prevent steam con-

densation. Ordinary stuffing boxes are provided on the shaft 3, the same being secured to the ends of the housing 5 by means of the screws 11.

The rotor 12 comprises four series of longitudinal radial blades 13 projecting from a cylindrical drum 14 concentric with the shaft 3, the end walls 15 of said drum being rigidly secured to said shaft. Partitions 16 separating the series of blades 13 are provided, said blades being arranged obliquely as indicated by the broken line *m m* of Fig. 5. The broken line of Fig. 4 indicates the path of the periphery of the rotor 12, the rotor itself not being shown in this figure.

The ports 17 of the series of intake pipes 18 arranged on one side of the housing are similar to the ports 19 of the series of intake pipes 20 on the other, steam emitting from the ports 17 driving the rotor in one direction and from the ports 19 in the other. The ports 17 and 19 are arranged obliquely, as shown by the broken line *n n* of Fig. 3, this angle with the plane of the axis of the rotor being greater than the angle of the line *m m* of Fig. 5, in order that the impact of the steam on the blades of one series shall not be simultaneous with the impact of the same in another series, thus tending to produce a constant torque at high rotative speeds. The ends 21 of the pipes 18 and 20 are disposed obliquely in order that the steam may be deflected to strike the blades at the proper angle, and a clearance space 22 is provided for side pipes, the wall of the housing 5 being bulged outwardly below the horizontal plane of the highest port.

22' is the exhaust port of the base 1. The portions of the intake pipes which are disposed in vertical planes are equally spaced and conform to the curvature of the path of the periphery of the rotor, said portions being connected to the pipes 23 which are connected to the valves 24, the main pipe 25 projecting through the base, as shown in Fig. 1.

The valve arrangement in this engine is such that the engine will run in either direction at the will of the operator.

While I have shown what I deem to be the preferable form of my reversible steam turbine engine, I do not wish to be limited thereto, as there might be slight modifications thereof which would be comprehended within the scope of my invention.

Having described my invention what I



claim as new and desire to secure by Letters Patent is:

1. In a steam turbine, a base having an exhaust opening formed therein and bearing standards mounted thereon, a horizontally disposed shaft journaled in said standards, collars integral with said shaft adapted to prevent longitudinal movement thereof, a rotor housing secured to said base, said shaft passing through the ends of said housing and packed tightly therein, a rotor having a series of longitudinal radial blades secured to said shaft, and a series of steam intake pipes the ports of which are disposed adjacent the periphery of said rotor and adapted to deflect the steam in a direction approximately tangent to said periphery, substantially as and for the purposes specified.
2. In a steam turbine, a base having bearing standards secured thereto adjacent the ends thereof, an engine shaft journaled in said standards, a rotor housing secured to said base having centrally disposed stuffing boxes secured to the ends thereof to receive said shaft, a rotor comprising a cylindrical drum having ends secured to said shaft, a plurality of series of radial longitudinal blades secured to said drum, circumferential partitions separating said series of blades, and a steam intake pipe for each of said series of blades the ports of which are disposed adjacent the periphery of said rotor, and an exhaust port in said base leading from said housing, substantially as and for the purposes specified.

3. In a steam turbine, in combination with a base and bearing standards secured thereto, a horizontally disposed shaft journaled in said standards, a housing concentric with

said shaft secured to said base, a rotor comprising a plurality of series of longitudinal radial blades rigidly connected with said shaft, a plurality of circumferential partitions separating said series of blades, two series of intake pipes arranged in said housing upon opposite sides of said rotor the ports of which pipes are disposed adjacent the periphery of said rotor, and two valves in connection with said pipes, whereby the engine may run in either direction at the will of the operator, substantially as and for the purposes specified.

4. In a steam turbine, in combination with a base and bearing standards secured thereto, a horizontally disposed shaft journaled in said standards, a housing whose axis is coincident with the axis of said shaft secured to said base, a rotor having a plurality of series of longitudinal radial blades secured to said shaft, a plurality of circumferential partitions separating said series of blades, a series of steam intake pipes having ports disposed adjacent said blades, an exhaust port leading from said housing, and an oblique arrangement of said blades and said ports, the obliquity of said blades with the plane of the axis of said rotor being less than that of said ports whereby a constant torque is produced, substantially as and for the purposes specified.

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

SIMON GRUND.

Witnesses:

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HELEN F. LILLIS.