E. I. BRADDOCK.

TURBINE.

APPLICATION FILED JUNE 6, 1908.

911,470.

Patented Feb. 2, 1909.

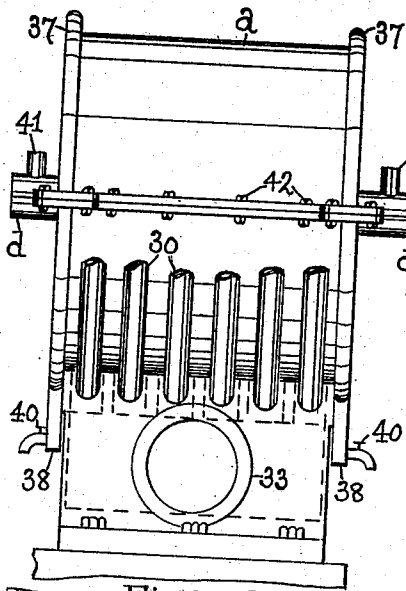

Fig. 1.

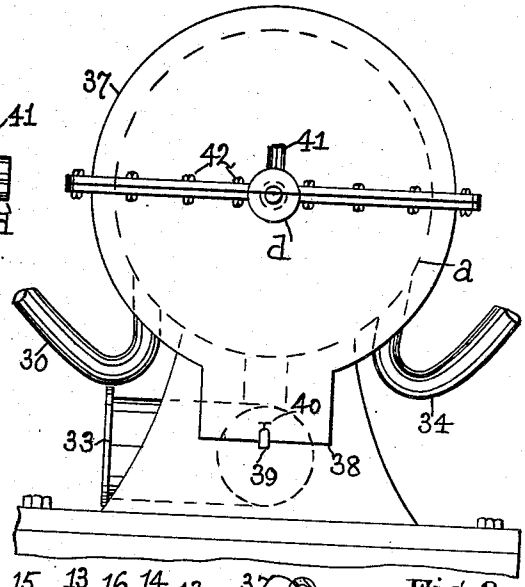

Fig. 2.

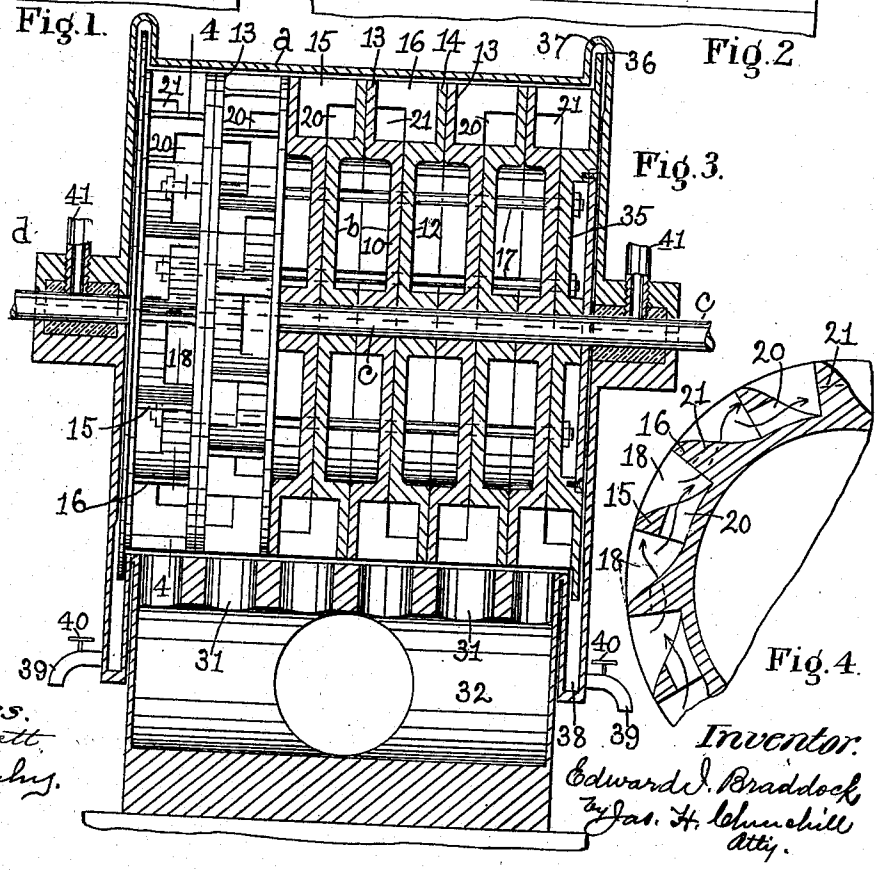

Fig. 3.

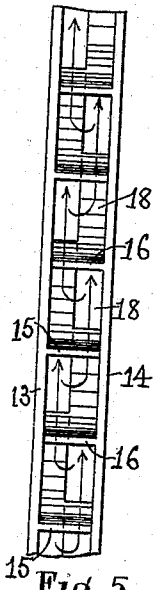

Fig. 5.

Fig. 4.

Witnesses.
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UNITED STATES PATENT OFFICE.

EDWARD I. BRADDOCK, OF WINCHESTER, MASSACHUSETTS, ASSIGNOR TO BRADDOCK MOTIVE POWER COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MAINE.

TURBINE.

No. 911,470. Specification of Letters Patent. Patented Feb. 2, 1909.

Application filed June 6, 1908. Serial No. 437,103.

To all whom it may concern:

Be it known that I, EDWARD I. BRADDOCK, a citizen of the United States, residing in Winchester, county of Middlesex, and State of Massachusetts, have invented an Improvement in Turbine-Engines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to a turbine engine or motor of that class in which a rotatable wheel having peripheral blades or vanes is employed, and has for its object to provide a turbine engine or motor of the class referred to, which is capable of being rotated at a great speed with a minimum fluid pressure, and in which the expansion of the fluid is utilized in addition to the velocity or impact of the same. For this purpose the rotatable wheel is provided with side flanges, from which extend the blades or vanes in staggered relation, and which are provided with throats or openings in their lower part on opposite sides of the circumferential center of the wheel, so that the steam or other fluid after striking against one blade or vane expands and is caused to move laterally in order to pass through the throat or opening to the next preceding blade against a solid part of which it is projected or directed. These and other features of this invention will be pointed out in the claims at the end of this specification.

Figure 1 is a front elevation of a turbine engine or motor embodying this invention. Fig. 2, a side elevation of the engine shown in Fig. 1. Fig. 3, a partial section and elevation of the engine shown in Fig. 1. Fig. 4, a detail in section to be referred to taken on the line 4—4, Fig. 3, and Fig. 5, a developed view of a portion of one of the wheels.

Referring to the drawings *a* represents a casing within which is located a series of piston wheels *b* fast on a shaft *c*, journaled in suitable bearings *d*.

Each piston wheel *b* is made in two parts or halves comprising annular body portions 10, 12, having annular flanges 13, 14, from which extend laterally piston blades or vanes 15, 16, said parts or halves being suitably secured together as by bolts or rods 17, so that the flanges 13, 14 form an annular chamber which is separated into a series of pockets 18, by the blades or vanes 15, 16. The pockets 18 are connected together to form a continuous but irregular passage for the steam or other fluid about the piston wheel by means of two sets of throats or openings 20, 21, which are formed in the blades 15, 16, so that the throats 20 are located on one side of the circumferential center of the wheel and the throats 21 on the other side of said center. This result may be accomplished by making each blade or vane substantially rectangular in shape, with the vertical portion or member of substantially the depth of the flange to which it is attached, and with a top horizontal portion or member of substantially the width of the space between the flanges 13, 14, the rectangular blade 15 coöperating with the flange 14 and the body portion 12 to form the throat 20, and the rectangular blade 16 coöperating with the flange 13 and the body portion 10 to form the throat 21 (see Figs. 3 and 4). As a result of this construction, the steam or other fluid admitted into the casing *a* through an inlet pipe 30 (see Fig. 2), strikes against the vertical and horizontal members of one piston blade or vane, as 15, expands in the pocket 18 formed by this blade and the next succeeding one, and then passes through the narrow throat 20 on one side of the circumferential center of the wheel, and impacts against the next preceding blade or vane 16 by which it is arrested in its course, and after expanding in the pocket into which it has just entered, is caused to pass to the other side of the circumferential center and through the narrow throat 21 into the next preceding pocket, etc. until it reaches the exhaust port 31, which is shown as located near the bottom of the casing *a* where it communicates with a chamber 32 common to all the exhaust ports, said chamber having an outlet pipe 33.

The casing *a* may also have connected with it at its opposite side, a second inlet pipe 34, which is designed to be used to admit steam or other fluid into the annular chambers when it is desired to effect a reverse rotation of the piston wheel and its shaft. The pipes 30, 34 in practice will be provided with suitable valves (not shown), by means of which one of said pipes may be closed when the other is open.

The engine is provided with means for preventing oil or other lubricant from getting into the exhaust steam or fluid, which may

be accomplished as herein shown, by providing the endmost or outside piston wheels with a center disk or plate 35 and with an annular flange 36, which latter projects into an annular chamber 37 formed in the casing *a* and communicating with an oil well 38 provided with an outlet pipe 39 having a valve 40, said outlet pipe being designed in practice to be connected with a pump (not shown), which is employed to deliver the oil to the bearings through the pipes 41. The casing *a* may be made in two parts, which are secured together by bolts 42. The course of the steam or other fluid is indicated by the arrows in Figs. 4 and 5, and by reference to these figures, it will be seen that the steam passing through the throat in one blade or vane on one side of the circumferential center of the piston wheel strikes against the next preceding blade and passes through the throat of that blade on the other side of the circumferential center of the piston wheel, and that opportunity is afforded for the steam or other fluid to expand in the pockets formed by the blades or vanes, whereby the expansion as well as the impact of the steam is utilized.

In practice, each part or half of the piston wheel may be cast in one piece with the blades or vanes integral therewith and the said parts fitted together with the piston blades on one half extended between the blades on the other half, which enables the turbine engine or motor to be made at a minimum cost. The oil supplied to the bearings works along the shaft *c* until it meets the disk 35 on which it is carried by centrifugal action to the flange 36 and thrown into the chamber 37.

Claims.

1. In a turbine engine or motor, in combination, an inclosing casing, a rotatable wheel within said casing comprising a body portion having side flanges, which coöperate with the casing to form an annular fluid chamber, a fluid inlet for said casing, a fluid outlet for said casing, and a plurality of blades or vanes attached to said wheel within said annular chamber and extended transversely of the same in staggered relation to form pockets between adjacent blades, said blades having throats or openings below their upper edges, and adjacent blades having their throats located on opposite sides of the circumferential center of the wheel, substantially as described.

2. In a turbine engine or motor, a wheel provided with circumferential flanges, and with blades or vanes extended transversely of the circumference from each flange toward the other in staggered relation, and having throats or openings below their upper edges and on opposite sides of the circumferential center of the wheel, substantially as described.

3. In a turbine engine or motor, a piston wheel provided on its circumference with blades or vanes separated from one another and comprising upright members and substantially horizontal members extended beyond said upright members to form throats or openings below the upper edges of said horizontal members, substantially as described.

4. In a turbine engine or motor, a piston wheel provided with circumferential flanges and with blades or vanes extended transversely of said circumference to form pockets and having throats or openings below their upper edges and on opposite sides of the circumferential center to connect said pockets, substantially as described.

5. In a turbine engine or motor, a piston wheel composed of two parts or halves, each comprising a body portion, a circumferential flange, a plurality of transversely extended blades or vanes having openings below their upper edges, and means to secure said parts or halves together with their blades in staggered relation and the openings in one set of blades out of line with the openings in the other set of blades, substantially as described.

6. In a turbine engine or motor, a piston wheel provided with circumferential flanges and with radial blades or vanes extended transversely of said circumference to form pockets and having in them throats or openings below their upper edges to connect said pockets, substantially as described.

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

EDWARD I. BRADDOCK.

Witnesses:

JAS. H. CHURCHILL,

J. MURPHY.