No. 768,432. PATENTED AUG. 23, 1904.

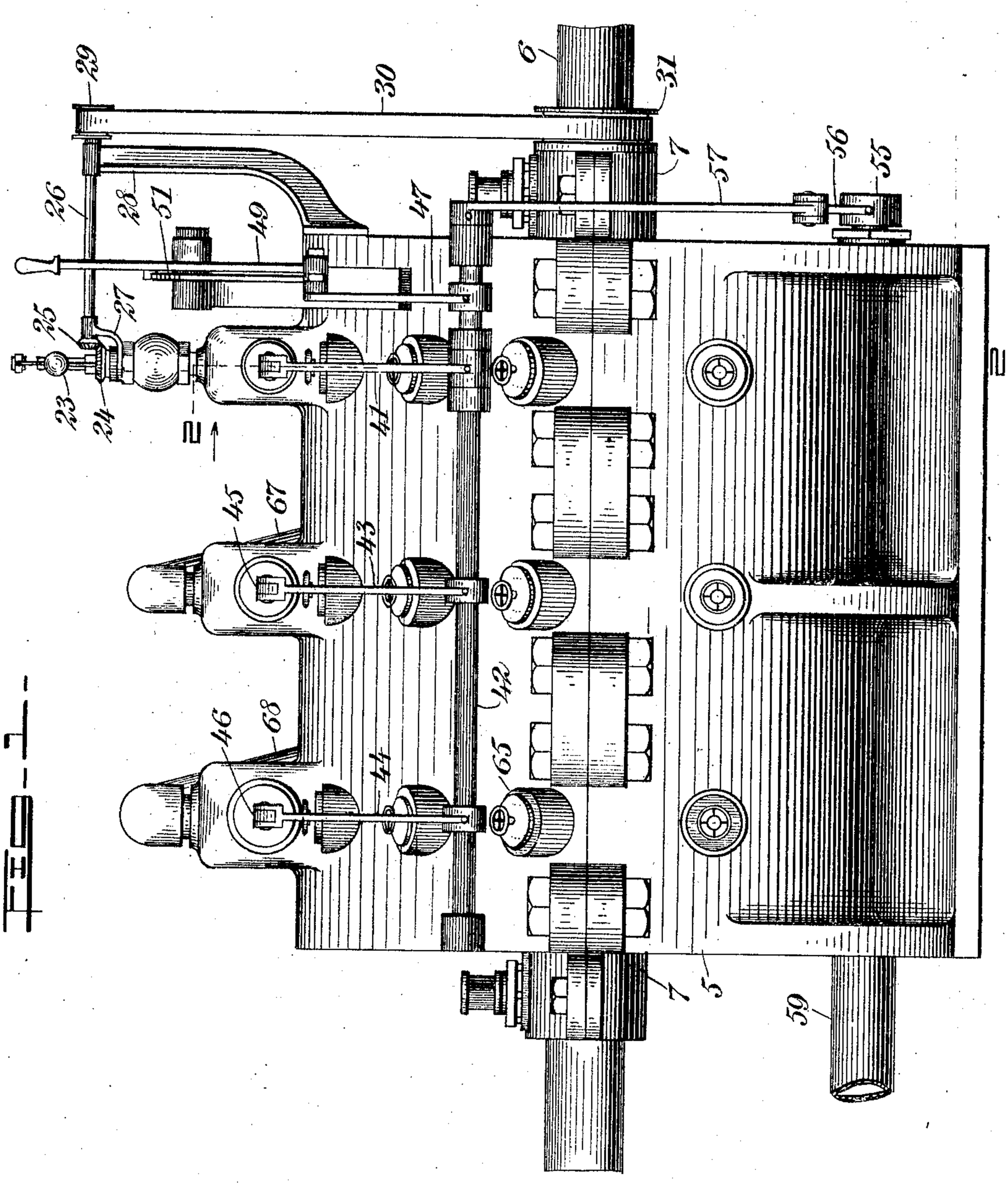
T. EASTMOORE & M. M. FREED.

TURBINE.

APPLICATION FILED APR. 7, 1904.

NO MODEL. 3 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:
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C. R. Ferguson

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NO MODEL. 3 SHEETS—SHEET 2.

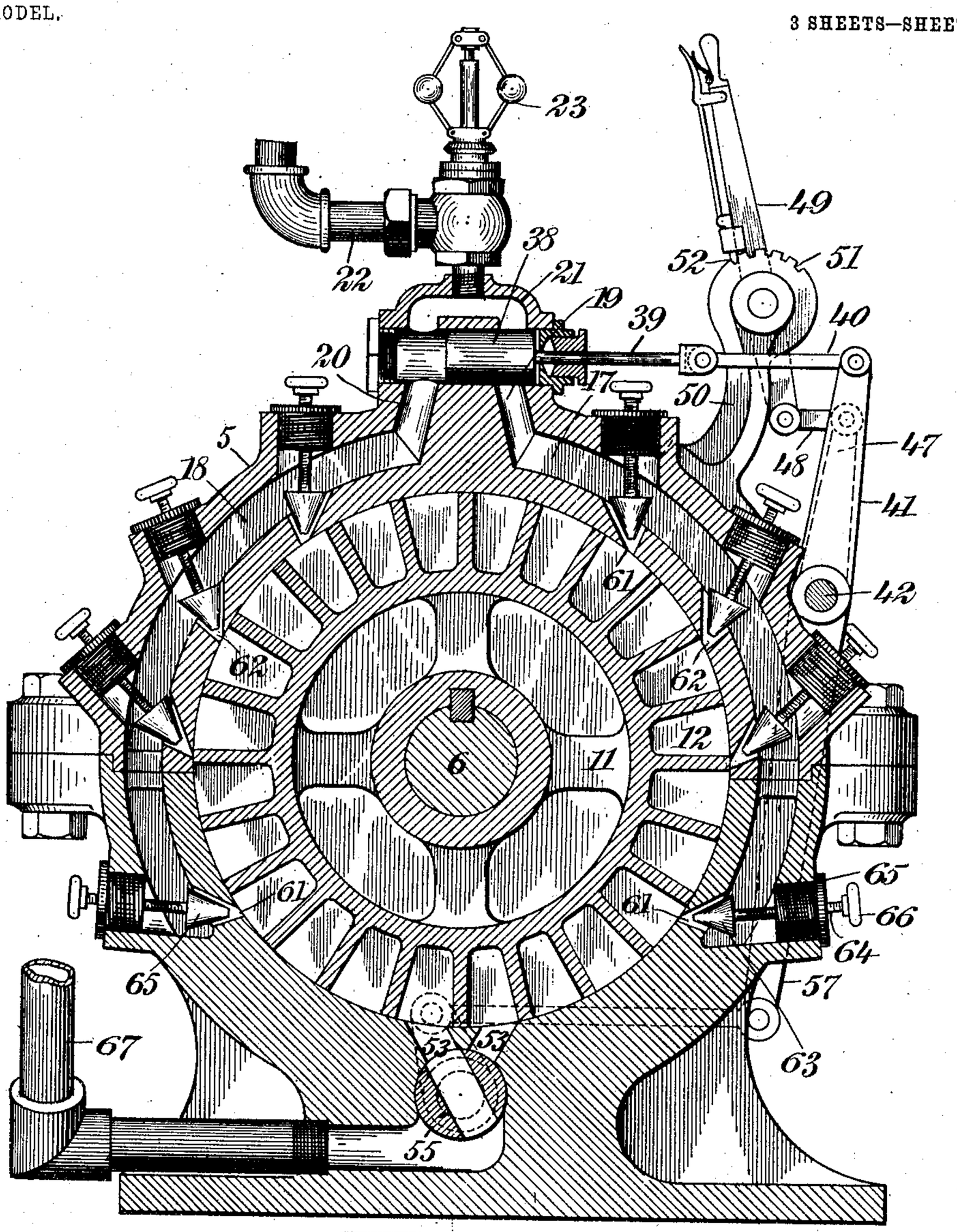

FIG. 2.

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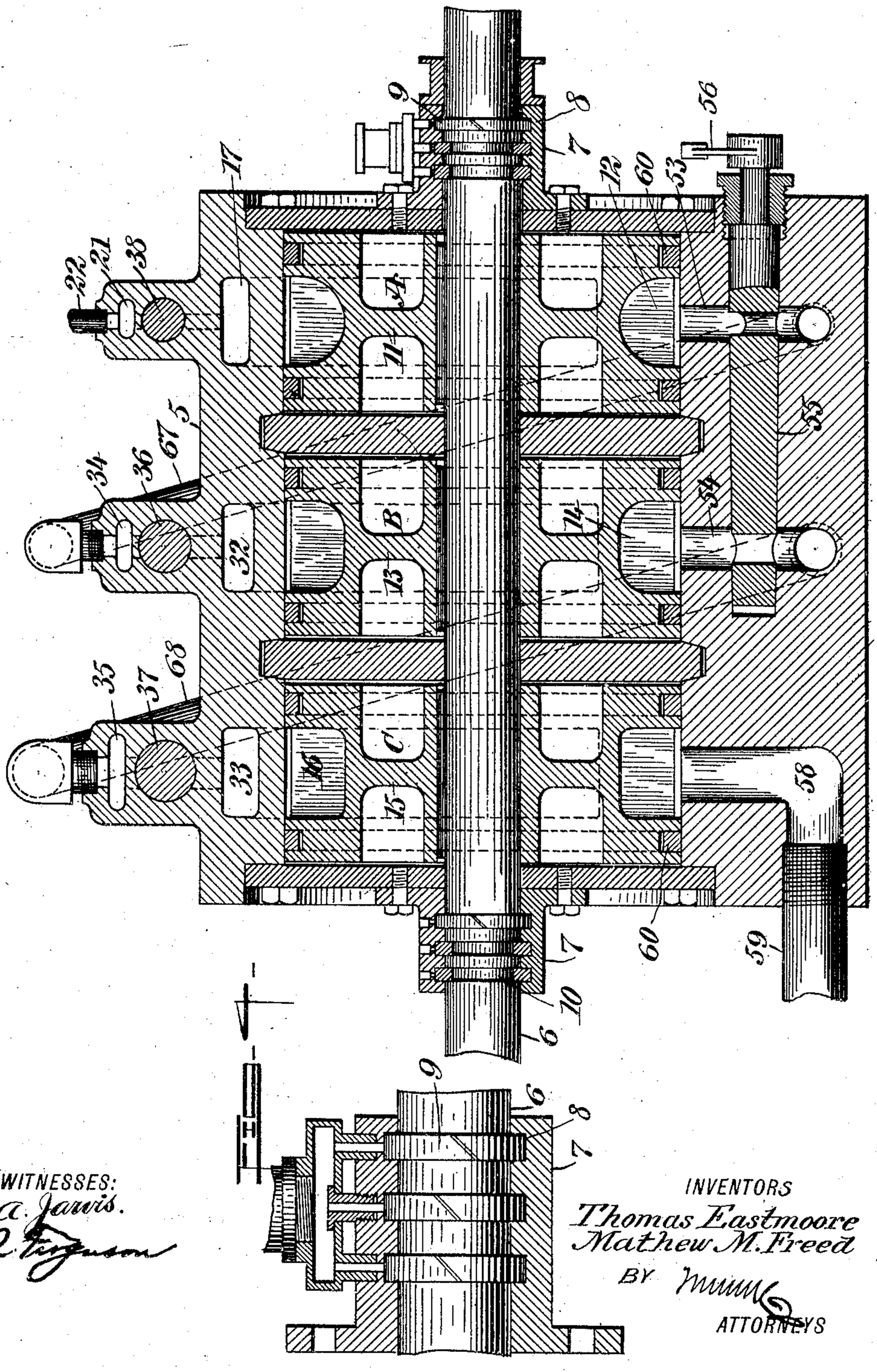
NO MODEL. 3 SHEETS—SHEET 3.



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No. 768,432. Patented August 23, 1904.

UNITED STATES PATENT OFFICE.

THOMAS EASTMOORE AND MATHEW M. FREED, OF JACKSONVILLE, FLORIDA.

TURBINE.

SPECIFICATION forming part of Letters Patent No. 768,432, dated August 23, 1904.

Application filed April 7, 1904. Serial No. 202,031. (No model.)

To all whom it may concern:

Be it known that we, THOMAS EASTMOORE and MATHEW M. FREED, both citizens of the United States, and residents of Jacksonville, in the county of Duval and State of Florida, have invented a new and Improved Turbine, of which the following is a full, clear, and exact description.

This invention relates particularly to improvements in turbines, an object being to provide a reversible multiple compound expansion-turbine that will be effective in operation with an economical use of motive agent, simple and durable in construction, and easily reversed.

Other objects of the invention will appear in the general description.

While we have mentioned the employment of steam, it is to be understood that other expansive motive agents may be employed instead of steam or water.

We will describe a turbine embodying our invention and then point out the novel features in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of a turbine embodying our invention. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a longitudinal vertical section, and Fig. 4 is a sectional detail showing a shaft-bearing employed.

The turbine comprises a cylinder 5, here shown as made in two sections suitably bolted together, and extended through the cylinder is a shaft 6. The shaft has its bearings in boxes 7, secured to the heads of the cylinder, and these boxes are provided interiorly with annular channels 8, receiving bearing-rings 9, which also extend into annular channels 10, formed in the shaft. These bearing-rings will preferably be of gun-metal. By this construction the rings travel in the channels in the shaft and also revolve in the channels formed in the boxes, thus insuring to the turbine-shaft the proper elasticity for high speed and reducing to a minimum the friction usually so troublesome in high-speed machines.

The cylinder as here shown is divided into three chambers A, B, and C. Secured to the shaft within the chamber A is a piston-wheel 11, having peripheral pockets 12, and secured to the shaft of the chamber B is a piston-wheel 13, having peripheral pockets 14, while on the shaft in the chamber C a piston-wheel 15 is secured and provided with peripheral pockets 16. The pockets of the several wheels are progressively of enlarged area from the inlet end to the exhaust end of the cylinder—that is, the pockets in the wheel 13 have a greater area than the pockets of the wheel 11, while the pockets in the wheel 15 have a greater area than the pockets 14—thus providing for the utilization of expansion in the motive agent.

Extending partly around the chamber A and formed in the wall of the cylinder in opposite directions are steam-chambers 17 18, which communicate through ports 19 20 with a steam-box 21, which is supplied with steam through a pipe 22, and the valve in this pipe is controlled by a governor 23, on the shaft of which is a bevel-gear 24, meshing with a bevel-pinion 25 on a shaft 26, having bearings in brackets 27 28, and on this shaft is a pulley 29, from which a band 30 extends to a pulley 31 on the shaft 6.

The wall of the cylinder around the chambers B and C is provided with oppositely-extended ports 32 33, similar to the ports 17 18. The ports or chambers surrounding the chamber B communicate with a steam-box 34, while the ports 33 communicate with a steam-box 35. The communication between the ports 32 and the box 34 is reversed or controlled by a valve 36, and a similar valve 37 controls a communication between the ports 33 and the box 35. The ports 19 20 are controlled by a valve 38, and these valves 36, 37, and 38 are in the form of slide-valves. The stem 39 of the valve 38 is connected, by means of a link 40, with an arm 41, extended upward from a rock-shaft 42, and arms 43 44 extend from the shaft 42

and connect, respectively, with links 45 46, connecting with the stems of the valves 36 37. By this means the several valves may be simultaneously adjusted to change the direction of rotation of the piston-wheels.

From the rock-shaft 42 an arm 47 extends upward and has a link connection 48 with a shifting lever 49, pivoted to a bracket 50, having a segment-rack 51, designed to be engaged by a dog 52, carried by the lever 49.

At the lower portion the chambers A and B have exhaust-ports 53 54, which are controlled by a plug-valve 55, on the outer end of which is an arm 56, connecting with a link 57, extended to a connection with the shaft 42.

As clearly shown in Fig. 2, the ports 53 54 are branched, so as to extend in opposite directions to receive the exhaust from a chamber, depending upon the direction of rotation of the piston. The chamber C has an exhaust-port 58, in which a pipe 59 leads back to the boiler, so that the condensation may be used over again. The several piston-wheels, it will be noted, are provided with peripheral channels in which packing-rings 60 are arranged, and these packing-rings preferably consist of gun-metal. Communication is provided between the steam-chamber 17 and the interior of the cylinder or with the pockets in the wheel 11 through conical ports 61, and similar communication is provided between the chamber 18 and the pockets through conical ports 62. It will be noted that these ports are arranged on an angle with relation to the walls of the pockets, so that motive agent will strike forcibly against the walls at the side in the direction of rotation. The ports are controlled by conical valves 63, the stems 64 of which are screw-threaded and operate in stuffing-boxes 65, the outer ends of the stems being provided with hand-wheels 66. The chambers B and C also have port communication with their steam-chests 32 33 similarly to the ports 61 62, which are controlled by valves similar to the valves 63 65. By employing the conical valves and conical ports all motive agent admitted may be regulated, and consequently the speed of rotation will be regulated. From the exhaust-port 53 a pipe 67 leads to the steam-chest 34, while from the port 54 a pipe 68 leads to the steam-chest 35. Therefore it will be seen that the steam entering the chamber A and acting upon the wheel 11 will exhaust into the chamber B and operate on the wheel 13, and from this chamber B the expanded steam will exhaust into the chamber C and operate on the wheel 15 and finally pass back to the boiler, as before mentioned.

It may be here stated that while we have shown but three chambers in the cylinder and three wheels a greater number may be employed, if desired. It will be noted that the steam or other motive agent will enter the chambers of the cylinder, as here shown, at four different points—that is, the impact will be upon the walls of four pockets simultaneously in each wheel; but the number may be varied without departing from the spirit of our invention.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. In a turbine, a cylinder having a plurality of piston-chambers of uniform size, a shaft extending through the cylinder, piston-wheels mounted on the shaft in the piston-chambers and corresponding in size to said chambers, each piston-wheel having peripheral pockets, the pockets of the different wheels being of progressively-enlarged area from the inlet end to the outlet end of the cylinder, the cylinder having valve-controlled exhaust-ports leading from the piston-chambers, and valve-controlled inlets for the motive agent, the exhaust-port of one piston-chamber communicating with the inlet of the next chamber, and means for simultaneously operating the controlling-valves for the inlet and exhaust ports.

2. A turbine comprising a cylinder divided into a plurality of chambers a shaft extended through the cylinder, piston-wheels mounted on the shaft within the chambers, the said wheels being provided with peripheral pockets, steam-chests formed in the wall of the cylinder around the chambers, steam-boxes over the chambers and with which the steam-chests of the chambers communicate, ports providing communication between the steam-chests and the chambers, the said ports having conical walls, conical valves for controlling said ports, exhaust-ports leading from the chambers, the exhaust-port of one chamber having communication with the inlet of the next chamber, valves for controlling the exhaust and inlet ports, and means for simultaneously shifting the valves.

3. In a turbine, a cylinder having a plurality of piston-chambers, a shaft extending through the cylinder, piston-wheels mounted on the shaft in the piston-chambers, each piston-wheel having peripheral pockets, the pockets of the different wheels being of progressively-enlarged area from the inlet end to the outlet end of the cylinder, the cylinder having steam-chambers connected by ports with the piston-chambers, valves controlling said ports to regulate the amount of motive agent admitted to the interior of the piston-chambers, the piston-chambers each having exhaust-ports, the exhaust-ports of one piston-chamber communicating with the inlet to the steam-chambers connected with the next piston-chamber, valves for controlling the said exhaust-ports, valves for controlling the inlet of the motive agent to the steam-chambers, and means for simultaneously operating the said exhaust and inlet valves.

4. A turbine comprising a cylinder divided

into a plurality of chambers, a shaft extended through the cylinder, piston-wheels on the shaft in the cylinder, the said piston-wheels being provided with peripheral pockets, steam-chests formed in the wall of the cylinder and partially extending around the same at opposite sides of the piston-wheels, valves for controlling the admission of the motive agent to said steam-chests, the said valves when moved in one direction admitting the motive agent to the steam-chests at one side of the piston-wheels and when moved in the opposite direction admitting the motive agent to the steam-chests at the other side of the piston-wheels, means for simultaneously operating said valves, ports providing communication between said chests and the interior of the cylinder, the said ports being arranged at an acute angle with relation to the walls of the pockets, and valves for controlling the passage of motive agent through said ports.

5. A turbine comprising a cylinder divided into a plurality of chambers, a shaft extended through the cylinder, piston-wheels mounted on the shaft within the chambers, the said wheels having peripheral pockets, inlet-ports for each chamber, valves for controlling the inlet-ports, exhaust-ports for each chamber, slide-valves for controlling the inlet of motive agent to the several chambers, a rotary valve for controlling the exhaust from certain of the chambers, and means for simultaneously reversing the exhaust-valves and inlet-controlling valves.

6. In a turbine, a cylinder having a plurality of piston-chambers, a shaft extended through the cylinder, piston-wheels mounted on the shaft in the piston-chambers, each piston-wheel having peripheral pockets, steam-chambers formed in the wall of the cylinder in opposite directions and extending partly around each piston-chamber, the said steam-chambers communicating by ports with said piston-chambers, steam-boxes with which the steam-chambers communicate, exhaust-ports leading from the piston-chambers, the exhaust-port of one chamber communicating with the steam-box for the next chamber, inlet-valves controlling the communication between the steam-boxes and the steam-chambers, valves controlling the exhaust from the piston-chambers, and means for simultaneously operating the said inlet and exhaust valves to reverse the same.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

THOMAS EASTMOORE.
MATHEW M. FREED.

Witnesses:
JNO. M. RITTER,
C. R. FERGUSON.