No. 713,461. Patented Nov. 11, 1902.

J. P. LENNON & C. E. BANKS.

TURBINE.

(Application filed Aug. 25, 1902.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 2.

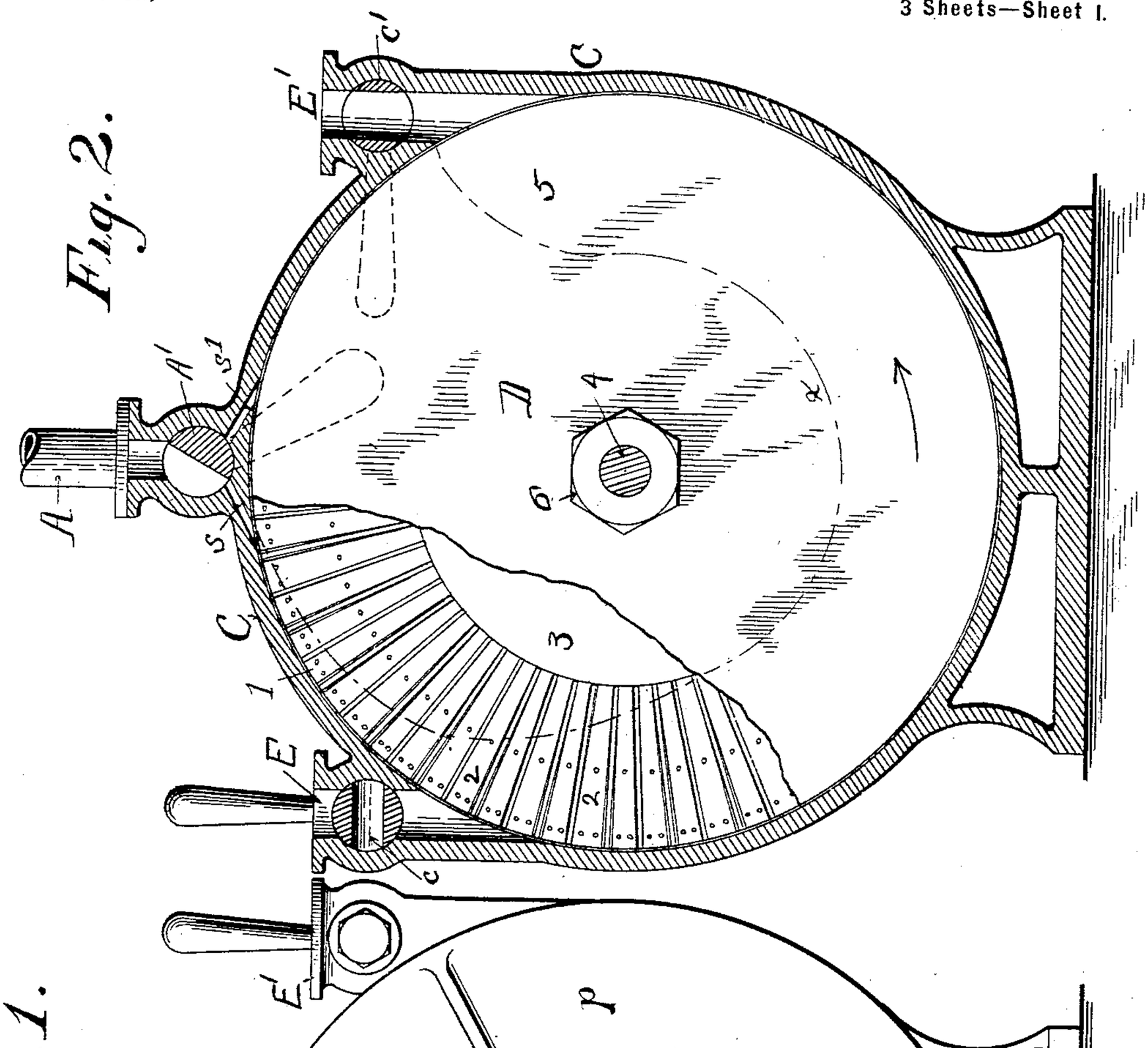

Fig. 1.

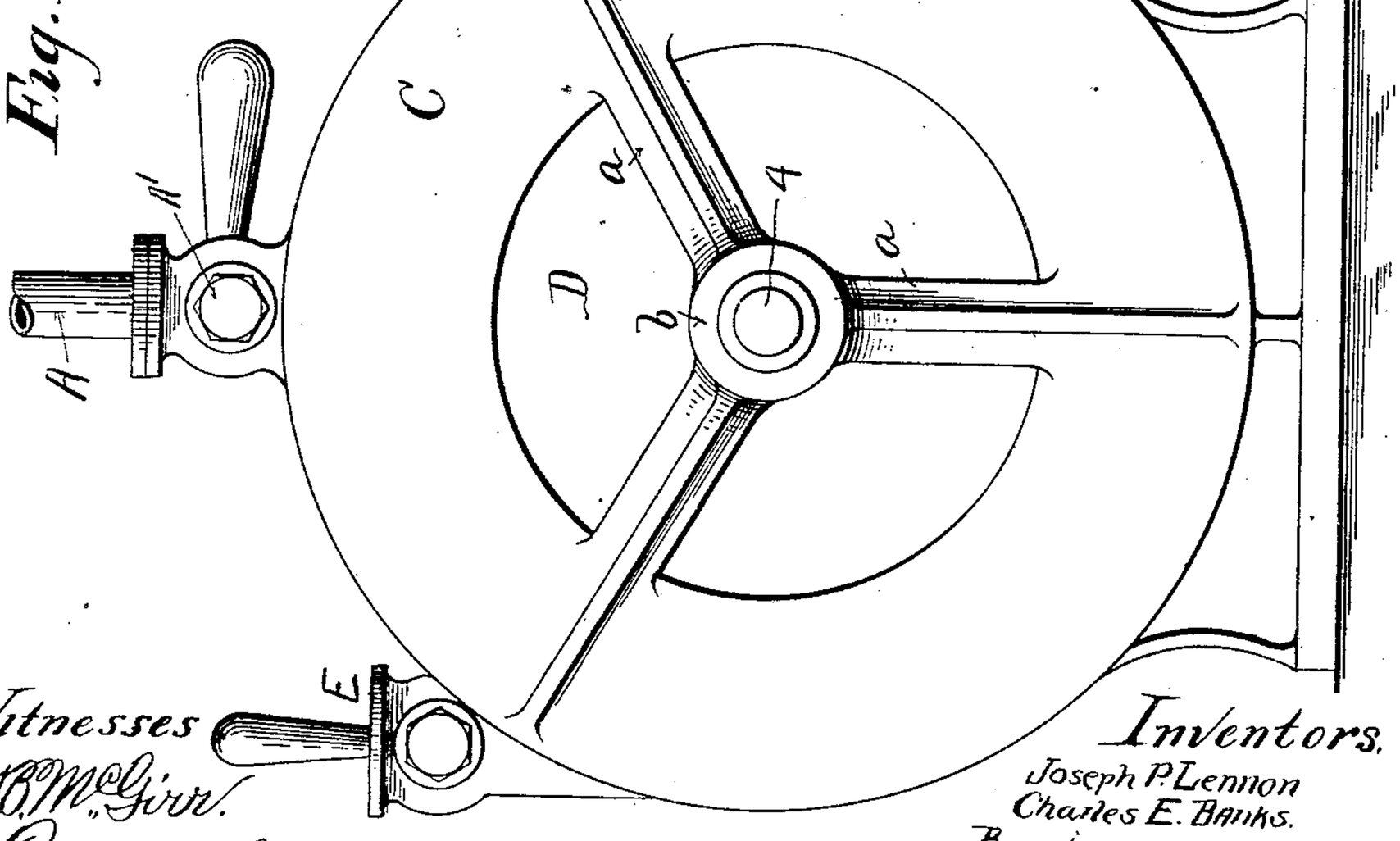

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Fig. 5.

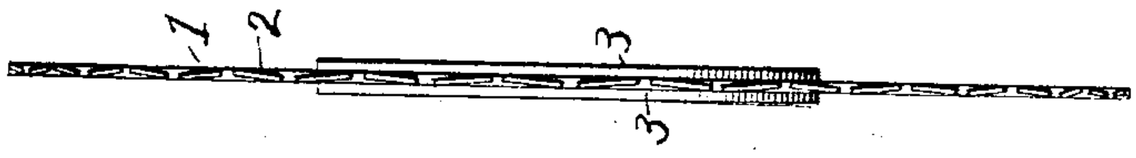

Fig. 4.

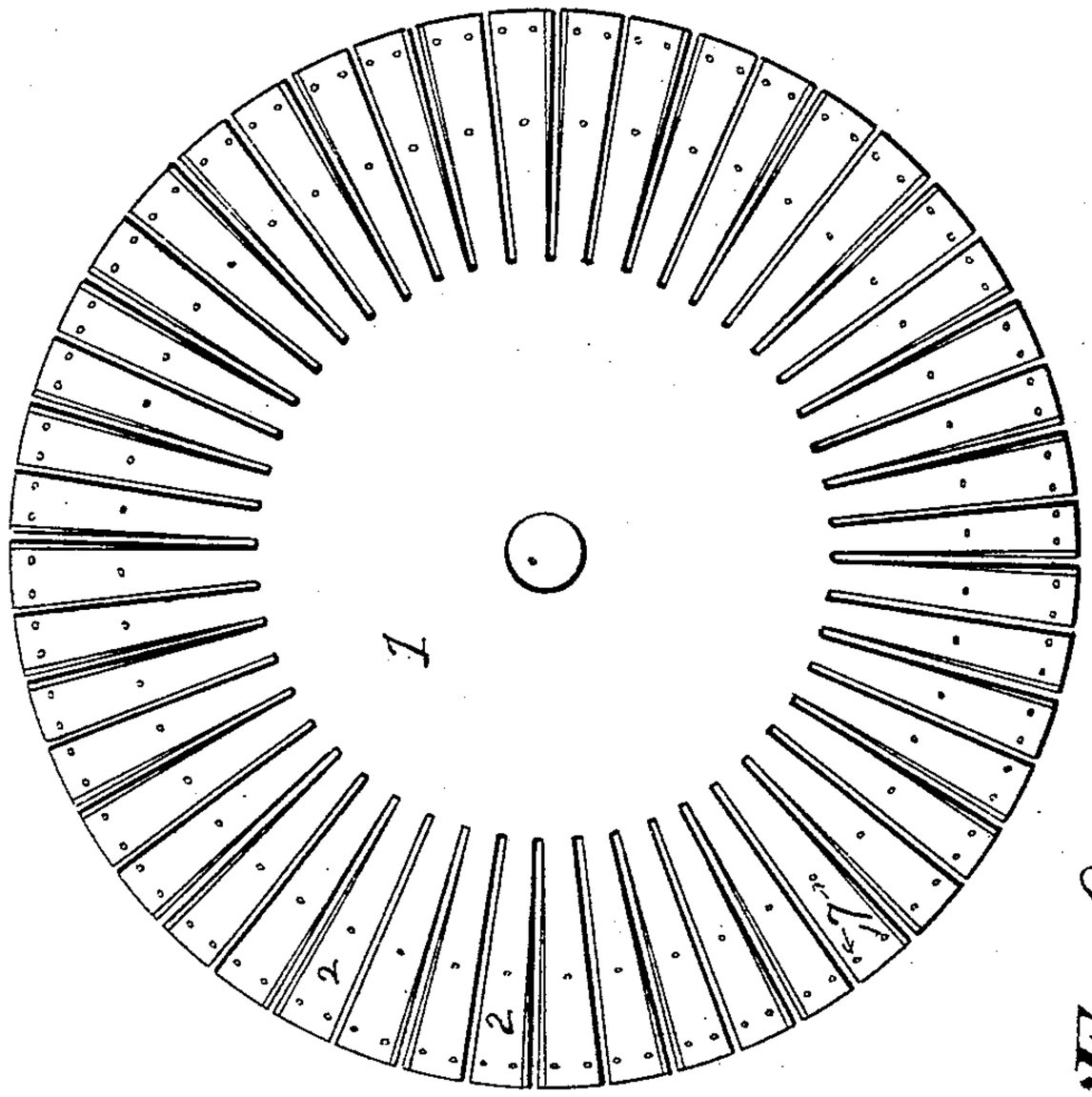

Fig. 6.

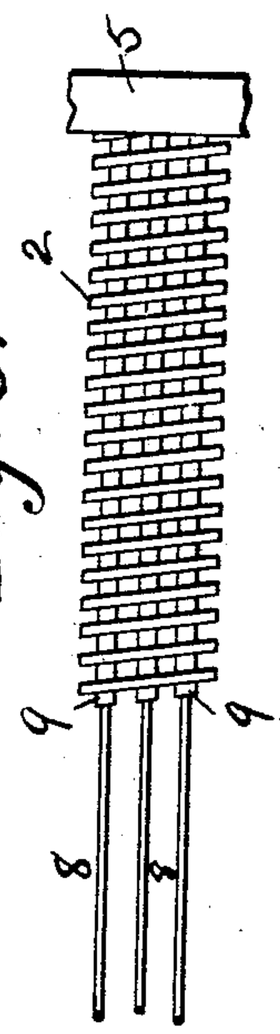

Fig. 3.

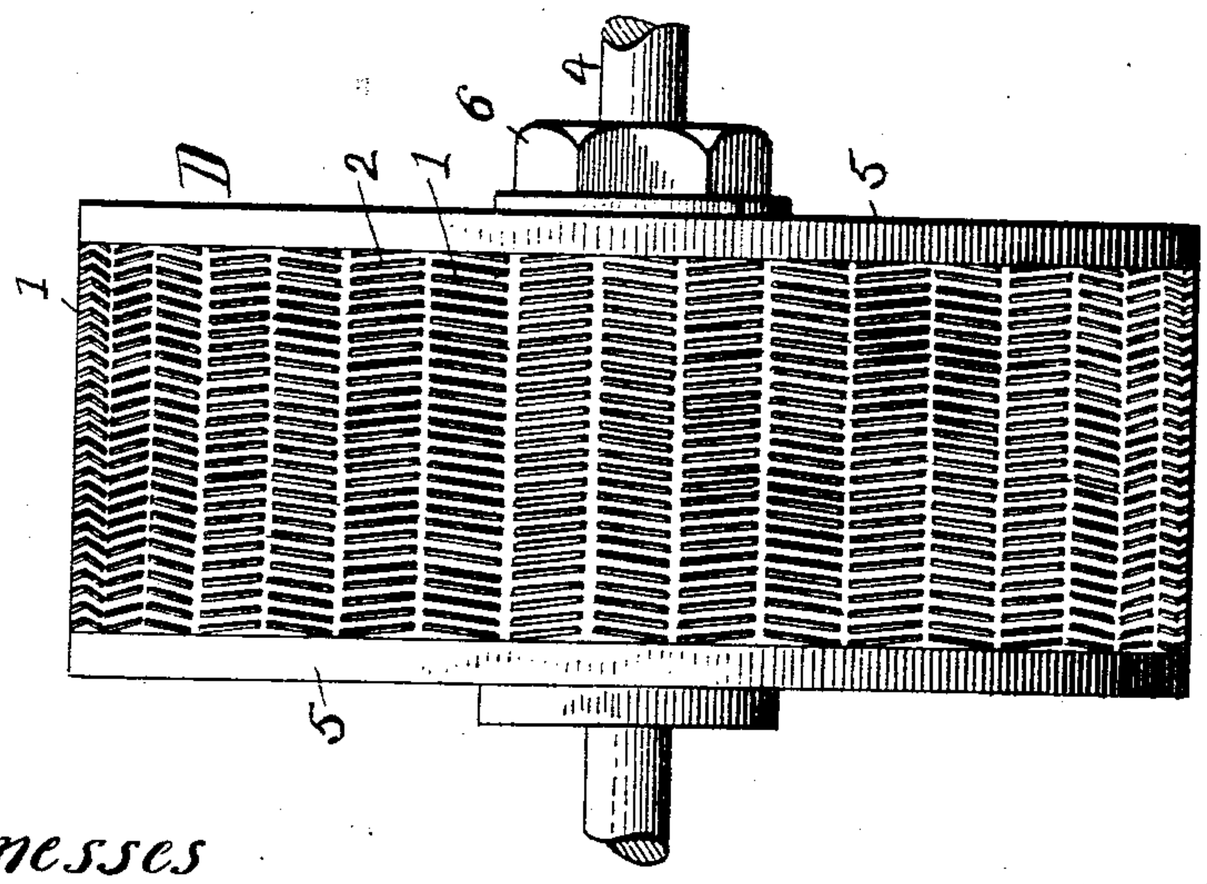

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Fig. 8.

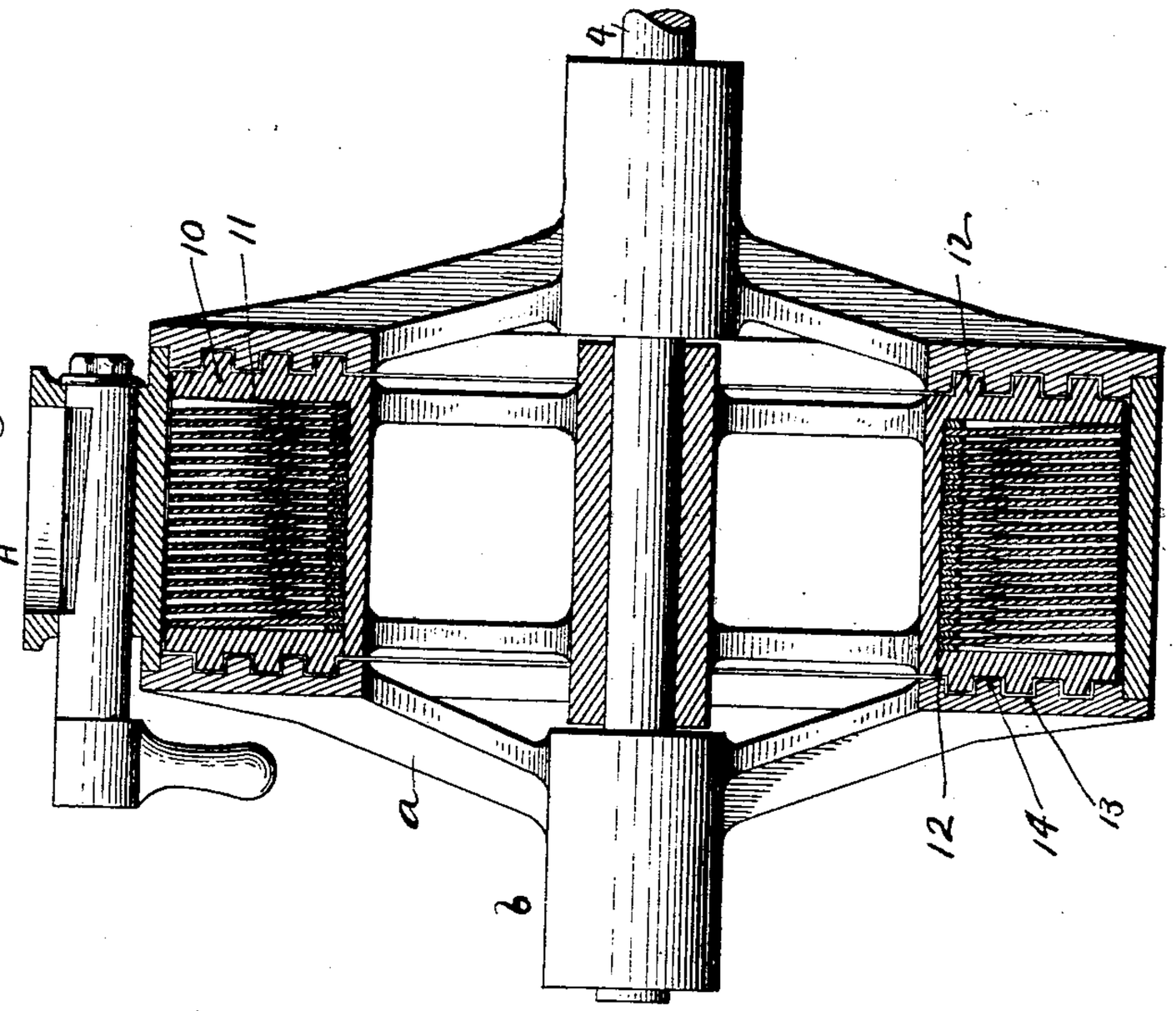
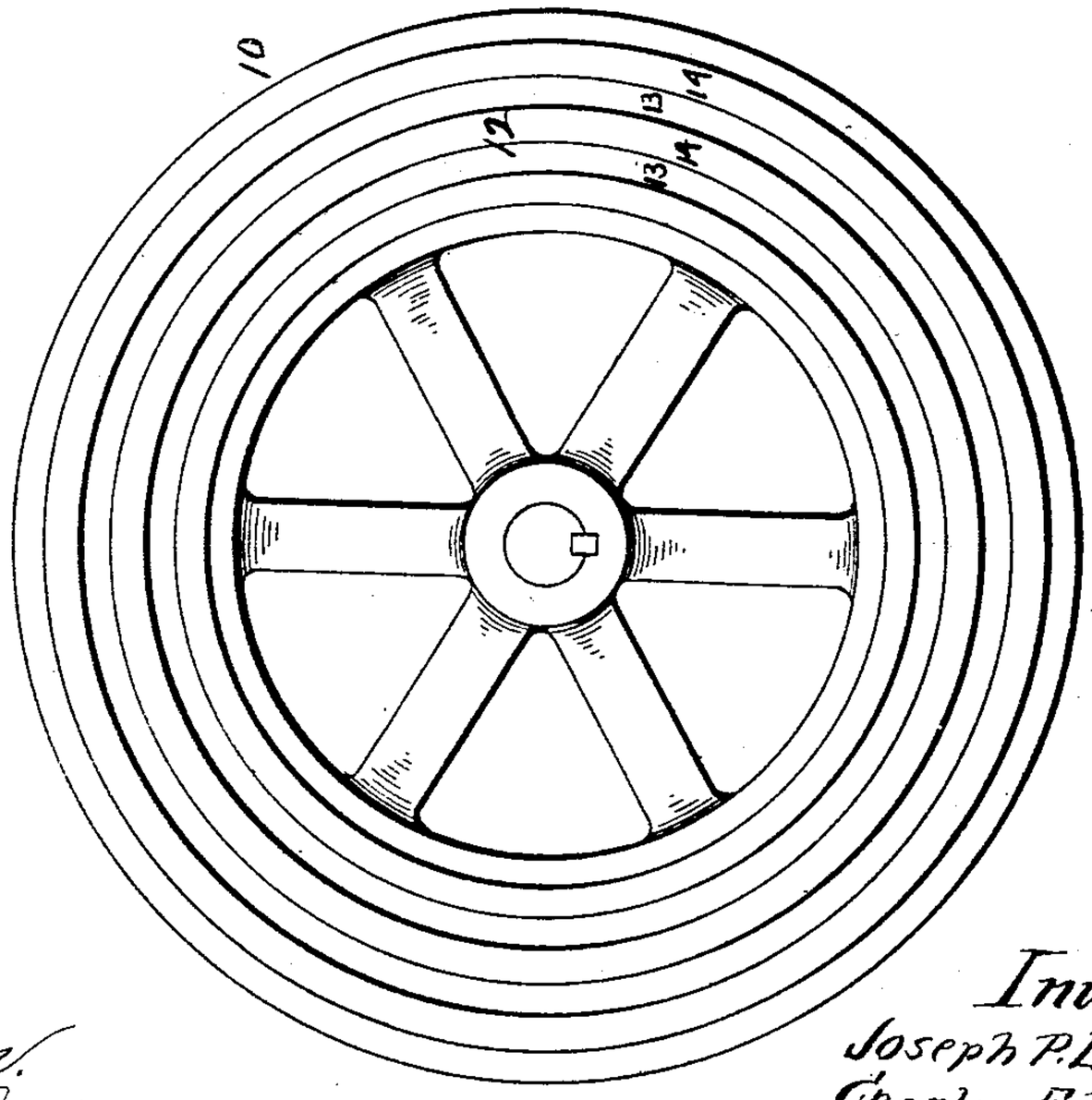


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOSEPH P. LENNON AND CHARLES E. BANKS, OF NEW YORK, N. Y.

TURBINE.

SPECIFICATION forming part of Letters Patent No. 713,461, dated November 11, 1902.

Application filed August 25, 1902. Serial No. 120,986. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH P. LENNON and CHARLES E. BANKS, citizens of the United States of America, residing in New York city, county and State of New York, have invented new and useful Improvements in Turbine-Motors, of which the following is a specification.

This invention relates to improvements in fluid-pressure turbine-motors, and has for its main object to improve the construction and mode of operation of the revolving pistons of such turbines.

In the accompanying drawings, Figure 1 is a face view of our improved turbine. Fig. 2 is a central sectional view showing one of the side plates of the piston broken away. Fig. 3 is an edge view of the piston. Fig. 4 is the face view of one of the piston-plates. Fig. 5 is an edge view of the same. Fig. 6 is a view showing one method of spacing and holding the blades apart. Fig. 7 is a side view of a modified form of piston, and Fig. 8 is a section through the center of the piston of Fig. 7 fitted into its casing.

As shown in Figs. 1 and 2, A is the live-steam pipe, A′ is the inlet-valve, having a suitable handle, and E E′ are exhaust-ports, one on each side of the inlet-valve and opening from the casing C on a line substantially tangential to the inner wall of the casing. Any suitable shut-off cocks *c c′* are provided in the exhaust-ports.

The inlet-ports *s s′* in the periphery of the casing lead from the inlet-pipe A at such angles that the motive fluid may strike the piston-wheel on lines also nearly tangential to the circumference. The inlet-valve A′ is adapted to direct steam from the live-steam pipe to either inlet-port *s* or *s′*, according to the direction of rotation required.

The casing C is fitted with opposite inclosing side plates *p*, having radial arms *a*, terminating in central bearings *b*. These plates may be solid; but we prefer them, as shown, with a central opening, through which the piston may be seen in Fig. 1.

The rotary piston D of Fig. 3 is made up of a number of metal plates 1, having blades or vanes 2, which may be cut and bent out of the body of the plates. Every other blade or vane in each plate stands at an angle reverse to its adjacent blades. These angles, as shown in Figs. 4 and 5, are but slightly displaced from the plane of the plate. Distance-pieces 3 of a diameter terminating at the base of the blades are inserted between adjacent plates, as indicated in Fig. 5, and the plates and distance-pieces are threaded onto a shaft 4 between two face-plates 5 5 and all are held bolted tightly together by a nut 6. The plates are so disposed upon their supporting-shaft as to bring all the blades which lie in any given radial plane parallel to each other, with clear spaces between the rows of vanes, as shown in Fig. 3. In large turbines and also in smaller ones if the vanes are not stiff enough to retain their original angled bend there may be placed between the vanes some means for keeping their angles permanent. This may be done in a variety of ways. Thus in Figs. 4 and 6 we have shown each vane as having three perforations 7, through which are passed rods 8, with a bushing 9 on each rod between adjacent vanes.

In Figs. 7 and 8 we have shown a piston 10, consisting of spokes carrying an annular trough 11, containing the vanes. In this modification we have also shown a particular arrangement of face-plates 12 12 for the casing, having a number of concentric grooves 13 13 and projections 14 14, into which corresponding projections and grooves in the piston fit. The water of condensation which creeps into the circuitous passages thus formed effectually acts as a packing to keep the turbine steam-tight.

In operation to secure a rotation in the direction of the arrow, Fig. 2, the exhaust-valve E′ is opened and the inlet-valve A′ at the periphery of the casing is turned to direct the motive fluid through the passage *s*. The motive fluid strikes first against and flows through the outer extremities of the vanes and passes on, expanding as it does work in a line quite similar to the dot-and-dash line *x*, Fig. 2, until it reaches and passes out at the exhaust-port E′. The vanes are set at such a slight angle that very little of the "bucket" effect common to steam-turbines is produced. The plates are so close together and the vanes so numerous that to a certain extent a frictional driving is effected in combination with the slight bucket effect. By leaving spaces

between the rows of vanes, as shown in Fig. 3, we secure small expansive chambers between the vanes, which we believe to be beneficial. By having the successive vanes around the circumference of the piston set at angles facing alternately in opposite directions, as shown in Fig. 3, we entirely do away with end thrust and secure a quietly-running turbine.

While we have shown the vanes as straight, we do not wish to confine ourselves to such construction, as curved or variously-shaped blades may be advantageously used.

We claim as our invention—

1. A fluid-pressure turbine-motor having a rotary piston provided with a number of radial vanes, the successive vanes around the circumference of the piston being some at one angle and others at a reverse angle, and each vane being separate from the next, substantially as described.

2. A fluid-pressure turbine-motor, having a casing with an inlet at its periphery for the admission of motive fluid opposite the vanes and a piston composed of a number of radial vanes set at angles slightly displaced from the plane of motion of the piston, said vanes arranged in rows across the piston, and with spaces between adjacent rows, substantially as described.

3. A fluid-pressure turbine-motor having a casing with an inlet at its periphery for the admission of motive fluid and a piston composed of a number of plates with radial vanes set at angles slightly displaced from the planes of the plates, and distance-pieces between the vane-carrying plates, substantially as described.

4. A fluid-pressure turbine-motor, having a casing with an inlet at its periphery for the admission of motive fluid and a piston composed of a number of plates with radial vanes set at angles slightly displaced from the planes of the plates, the vanes being in rows across the piston, with spaces between the rows, substantially as described.

5. A fluid-pressure turbine-motor, provided with a motive-power inlet in the periphery of the casing, and having a piston with solid face-plates, and intermediate spaced plates having vanes cut and bent out of said intermediate plates, so assembled between the face-plates that the vanes are arranged in rows with spaces between the rows, substantially as described.

6. A plate for a turbine-piston, provided with a number of radial vanes, the successive vanes being set at opposite angles alternately, substantially as and for the purpose described.

7. A plate for a turbine-piston, provided with a number of radial vanes set at angles but a few degrees from the plane of the piston, the angles of successive vanes being in opposite directions alternately, substantially as described.

8. A turbine-piston comprising a number of plates each having vanes alternating in angular bend, said plates being assembled so that all the vanes of one angle in adjacent plates are parallel to each other and in rows, substantially as described.

9. A turbine-piston provided with a number of plates, each having radial vanes, the successive vanes alternating in angular bend, and so assembled on a shaft that all the vanes of one angle in adjacent plates are parallel, and forming rows with intervening spaces between the rows, substantially as described.

10. A turbine-piston, having a number of vanes set at angles but a few degrees from the plane of the piston, in combination with a casing having an inlet at its periphery, and an exhaust-port so located in the casing that the steam is caused to travel in a circular direction around the casing, exhausting in a direction reverse to the admission, substantially as described.

11. A turbine-motor having a piston with a number of radially-arranged vanes, the successive vanes around the circumference of the piston being set at different angles alternately, in combination with a casing having an inlet-port in its periphery and an exhaust-port, substantially as described.

12. A turbine-motor, having a casing with an inlet at its periphery for the admission of the motive fluid, and containing a rotary piston with radial vanes set at angles but a few degrees from the plane of the piston, the angles of the successive vanes around the circumference of the piston being in opposite directions alternately, as and for the purpose described.

13. A turbine-motor, having a casing with an inlet at its periphery for the admission of the motive fluid, and containing a rotary piston with radial vanes set at angles to the plane of the piston and in spaced rows across the piston, the angles of the successive vanes around the circumference of the piston being in opposite directions alternately, as and for the purpose described.

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

JOSEPH P. LENNON.
CHAS. E. BANKS.

Witnesses:
EDNA W. COLLINS,
F. WARREN WRIGHT.