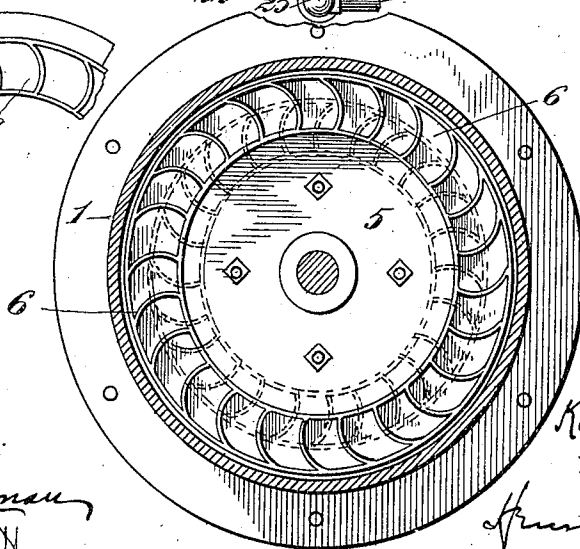
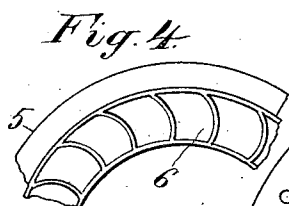
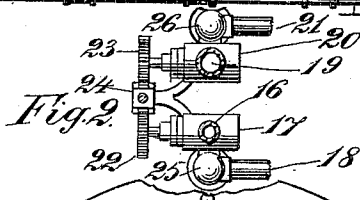
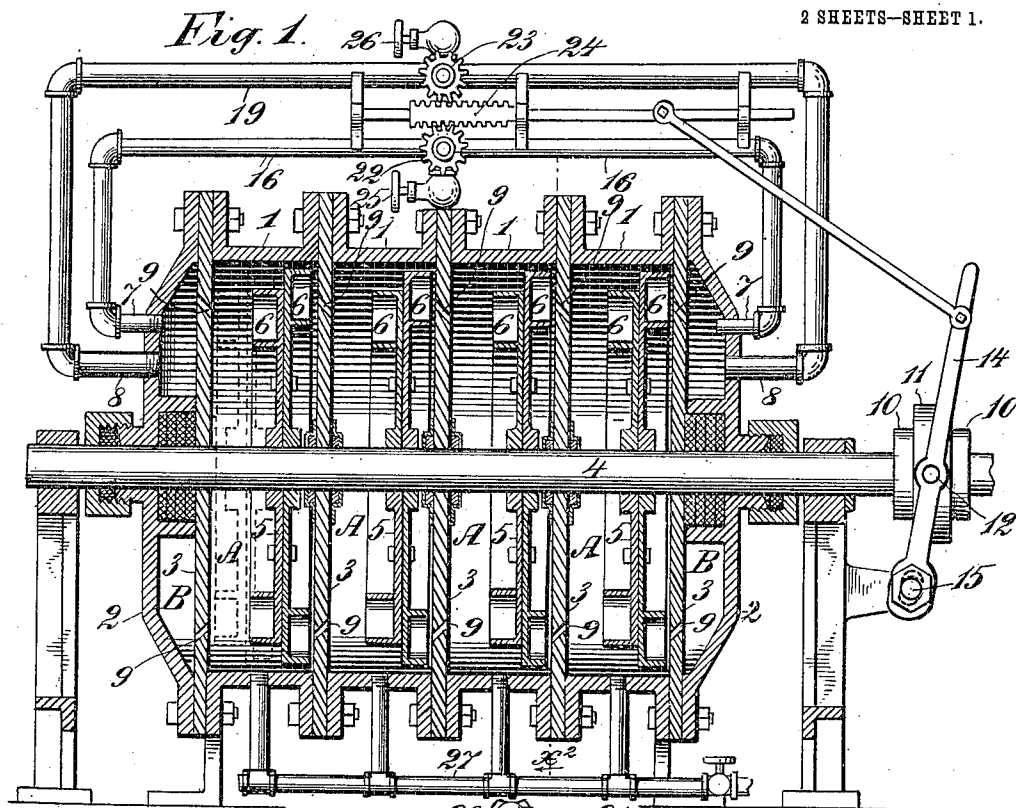


K. P. HANGL.
TURBINE MOTOR.

APPLICATION FILED MAR. 15, 1906.

2 SHEETS—SHEET 1.



WITNESSES:

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No. 838,538.

PATENTED DEC. 18, 1906.

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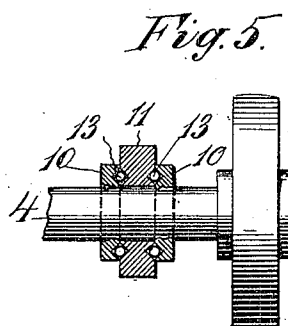
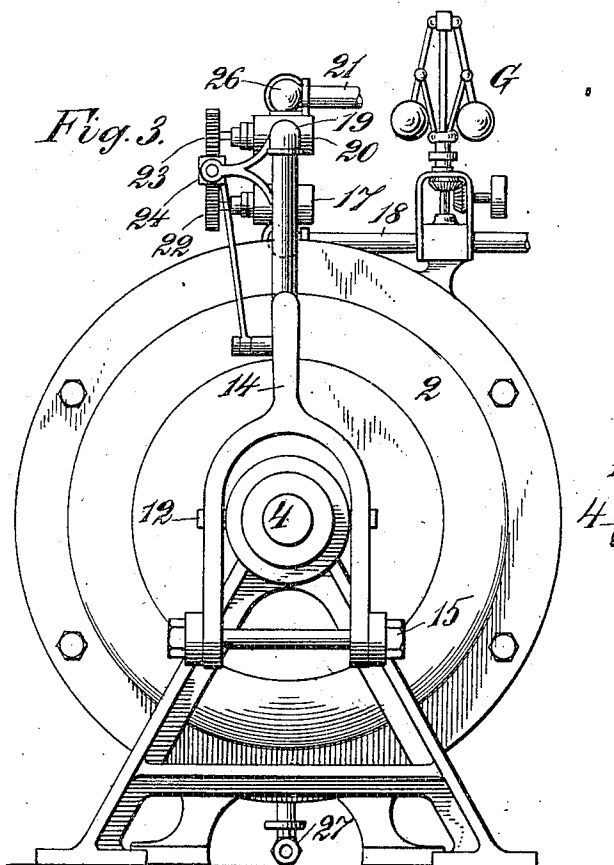
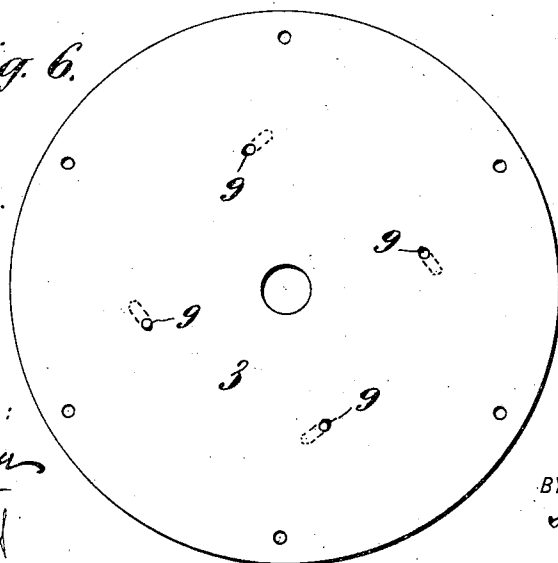


Fig. 6.



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UNITED STATES PATENT OFFICE.

KARL P. HANGL, OF NEW YORK, N. Y.

TURBINE-MOTOR.

No. 838,538.

Specification of Letters Patent.

Patented Dec. 18, 1906.

Application filed March 15, 1906. Serial No. 306,226.

To all whom it may concern:

Be it known that I, KARL P. HANGL, a citizen of the United States, residing in the borough of the Bronx, in the city, county, and State of New York, have invented certain new and useful Improvements in Turbine-Motors, of which the following is a specification.

This invention relates to the class of motors or engines known as "turbine-motors," wherein the flow of the fluid under pressure is axial; and it has for its object to provide a motor of relatively inexpensive construction which will operate with the maximum of economy in expenditure of fluid in proportion to the yield of power or energy.

One of the important features of this motor is the large fluid-chamber in which each turbine or piston rotates and the means for regulating by hand the area of the exhaust.

Another feature is the means for shifting the rotary piston with its double ring of blades for reversing, and another feature is the double ring of blades or buckets adapted to receive the impact of the fluid from the respective ends of oblique jet-passages.

In the accompanying drawings, which illustrate an embodiment of the invention, Figure 1 is a vertical longitudinal axial section of the motor. Fig. 2 is a transverse section of the motor-cylinder, showing a rotary piston in elevation; Fig. 3, an elevation of that end of the motor seen at the right in Fig. 1. Fig. 4 is a fragmentary view of the ring of buckets seen in dotted lines in Fig. 2. Fig. 5 is a detail view of the device for shifting the shaft. Fig. 6 is a face view of one of the partitions or diaphragms between the chambers.

The motor will be described as it is illustrated in the accompanying drawings, premising that the invention is not limited in all respects to this construction so long as the instrumentalities employed are adapted to operate on the same principle and will produce the same or substantially the same results.

The motor has a plurality of chambers A for the steam or other fluid and two fluid-chests B, one at each end. These chests and chambers are disposed in series. The chambers are inclosed by short cylindrical sections 1, forming the engine-cylinder, and the chests are formed by concave cylinder-heads 2. The chambers are separated by partitions or diaphragms 3 and the whole cylinder

bolted together through suitable flanges, as shown. Extending through the chests and chambers is a rotatable shaft 4, and on said shaft in each of the chambers A is keyed a device which may be called a "rotary piston."

As the motor illustrated is adapted for reversing, it will be so described, although it might be constructed on the same principle by simply omitting some of the parts to operate as a non-reversing motor or one wherein the reversing is effected exterior to the motor or engine.

The rotary piston consists of two circular disks 5, bolted together back to back and having a diameter a little less than the interior diameter of the chamber A, in which it rotates. On the face of each disk is formed, preferably integral with the disk, a ring of turbine buckets, vanes, or blades 6, which project out from the plate and are boxed between outer and inner rings, Fig. 1. The fluid may enter the chests B at inlets 7 and exhaust therefrom at outlets 8. It escapes from the chest and passes from one chamber A to the next in the series through oblique jet-nozzles or port-passages 9 in the diaphragms or plates 3, which separate the chambers. These jet-nozzles in the diaphragms have an obliquity both in a radial and a lateral direction oblique to the radius. The object of this is to cause the fluid to impinge on the curved buckets in a substantially perpendicular direction and in the direction the buckets are moving. By reference to the drawings it will be noted that the curved buckets or blades are disposed in one series so as to receive the fluid properly when it is flowing in one direction through the nozzles 9 and that in the other series they are disposed so as to receive the fluid properly when it is flowing in the other direction. It is essential that the buckets receiving the fluid shall rotate in close proximity to the supplying-nozzles through which the steam or fluid is flowing, and consequently when the motor is reversed the disk carrying the buckets—that is, the rotary piston—must be shifted, and this is effected by shifting the motor-shaft 4 longitudinally. This movement is effected simultaneously with the regulation of the fluid distribution. The means for effecting this will be now described.

The shaft is provided with collars 10, keyed or otherwise secured thereon, and between these collars is rotatively mounted on the shaft a ring 11, provided with trunnions

12. To reduce friction, there are balls 13 between the ring 11 and the collars, which form ball-bearings. A lever 14 of special form supplies bearings for the trunnions 12, and this lever has a slotted fulcrum below at 15. Obviously by means of this lever 14 the shaft 4 may be moved to and fro longitudinally without interfering with its rotary motion.

In order that the distribution of the steam or other fluid may be changed for reversing at the same time that the shaft is shifted, the two fluid-inlets 7 have supply-pipes 16, coming from a so-called "three-way valve" 17, which controls the supply of fluid coming from a generator by a pipe 18, and the exhaust-outlets 8 are connected by pipes 19 with a similar three-way valve 20, controlling an exhaust-outlet 21 in common. On the stems of the respective valves 17 and 20 are pinions 22 and 23, and these gear with the teeth on the respective edges of a rack-bar 24. This bar has a stem which is coupled to the lever 14, whereby when the latter is operated to shift the shaft the rack-bar will act through the pinions to shift the three-way valves 17 and 20, so as to change the admission of the fluid and of the exhaust to the opposite ends of the motor or engine. The pipe 18 will have in it a valve 25 for regulating the supply of fluid, and there will also be a stop-valve 26 in the exhaust-pipe 21, so that the freedom of the exhaust may be regulated.

The characteristic features of this motor are these: The fluid enters a steam or fluid chest B and is distributed from this chest in jets through the oblique nozzles or port-passages 9 directly onto the turbine buckets or blades 6 of the rotary piston. These buckets project out to their full extent from the face of the disk that carries them. The rotary piston occupies a relatively capacious chamber A, which serves as a chest for the rotary piston in the next succeeding chamber. The several rotary pistons are in separate chambers, and the fluid after impinging upon the buckets must pass about the peripheries of the disks 5 before it can flow on to the next chamber beyond. The two rings of buckets for driving in opposite directions are so disposed with reference to a single set of jet passages or nozzles that the same nozzles may be employed for driving in both directions. Greater power and higher speed may be developed by confining or throttling the exhaust within certain limits than can be obtained with a free or full open exhaust, and the inlet for steam or fluid may be less in proportion to the pressure and the power developed than in turbine-motors as ordinarily constructed.

Respecting constructive features, the parts will in the main be left rough, as the castings come from the sand, and this effects an important economy.

As high fluid-pressures will be employed, the joints will be thoroughly packed, as shown.

The number of chambers A in the motor is not important to the invention, nor the number of nozzles or jet-passages 9 in a diaphragm. There should be at least two, and they should be equally spaced or distributed. The chests B are of course chambers; but they are called "chests" mainly to distinguish them from the chambers A, in which the rotary pistons are located.

To drain the cylinder of water of condensation, a pipe 27 is employed. This pipe has branches connecting with the respective chambers A.

G is the governor, controlling the throttle-valve.

The chamber A, enlarged in the direction of the motor-axis, is a very important feature, especially in connection with manually-operated means for varying the exhaust-outlet. It is believed that this advantage is due to the fact that the rapidly-rotating turbine elements or rotary piston in the chamber imparts to the fluid in the chamber a rapidly gyrating or whirling movement and then increases the impact of its particles on the blades of the rotary piston. A good proportion for the chamber A is to make the length, measured along the motor-shaft, about one-fourth of its diameter. Obviously this elongation of the chamber A provides room for shifting the rotary piston for reversing the engine. The rotating piston occupies only about one-half of the space in the chambers.

Having thus described my invention, I claim—

1. A turbine-motor having a cylinder with an inlet and outlet for the fluid at each end thereof, a slidable shaft rotatably mounted in the axis of said cylinder, a rotary piston in said chamber and fixed on said shaft, said rotary piston comprising a disk provided on each face with a ring of buckets to receive the impact from the fluid, means for shifting the shaft longitudinally in order to shift the rotary piston, in reversing from one end of the chamber to the other, and means for changing the flow of fluid through the cylinder when reversing.

2. A turbine-motor, having a cylinder divided into chambers by transverse partitions provided with oblique jet-nozzles, one end of each nozzle being nearer the motor-axis than the other end thereof, a longitudinally-slidable and rotatable shaft extending through the cylinder, rotating pistons on the shaft in the respective chambers, each of said pistons comprising a disk with a ring of turbine-buckets on each face, the said rings being at different distances from the shaft and one ring adapted to receive the fluid from the outer ends of the jet-nozzles, and the other

ring from the inner ends of said nozzles, means for shifting the rotary pistons from one end to the other of said chambers, and means for simultaneously changing the fluid distribution for reversing.

3. A turbine-motor, having a chambered cylinder, a shaft rotatively mounted in and extending through said cylinder which latter has inlets and outlets for the fluid at its respective ends, a rotary piston on the shaft within said cylinder, said piston comprising a ring of turbine-buckets on each lateral face of a disk, means for shifting said rotary piston in the chamber of the cylinder for reversing and means for changing the distribution of the fluid in the cylinder.

4. A turbine-motor, having a cylinder which is divided into chambers by transverse partitions each having in it oblique jet-passages for the flow of a fluid, one end of each passage being nearer the motor-axis than the other end, a shaft extending through said cylinder longitudinally concave heads 2 on the respective ends of the cylinder and forming fluid-chests B, a fluid-inlet and fluid-outlet in each of said heads, a rotary piston in each chamber and on said shaft, each piston consisting of two disks 5 secured rigidly together back to back and each disk provided with a ring of turbine-buckets 6, one ring of buckets being disposed to receive fluid from the end of the jet-passages which is farthest from the motor-axis, and the other from the end of same which is nearest said axis, means for shifting said piston laterally in its chamber from one end thereof to the other, and means for simultaneously changing the distribution of the fluid in the motor.

5. A turbine-motor, having a cylinder, a rotatable shaft disposed axially in the cylinder, means for moving said shaft endwise, a

fluid-chest B at each end of the cylinder, partitions, for separating said chests from the interior of the cylinder and also for dividing said interior into chambers A, said partitions being provided with oblique jet-nozzles, rotary pistons, one in each chamber A and carried by the shaft, each of said pistons consisting of a disk having on its respective faces rings of buckets adapted to receive the impact of the fluid from the respective ends of said nozzles, whereby the motion of the motor may be reversed, means for supplying fluid under pressure to either of the fluid-chests at will, and means for exhausting from either end of the cylinder at will.

6. A turbine-motor, having a cylinder composed of sections 1 and heads 2, partitions 3, dividing said cylinder into piston-chambers A and fluid-chests B, said partitions having in them oblique jet-nozzles 9, a slidable shaft 4, axially disposed in the cylinder, rotating pistons on the shaft in the respective chambers, said pistons each comprising a disk provided with a ring of buckets on each face, a fluid-supply pipe 18, two pipes 16 to convey the fluid to the respective chests B, a valve 17 controlling the flow of fluid to the pipes 16, exhaust-pipes 19 from the respective ends of the cylinder, a valve 20 controlling the flow of the fluid through the pipes 19, means for moving the shaft and shifting the valves 17 and 20 simultaneously, for reversing, and a cut-off device 26 for throttling the exhaust.

In witness whereof I have hereunto signed my name, this 12th day of March, 1906, in the presence of two subscribing witnesses.

KARL P. HANGL.

Witnesses:

WILLIAM J. FIRTH,
H. G. HOSE.