

(No Model.)

4 Sheets—Sheet 1.

G. J. ALTHAM.
STEAM TURBINE.

No. 475,957.

Patented May 31, 1892.

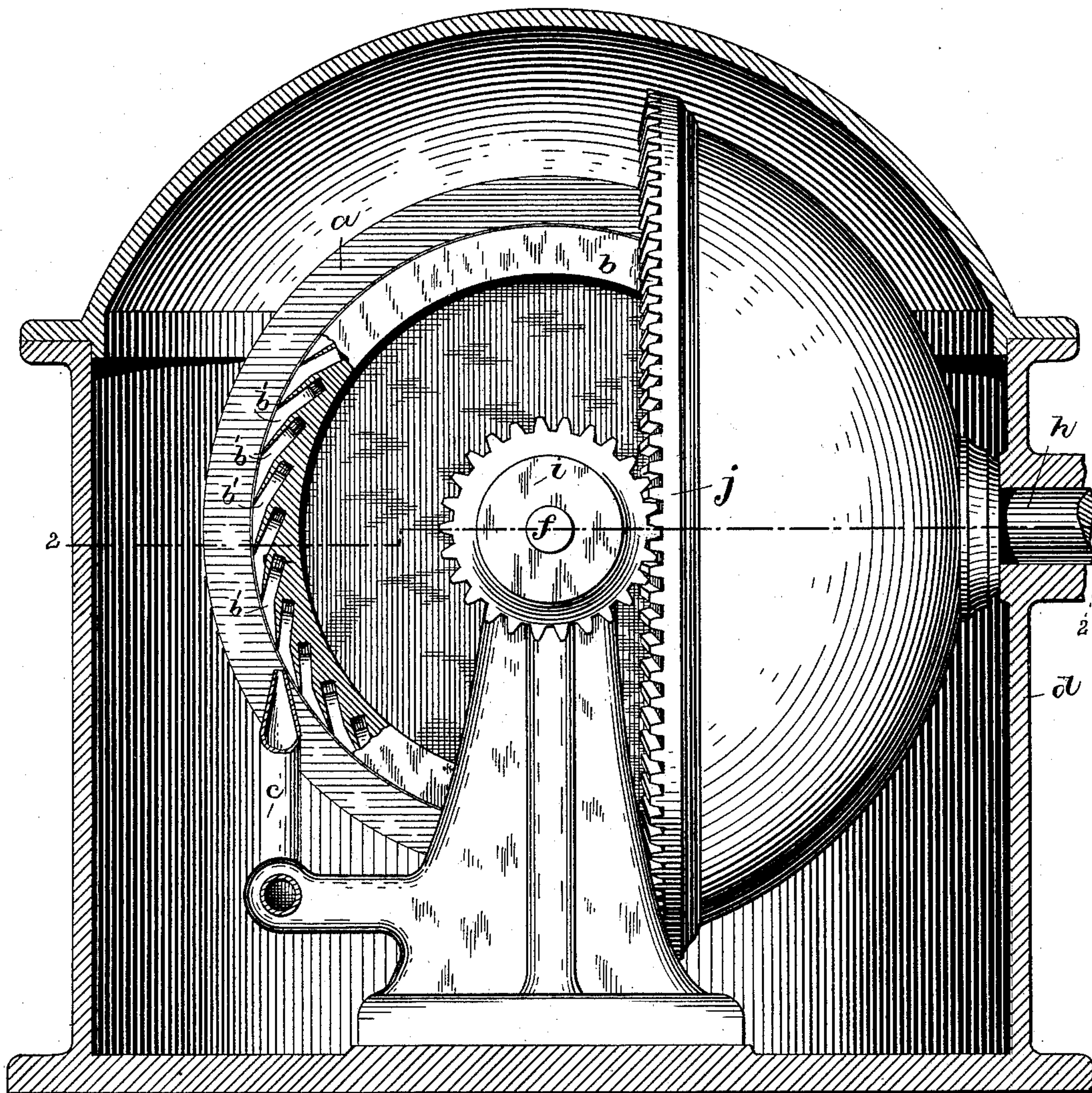


Fig. 1.

WITNESSES.

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INVENTOR.

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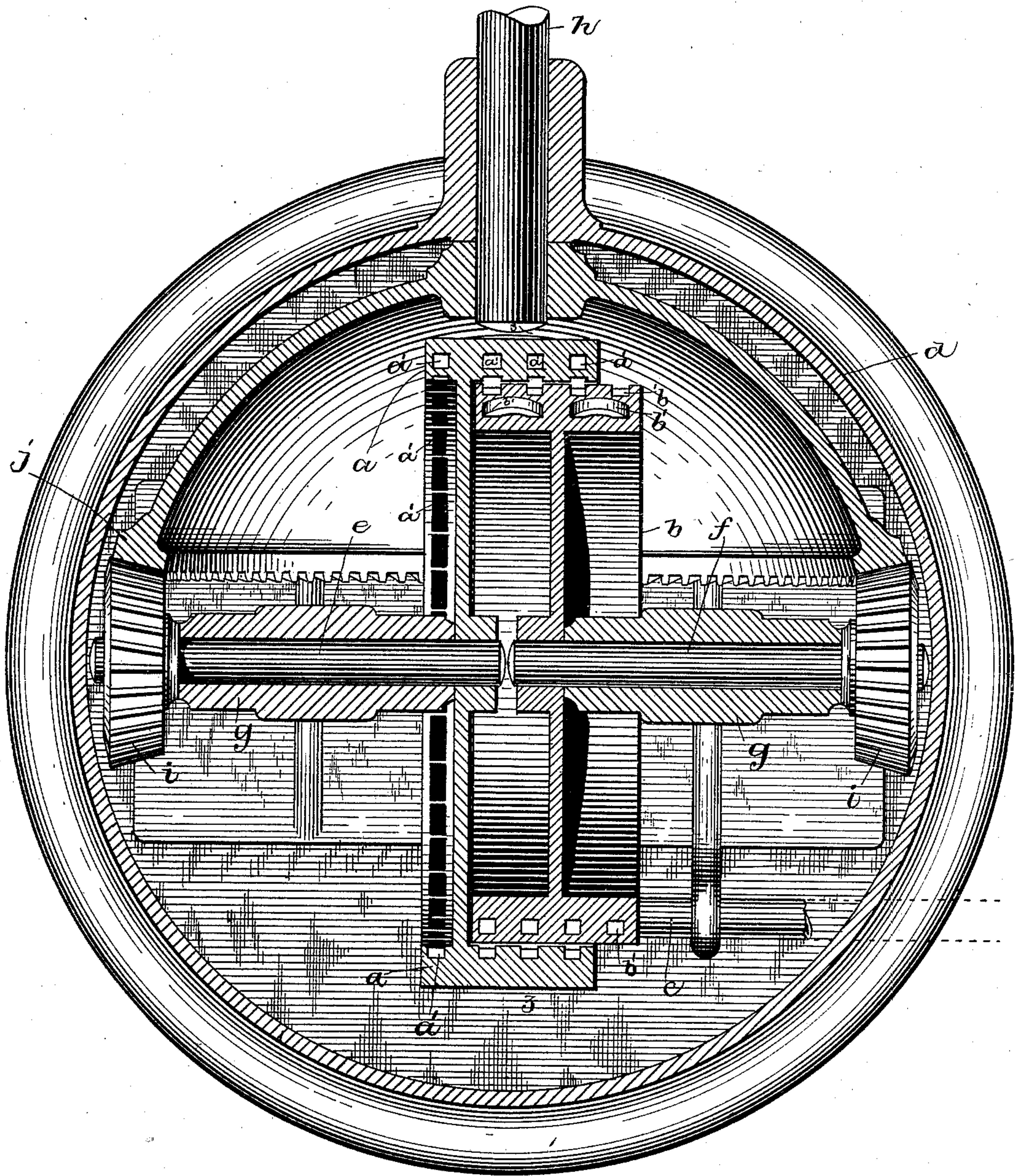


Fig. 2.

WITNESSES

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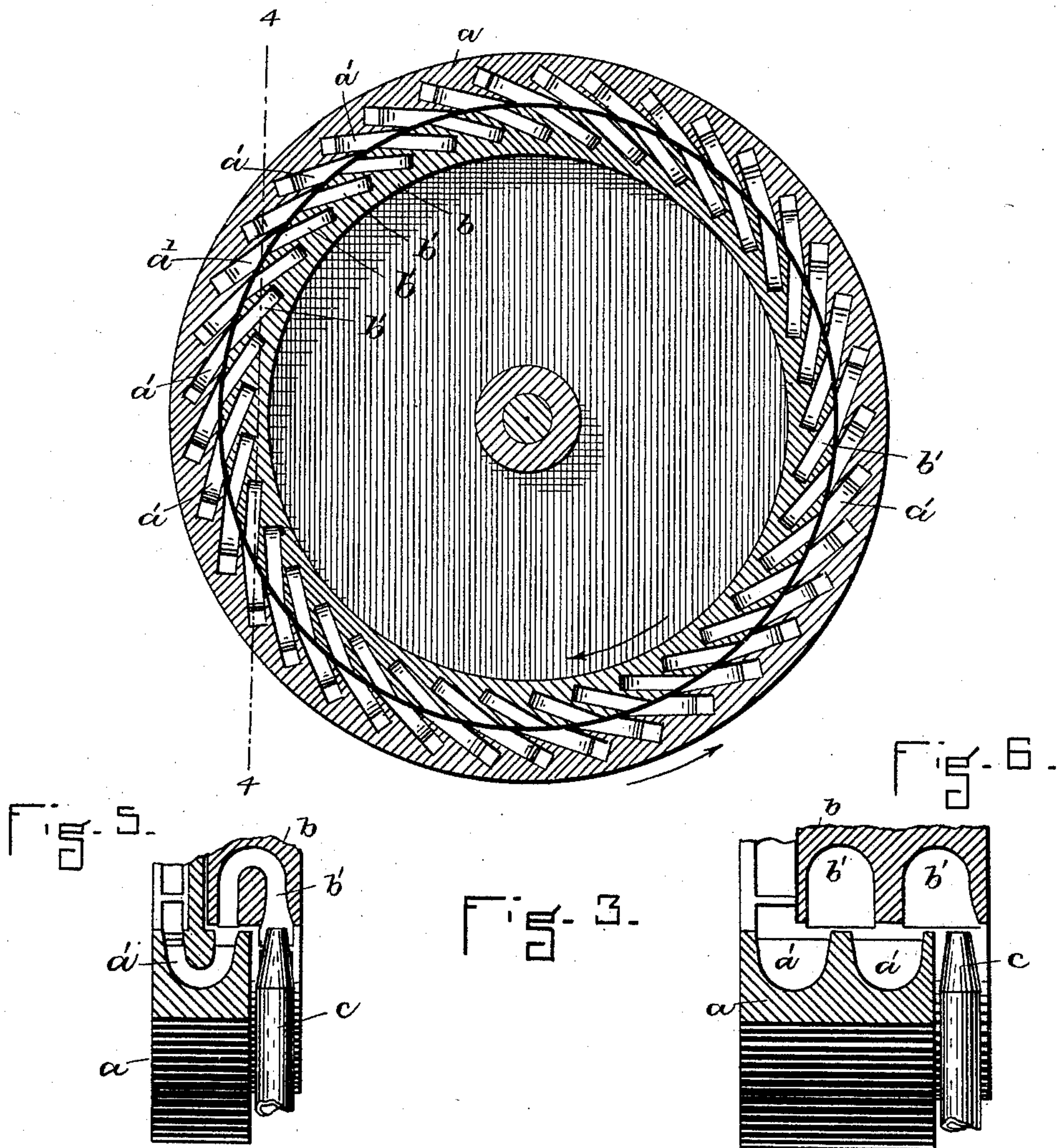
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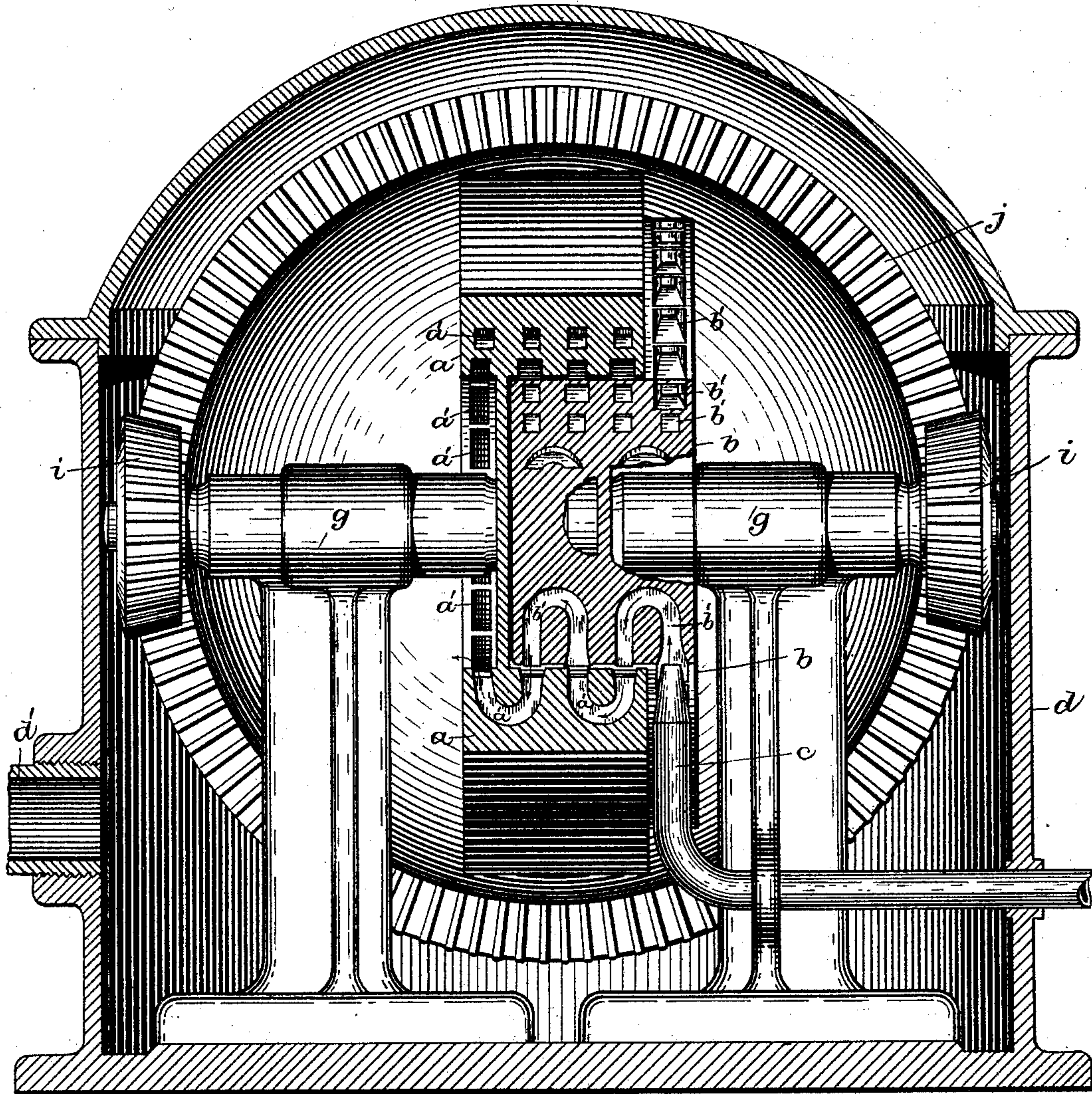


Fig. 4.

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UNITED STATES PATENT OFFICE.

GEORGE J. ALTHAM, OF SWANSEA, MASSACHUSETTS.

STEAM-TURBINE.

SPECIFICATION forming part of Letters Patent No. 475,957, dated May 31, 1892.

Application filed February 3, 1891. Renewed May 4, 1892. Serial No. 431,754. (No model.)

To all whom it may concern:

Be it known that I, GEORGE J. ALTHAM, of Swansea, in the county of Bristol and State of Massachusetts, have invented certain new and
5 useful Improvements in Steam-Turbines, of which the following is a specification.

This invention relates to motors in which the velocity of a jet of steam is expended in such a manner as to rotate a wheel provided
10 with buckets formed to present surfaces, upon which the steam acts in such manner as to cause the rotation of the wheel.

The object of the invention is to provide a simple and efficient motor of this class adapted
15 to utilize all the velocity of the steam and convert the same into rotary motion with the minimum of waste or loss of power.

The invention consists as a whole in a motor comprising two rotary wheels having
20 buckets, one wheel inclosing the other, or a greater portion thereof, the buckets in the inner wheel being arranged in the outer periphery thereof, while those of the outer wheel are arranged in the inner periphery, the said buckets
25 being arranged so that the steam will act alternately on the inner and outer wheels and will act successively on different buckets of each wheel, the arrangement being such that the wheels are rotated simultaneously in op-
30 posite directions. Each wheel is provided with a shaft, through which its rotary motion may be imparted to any suitable mechanism to be driven by the motor, all as hereinafter described.

35 Of the accompanying drawings, forming a part of this specification, Figure 1 represents an end elevation and a partial vertical section of a motor embodying my invention. Fig. 2 represents a section on line 2 2, Fig. 1. Fig.
40 3 represents a section on line 3 3, Fig. 2. Fig. 4 represents a side elevation of the motor and a sectional view of the casing thereof, the wheels of the motor being shown in partial section on the line 4 4, Fig. 3. Fig. 5 repre-
45 sents a sectional view of a modification hereinafter referred to. Fig. 6 represents another modification.

The same letters of reference indicate the same parts in all the figures.

50 In the drawings, *a* and *b* represent the bucketted wheels of a motor, the same being hereinafter called by me for convenience "turbines."

The turbine *a* is of annular form and receives a considerable portion of the turbine *b*, the latter being of smaller diameter than the turbine *a*,
55 so that it enters the latter, as shown in Figs. 2, 3, and 4, the outer periphery of the turbine *b* being in close proximity to the inner periphery of the turbine *a*, as shown in Fig. 3. The turbine *a* has a series of buckets *a'* opening
60 on its inner periphery, and the turbine *b* has a series of buckets *b'* opening on its outer periphery, the buckets of both turbines being U-shaped in the direction of their length, as shown in Fig. 4, while the buckets of one wheel
65 alternate with those of the other wheel, so that the steam entering one of the buckets *b'* will pass thence into one of the buckets *a'* and from the latter back into another of the buckets *b'*, and then again into another of
70 the buckets *a'*, each wheel preferably having its buckets arranged in rows extending across its periphery, there being two or more buckets in each row, as shown in Fig. 4. One end of one of the buckets *b'* of each row
75 is outside of the wheel *a*, and said end is preferably enlarged or made flaring to serve as a port to receive steam from a pipe or tuyere *c*. The buckets of both wheels are tangentially arranged, as shown in Fig. 4, the buckets *a'*
80 being substantially or nearly tangential to the periphery of the wheel *b*, while the buckets *b'* are tangents of a circle within the periphery of the wheel *b*.

The steam-delivering pipe or tuyere *c* is ar-
85 ranged so that it is substantially in line with each bucket *b'* that is brought by the rotation of the wheel *b* into position to receive steam from said tuyere.

It will be seen that steam emerging from
90 the tuyere *c* will enter the enlarged mouths or ports of the buckets *b'* at one end of the wheel *b*, and, passing through said buckets, will enter the buckets *a'* in the wheel *a*, and will then re-enter the wheel *b* and finally pass
95 through the delivering-buckets of the wheel *a* and escape through the ends of said buckets, (shown in Figs. 2 and 4 as arranged outside of the portion of the wheel *a* that receives *b*,) the spent steam escaping into a cas-
100 ing *d*, which incloses the motor, and emerging through a waste or outlet pipe *d'* in one side of said casing. Each charge of steam, therefore, acts alternately on the wheels *b* and *a*

and acts successively on different portions of each wheel, so that in its course its velocity is fully expended or utilized in giving motion to the wheels. The outer periphery of the wheel *b* is in such close proximity to the inner periphery of the wheel *a* that there can be no material leakage of steam between said peripheries, so that substantially all the steam that passes through the buckets of one wheel will pass, also, through the buckets of the other wheel.

The wheel *a* is attached to a shaft *e* and the wheel *b* to a shaft *f*, said shafts being journaled in suitable fixed bearings *g g* within the casing *d*. The wheels *a b* being rotated simultaneously in opposite directions, suitable means may be provided to enable the shafts *e f* to co-operate in imparting rotary motion to a driven shaft *h*, said means being here shown as two bevel gears or pinions *i i*, affixed to the outer ends of said shafts, and a bevel-gear *j*, arranged to mesh with both of said pinions, said gear *j* being affixed to the shaft *h*, as shown in Figs. 1 and 2, the arrangement being such that the pinions *i i* mesh with the gear *j* at diametrically-opposite points on the latter, so that each pinion imparts rotation to the shaft *h* in the same direction as the other.

My invention is not limited to the arrangement of the buckets in rows extending across the wheels, as each wheel may have but one series of buckets extending around it, so that each charge or subdivision of steam will pass through only one bucket of each wheel, as shown in Fig. 5. The form of the buckets may also be varied, my invention not being limited to the particular form shown in the drawings, although I consider it important to give each bucket a reverse curve or bend, so that steam will enter the bucket in one direction and leave it in substantially the opposite direction.

In Fig. 6 I have shown the buckets *a'* and *b'* made without the internal partitions which give the U shape to the buckets shown in Figs. 4 and 5, the general form and arrangement of the buckets being otherwise the same as in the preceding figures.

It will be seen that in all cases the buckets of each wheel have receiving and delivering ends and that the buckets of the outer wheel are offset from the buckets of the inner wheel in a line parallel with the axes of the wheels, so that the receiving ends of the buckets of the outer wheel register with the delivering ends of the buckets of the inner wheel.

I claim—

1. A motor comprising two independently-revoluble wheels, one within the other, said wheels having tangential buckets, each having a receiving and a delivering end, the buckets of one wheel being offset from the buckets of the other wheel in a line parallel

with the axes of the wheels, whereby the receiving ends of the buckets of one wheel will register with the delivering ends of the other, as set forth.

2. A motor comprising two independently-revoluble wheels, one within the other, the inner wheel having tangential buckets the receiving ends of which are at one side of the outer wheel, while the outer wheel has tangential reversely-extending buckets whose delivering ends are at one side of the inner wheel, the delivering ends of all the buckets in the inner wheel registering with the receiving ends of all the buckets in the outer wheel, as set forth.

3. In a motor, the combination of the inner wheel having tangential buckets in its outer periphery, the hollow outer wheel receiving the inner wheel and having tangential buckets in its inner periphery, offset from the buckets of the inner wheel in a line parallel with the axes of the wheels, whereby they will register at their receiving ends with the delivering ends of the buckets of the inner wheel, and a pipe or tuyere arranged to deliver a jet of steam or other fluid under pressure to the receiving ends of the buckets at one side of one of said wheels, as set forth.

4. In a motor, the combination of the inner and outer turbines, one having internal and the other external buckets U-shaped in the direction of the axis of the wheel and having the delivery ends of the buckets of one wheel registering with the receiving ends of the buckets of the other wheel, means for supplying steam or other fluid to said buckets, the shafts supporting said wheels and mounted in fixed bearings, a power-transmitting shaft, and connections between said wheel-supporting shafts and the power-transmitting shaft, whereby the latter is driven by the rotation of the turbines, as set forth.

5. In a motor, the combination of the inner and outer turbines, one having external and the other internal buckets U-shaped in the direction of the axis of the wheel and having the delivery ends of the buckets of one wheel registering with the receiving ends of the buckets of the other wheel, means for supplying steam or other fluid to said buckets, the shafts supporting said wheels and mounted in fixed bearings, bevel gears or pinions on said shafts, a larger bevel-gear meshing with both of said pinions, and a power-transmitting shaft affixed to said larger gear, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 28th day of January, A. D. 1891.

GEORGE J. ALTHAM.

Witnesses:

C. F. BROWN,
ARTHUR W. CROSSLEY.