

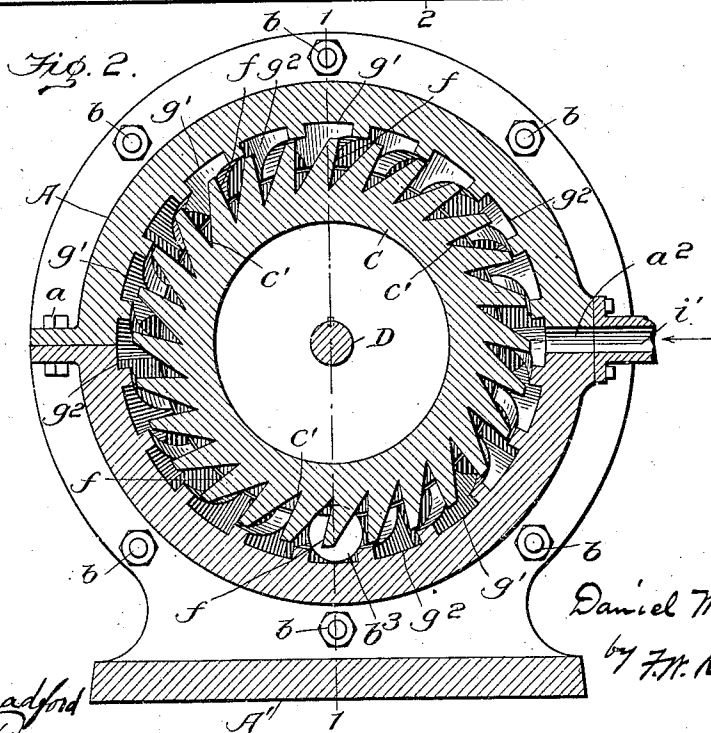
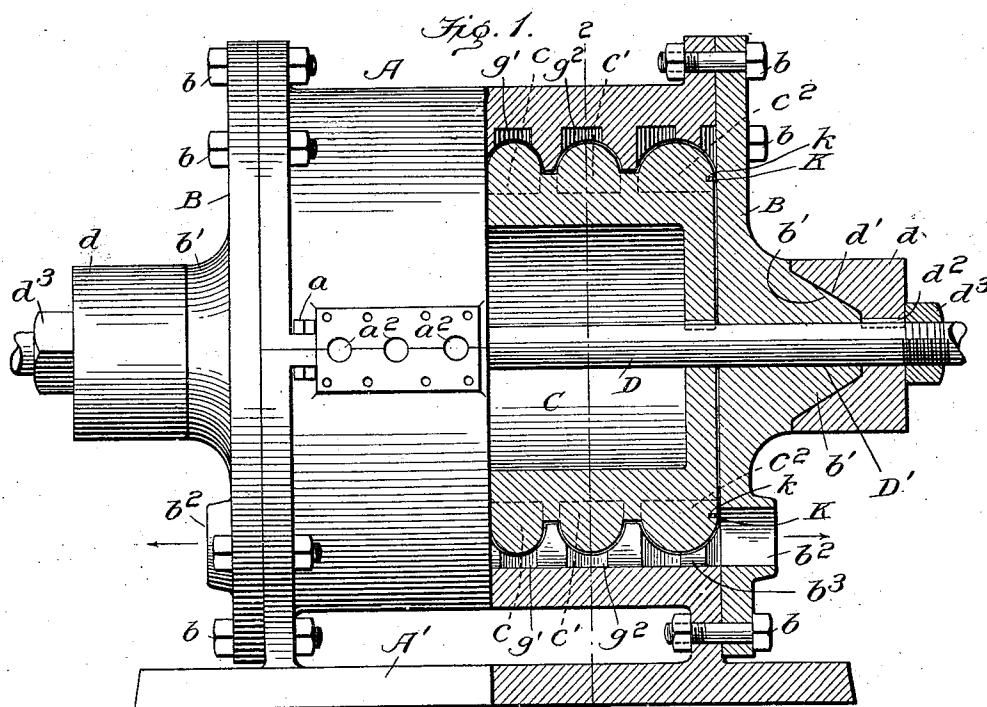
No. 852,672.

PATENTED MAY 7, 1907.

D. McARTHUR.
TURBINE.

APPLICATION FILED JAN. 5, 1907.

2 SHEETS—SHEET 1.



Witnesses

Edwin L. Bradford
G. F. Ritter

Inventor

Daniel McArthur,
by F. H. Ritter, Jr.

Attorney

No. 852,672.

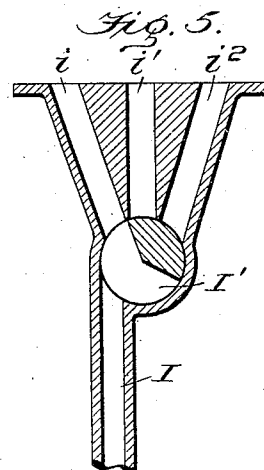
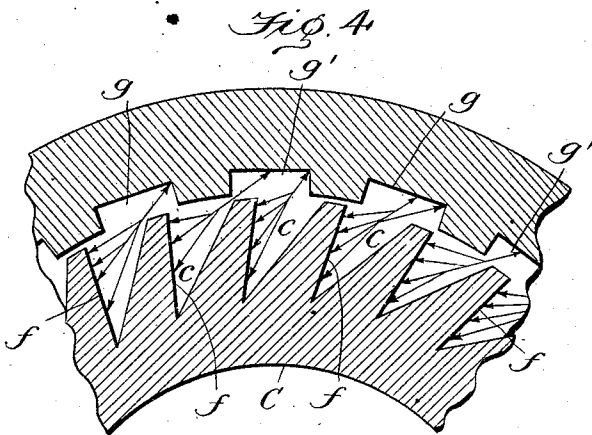
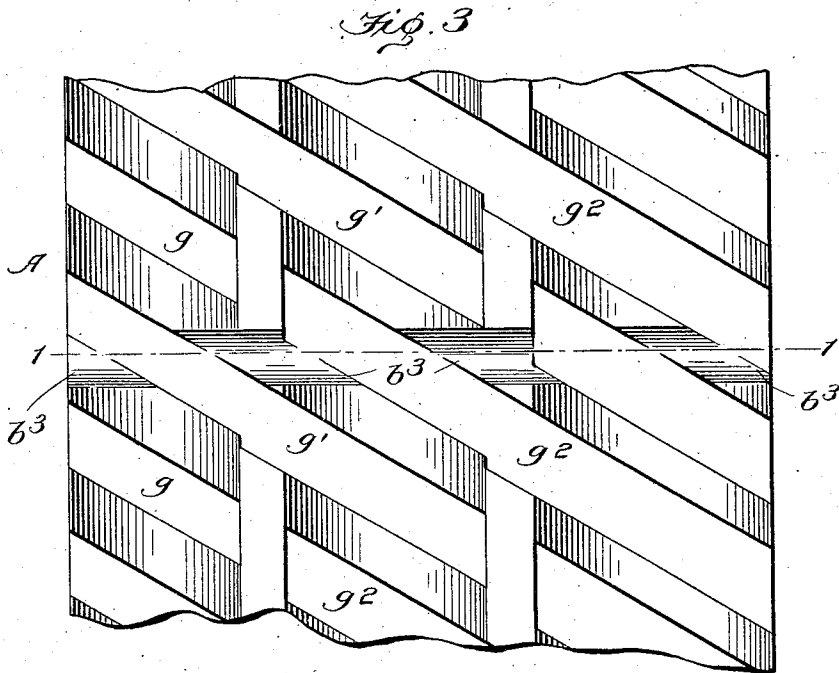
PATENTED MAY 7, 1907.

D. McARTHUR.

TURBINE.

APPLICATION FILED JAN. 5, 1907.

2 SHEETS—SHEET 2.



Witnesses

Edwin L. Bradford

J. W. Ritter

By

Inventor

Daniel McArthur

J. W. Ritter, Jr.

Attorney

UNITED STATES PATENT OFFICE.

DANIEL McARTHUR, OF JERSEY CITY, NEW JERSEY.

TURBINE.

No. 852,672.

Specification of Letters Patent.

Patented May 7, 1907.

Application filed January 5, 1907. Serial No. 350,943.

To all whom it may concern:

Be it known that I, DANIEL McARTHUR, a citizen of the United States, residing at Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Turbine-Motors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the construction of rotary-engines or turbine motors of the impact and compounding type adapted for locomotive, marine, or stationary service, and wherein steam, gas, or equivalent motive fluid is utilized. The several objects of my invention are the elimination of frictional resistance and the consequent conservation of power, as well as simplicity of construction which will facilitate inspection, and repair and reduce first cost and cost of maintenance.

To this end the main feature of my invention embraces the formation of the periphery of the rotary member or the peripheries of the series of rotary pockets thereof and the interior of the casing or series of pockets thereof on corresponding curves, whereby the pockets of said members open laterally as well as radially, and in providing the casing with pockets which overlap or span the adjacent series of pockets of the rotary member, whereby said casing pockets serve as both expansion and transmission or transfer pockets thus avoiding loss by friction incident to angular transfer or transmission passages.

There are other, minor, features of invention, all as will hereinafter more fully appear. In the drawings chosen for the purpose of illustrating this invention, the scope whereof is pointed out in the claims; Figure 1 is a view partly in side elevation, and partly in longitudinal vertical section on line 1—1 Fig. 2, of a triple expansion reversible turbine-motor embodying my invention. Fig. 2 is a vertical transverse section of the same taken on the line 2—2 Fig. 1, showing one series of impact and expansion pockets of the rotary member and the expansion and transmission pockets of the casing. Fig. 3 is an enlarged diagrammatic view of a portion of the interior of the casing showing the expansion pockets, and the combined expansion and transmission or transfer pockets of the casing as well as their relative arrangement for over-

lapping the adjacent series of pockets of the rotary member. Fig. 4 is an enlarged detail sectional view with a diagram of the pressure expansion lines between the casing pockets and rotary member pockets; and Fig. 5 is an enlarged sectional view of the motive fluid inlet pipe with branches and three way valve whereby the motive fluid may be simultaneously admitted to several of the series of pockets, or confined to one or more of the series as desired.

Like symbols refer to like parts wherever they occur.

The motor shown in the drawings, and chosen for purposes of illustration only, is a reversible motor wherein one-half is a duplicate of the other, excepting that the abutments of the pockets and the motive fluid inlets are reversely arranged on opposite sides of the transverse center of the motor, and therefore for the purposes of this specification, and for the information of those skilled in the art, it will only be necessary hereinafter to describe that portion of the motor shown in section in Fig. 1. Furthermore, the motor is shown as a triple expansion motor, that is to say having three series of gradually enlarged expansion pockets in the casing and the rotary member, but it will also be well understood by those skilled in the art that, without invention, the number of the series of expansion pockets may be increased, the relative proportions being observed, within any reasonable limits.

I will now proceed to describe my invention more fully so that others skilled in the art to which it appertains may apply the same.

In the drawings, A indicates the cylinder of the casing or shell of the turbine which cylinder is separable longitudinally preferably on its axial line, the sections being secured together by bolting as at *a*, or in other suitable manner, and if the plane of division between the sections is horizontal then the lower section may be provided with a base plate A' for attachment to any suitable bed or support.

B, B indicate the casing heads bolted or otherwise suitably secured to the flanges of the casing A, as at *b*, *b*, and each of said heads, on its exterior and surrounding the bearing of the shaft for the rotary member, is provided with a projection or hub *b'* preferably of conoidal form with which coacts a collar on the shaft of the rotary-member,

said collar having a corresponding cup-shaped cavity for the reception of said hub or projection on the adjacent head of the casing.

C indicates the rotary member of the turbine which is keyed to and revolves with a shaft D, said shaft having suitable bearings D' in the heads B, B of the shell or casing, and being provided with attached collars d, d having conic cavities d', d' adapted to receive the conoidal projections b', b' , on the heads B, B of the casing or shell A. The collars d, d are made adjustable on the shaft by means of splines d^2 and nuts d^3 . As a result of this construction a strong shoulder bearing is obtained between the rotary member and casing, said bearing being on a line at an angle to the shaft, which not only facilitates lubrication of the parts but also permits and maintains an exact relative adjustment of the rotary member and the interior of the casing thus minimizing the friction between said members.

In the head B of the cylinder or shell A is the exhaust passage b^2 or outlet of the exhaust channel b^3 which latter extends the length of the motor and crosses the several series of pockets c, c', c^2 of rotary member C, and in the shell A are the inlet ports a^2 , in this instance three in number, one inlet port for each series of pockets, with which latter ports a^2 are connected the several branches i, i', i^2 (Fig. 5) of the main inlet pipe I in which is a three-way cock I' for admitting the motive fluid to all or any one or more of the series of pockets of the motor as desired.

c, c', c^2 indicate the several rows or series of pockets of the rotary-member, the pockets of each succeeding series being larger than the pockets of the preceding series as is required by the expansion of the motive fluid. The periphery of the rotary-member C in the planes of the pockets is formed on curved lines which gives to said pockets curved lips that permit a lateral as well as a radial discharge from said pockets, and the interior of the casing A at said points is also formed on corresponding curved lines to allow of an unobstructed transmission or transfer of the motive fluid longitudinally of the motor or from series to series axially.

The pockets constituting the several series of the rotary-member are each preferably formed with abutments f (or rear walls) at an acute angle with a radius of said member to prevent the pockets from spilling the motive fluid when opening on a shell or casing pocket, but the abutment walls of the casing pockets may be on substantially radial lines if desired. Also if desired, the pockets of the several series may be staggered, that is to say, the pockets of series c' leading those of series c , and the pockets of series c^2 leading those of series c' , and so on throughout any given number of series.

The interior of casing or shell A is formed with a series of longitudinal curves corresponding with the curves of the peripheries of the series of pockets c, c', c^2 of the rotary-member C, and with an equal number of series of pockets g, g', g^2 which, like those of the rotary-member are of gradually increasing size for each succeeding series to meet the requirements of the expanding motive fluid, and of said pockets those of the first series which are marked g in the drawings are simple expansion pockets, while those which overlap the first and second series of pockets (c, c') of the rotary-member, and which alternate with expansion pockets g , and are marked g' , are both expansion and transmission or transfer pockets, as are also those marked g^2 which overlap or span the second and third series of pockets (c', c^2) of the rotary member, and if any additional series of pockets are used, the construction and relative arrangement of expansion and transfer pockets will be such as in case of the pockets g' and g^2 . These pockets g, g' and g^2 are preferably arranged on parallel lines at an angle or inclination to the axis of the rotary member or of the cylinder and recede from the motive fluid inlet so that while the motive fluid transference is across the rotary member from series to series on a line oblique to the axis of the rotary member its direction is away from the direction of motion of said rotary member, or in the direction of the motive fluid inlet.

On the outer ends of the rotary member, and immediately below the pockets are grooves k for the reception of spring pressed packing rings K of suitable material which prevent the motive fluid from passing through between the rotary member and casing heads.

As illustrated in the drawings, the rotary member C is formed in a single casting, keyed to the shaft, and with the teeth which form the pockets integral therewith, but it is evident to those skilled in the art that if desired the teeth constituting the pockets of the rotary member may be made detachable or separable for purposes of renewal or repair, and that both rotary member and casing may be built up of separable sections, the only questions involved being those of cost and tight joints.

The construction of the casing or shell and the rotary member being substantially such as hereinbefore pointed out, and such that the curved lips of the pockets will, when adjusted, move in close proximity to the curves on the interior of the casing or shell, the collars d, d are so adjusted on the shaft D as that the rotary-member C shall assume a uniform distance from the inner face of the casing both horizontally with the shaft D and vertically across the motor, after which the collars d, d are fixed on the shaft to maintain

such relation of the parts during the operation of the motor.

The adjustment of the casing or shell and the rotary member having been made and the motive fluid admitted through the inlet port a^2 to the first series of pockets c of the rotary-member, or to any number of said series as desired, said motive fluid by its impingement on the abutments f of the pockets of the rotary member will rotate said member until the pockets thereof, in succession, pass the first expansion pocket g where expansion only occurs, and thereafter pass the expansion pocket g' , which overlaps the next or second series of pockets c' of the rotary member, where both expansion and transmission or transfer takes place. The motive fluid which escapes not only radially but laterally from the pockets of the rotary member by reason of the curved lips thereof, but also in a free and unobstructed manner longitudinally of the motor by reason of the opening of the casing pockets laterally through the arched interior of the casing, will without obstruction enter the second series of pockets c' of the rotary member which will transfer the motive fluid to casing pockets g^2 that overlap series c' and c^2 of the pockets of the rotary member and wherein expansion and transmission again occurs. In the meanwhile each pocket of each series of pockets c , c' , and c^2 of the rotary-member C before reaching the inlet passage a^2 will in turn pass through the exhaust channel v^3 leading to outlet passage b^2 and be finally exhausted before it is again presented opposite the inlet port a^2 for a fresh charge of the motive fluid.

If at any time, as for instance, in starting the motor, the admission of the motive-fluid to one of the series of pockets of the rotary-member does not give the required initial power, the motive fluid may, by properly positioning the three-way cock I', be admitted to two or more of the series of pockets (c , c' , c^2) of the rotary-member, and be subsequently cut off from one or more of the series as desired.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a rotary-engine or turbine-motor of the class specified, the combination of coacting members, one of which is a rotary member, said members having expansion pockets, the contiguous faces of said members and their pockets being formed on corresponding curves, substantially as and for the purposes specified.

2. In a rotary-engine or turbine-motor of the class specified, the combination of coacting members, one of which is a rotary member, each of said members having a plurality of series of expansion pockets some of which pockets in one of which members entirely

overlap two series of pockets in the other of said members, substantially as and for the purposes specified.

3. In a rotary-engine or turbine-motor of the class specified, the combination of coacting members, one of which is a rotary member, each of said members having a plurality of series of expansion pockets, some of the pockets of one of said members arranged to overlap two series of pockets in the other of said members, said last named pockets arranged obliquely to the axis of the rotary member, substantially as and for the purposes specified.

4. In a rotary-engine or turbine-motor of the class specified, the combination of coacting members, one of which is a rotary-member, each of said members having a plurality of series of pockets, and one of said members having pockets which overlap two series of pockets of the other member and are arranged obliquely to the axis of the rotary member and extend in a direction contrary to direction of rotation of said member, substantially as and for the purposes specified.

5. In a rotary-engine or turbine-motor of the class specified, the combination of coacting members, one of which is a rotary member, each of said members provided with a plurality of series of pockets, some of the pockets of one of said members arranged to overlap two series of pockets in the other member, the contiguous pocket faces of said members being formed on corresponding curves, substantially as and for the purposes specified.

6. In a rotary-engine or turbine-motor of the class specified, the combination of coacting members, one of which is a rotary member, each of said members provided with a plurality of series of pockets, the pockets of one member arranged at an angle to the axis of the rotary member, extending obliquely in a direction contrary to the direction of rotation of said member and overlapping two series of pockets of the other member, the contiguous pocket faces of said members formed on corresponding curves, substantially as and for the purposes specified.

7. In a rotary-engine or turbine-motor of the class specified, the combination of a casing and a rotary member each provided with pockets, the periphery of the rotary member, and the contiguous interior surface of the casing being formed on corresponding curves, substantially as and for the purposes specified.

8. In a rotary-engine or turbine-motor of the class specified, the combination with a casing having its interior surface formed on curved lines, and provided with pockets which intersect said lines, of a rotary member provided with a plurality of series of pockets the periphery of said rotary member being formed on curved lines corresponding with

those of the casing, substantially as and for the purposes specified.

9. In a rotary engine or turbine-motor of the class specified, the combination of coacting members, one of which is a rotary member, each of said members having a plurality of series of expansion pockets, the expansion pockets of one of said members being unobstructed throughout and arranged to overlap

a plurality of pockets in the other of said members, substantially as and for the purposes specified.

In testimony whereof I affix my signature, in presence of two subscribing witnesses.

DANIEL McARTHUR.

Witnesses:

L. H. OPDYCKE,
R. W. TRETJEN.