

R. DUDGEON.
ROTARY ENGINE.

No. 110,022.

Patented Dec. 13, 1870.

Fig. 1.

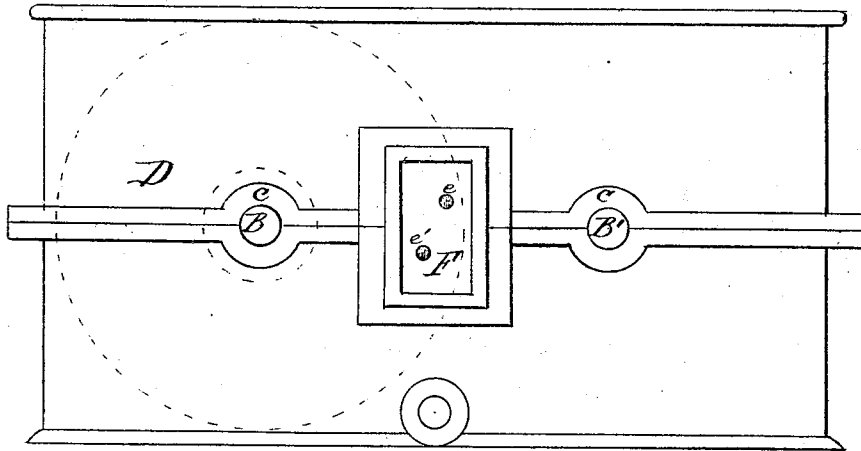
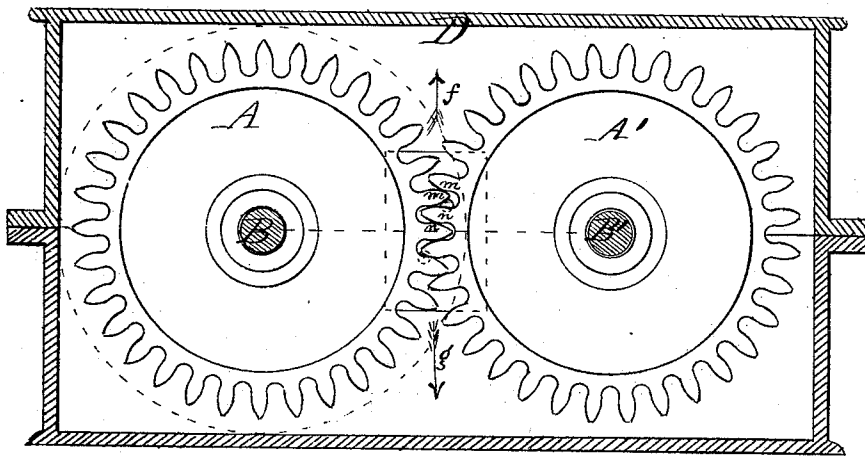


Fig. 2.



Witnesses
W. L. Bennett.
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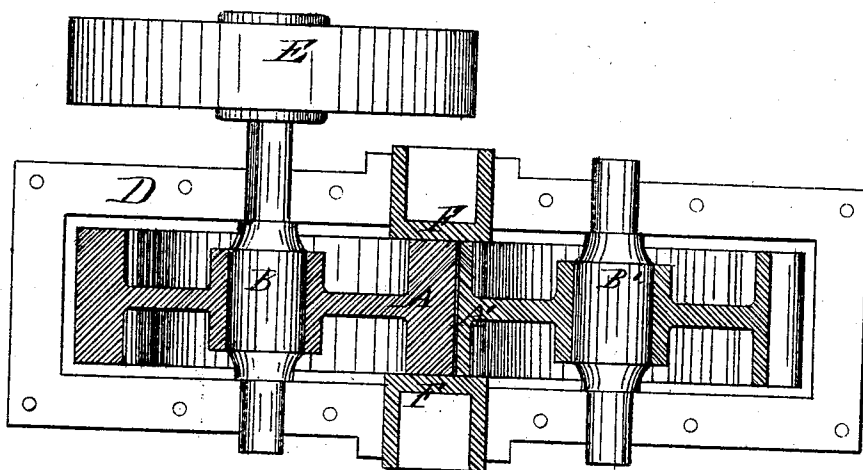
Inventor
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Fig. 3



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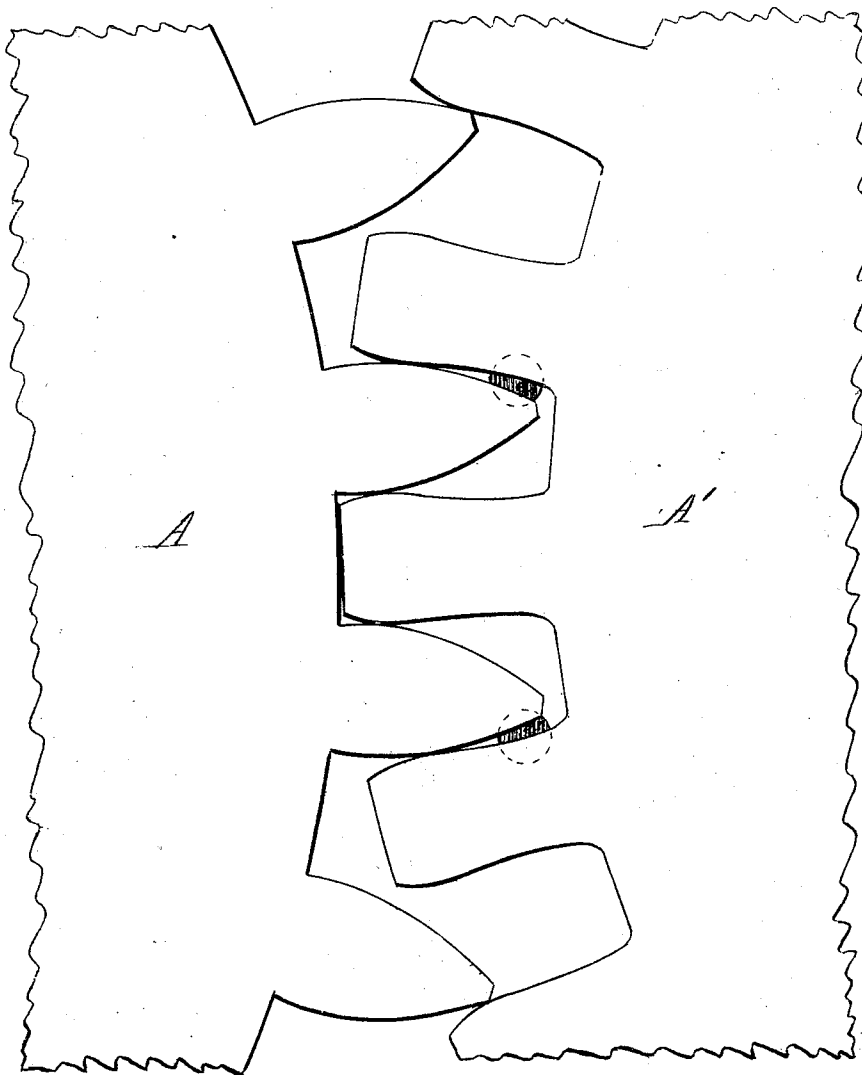
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Fig. 4.



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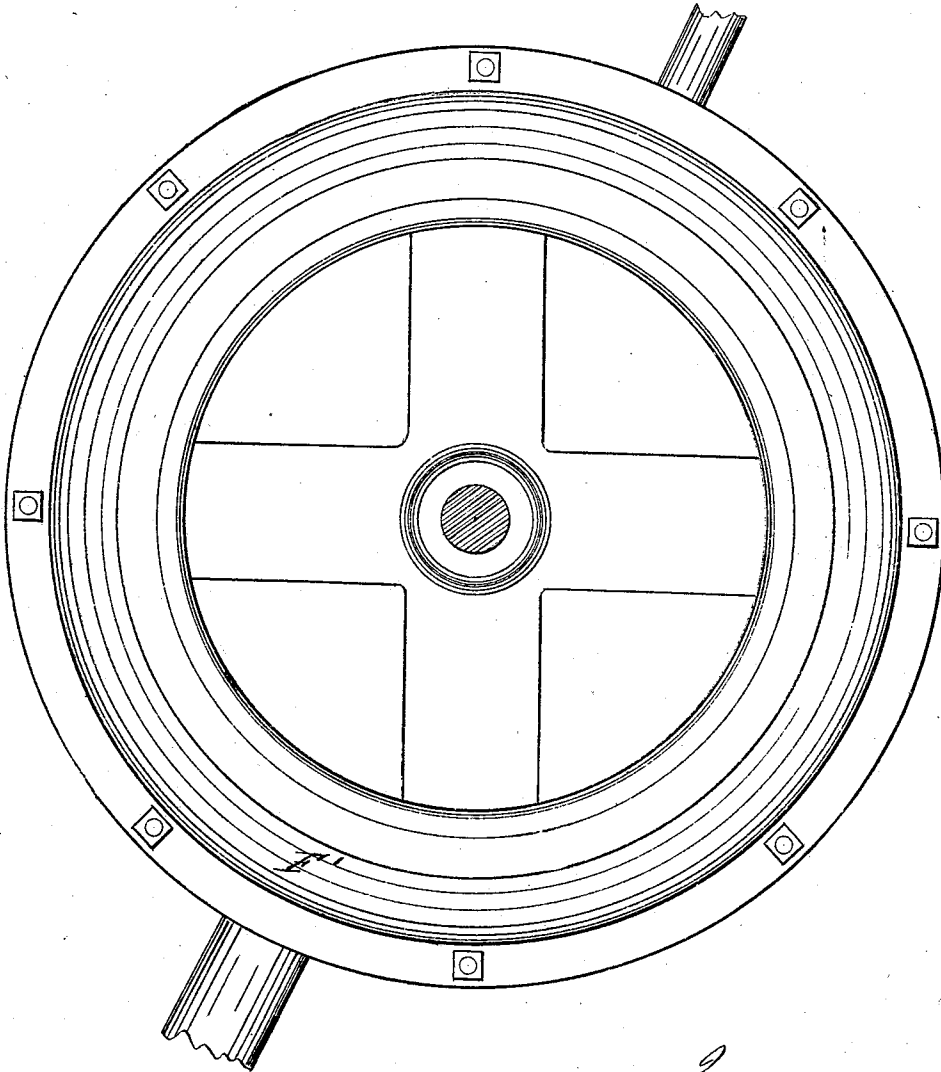
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Fig. 5.



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Fig. 6.

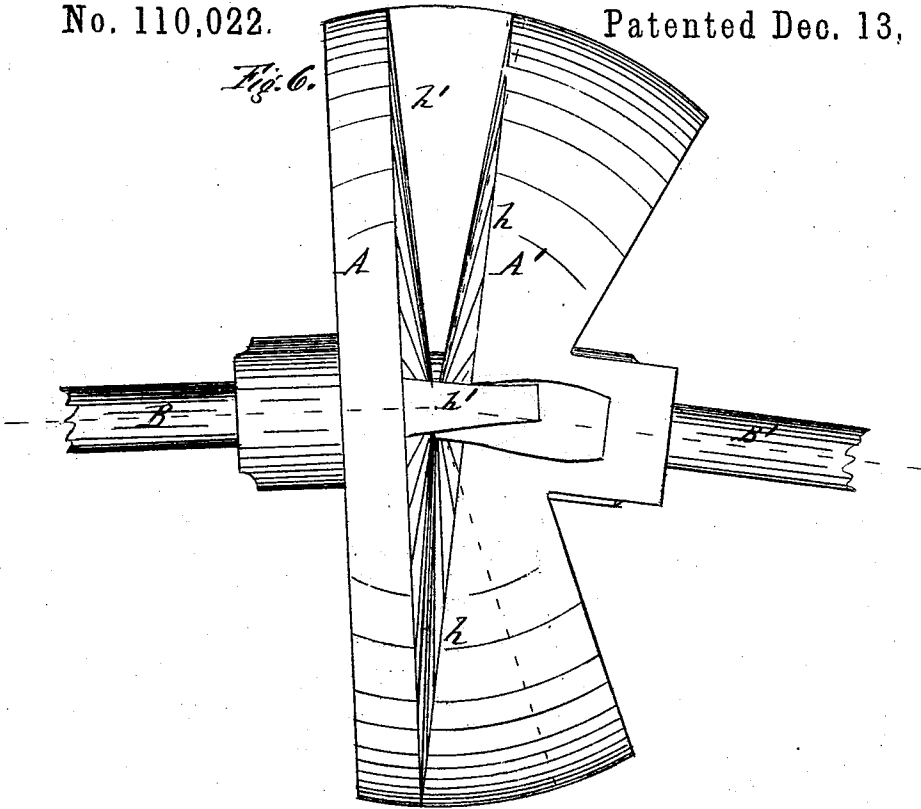
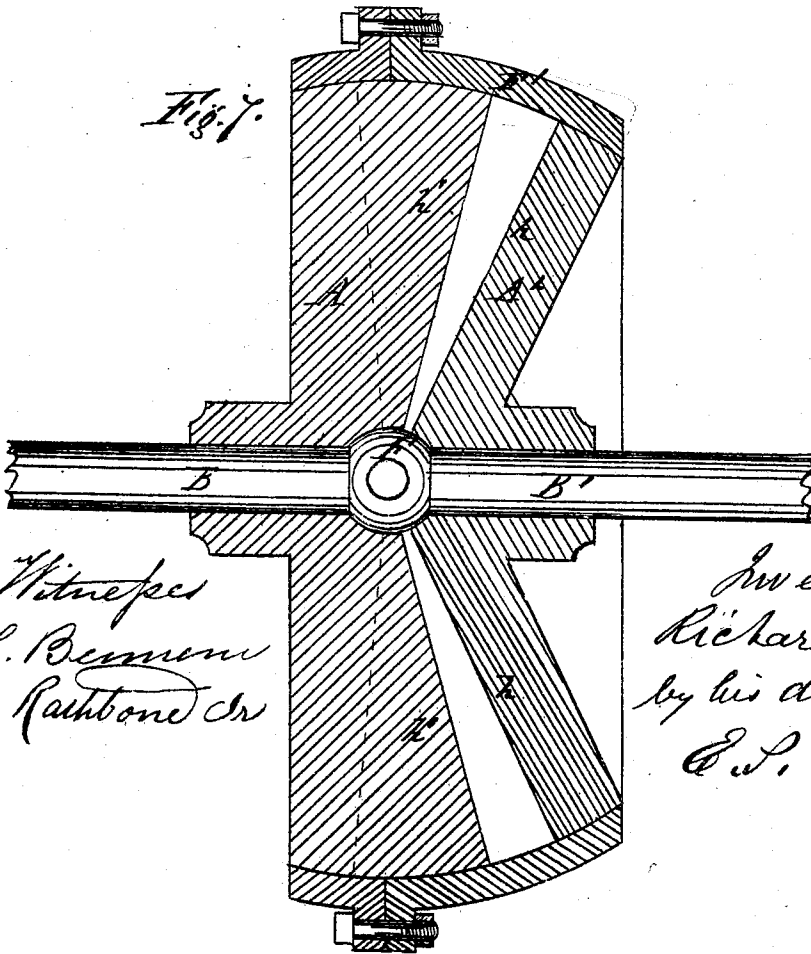


Fig. 7.



Witnesses
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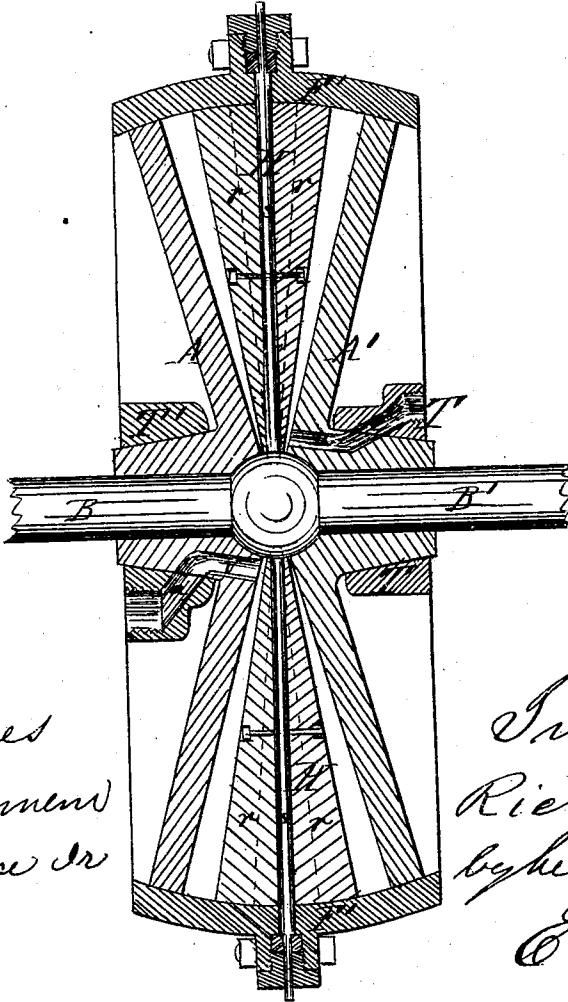
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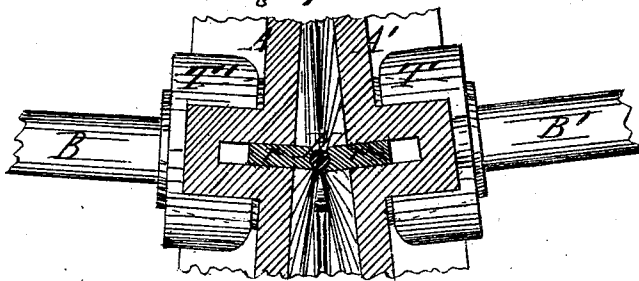
Fig. 8.



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Fig. 9.



United States Patent Office.

RICHARD DUDGEON, OF NEW YORK, N. Y.

Letters Patent No. 110,022, dated December 13, 1870.

IMPROVEMENT IN ROTARY ENGINES.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, RICHARD DUDGEON, of the city, county, and State of New York, have made an invention of a new and useful Rotary Engine; and that the following is a full, clear, and exact description and specification of the same.

The invention consists of an engine which is a combination of the following instrumentalities, viz., two cog-wheels geared together, cheek pieces to close the ends of the spaces between the cog-teeth, and an entry-port so arranged as to admit steam into the spaces between the cog-teeth at one side of the line connecting the axes of the two cog-wheels.

In this combination the practical effect of admitting steam at said entry-port is to cause the wheels to turn on their axes in a direction extending from the line of the axes toward that side thereof at which the steam is admitted.

As the wheels turn each pair of cog-teeth passes over the steam-port in succession, and acts as a valve to close the supply of the steam to the space between it and the preceding pair of teeth, and to admit steam to the space between it and the succeeding pair of teeth. Moreover, as the teeth gradually draw out of engagement during their recession from the steam-port, the space between the teeth is enlarged, and the steam inclosed in that space is permitted to expand progressively, the expansion being continued until the teeth recede sufficiently to form an opening, whereupon the steam exhausts.

The invention consists, further, of the combination of the said cog-wheels, cheek-pieces, and entry-port, with a second port, the two ports being arranged at opposite sides of the line drawn through the axes of the wheels, so that one port may be used to supply steam when the wheels are run in one direction, and the other port may be used when the direction of motion is to be reversed. This combination is advantageous because it permits the engine to be readily reversed by simply shutting off the supply of steam to one steam-port and admitting the supply to the other port.

The invention consists, further, of the combination of the said cog-wheels, cheek-pieces, and steam-port with an external casing to receive the exhaust steam, so that the said steam may be conducted to an exhaust-pipe, and be thereby discharged in any desired direction.

The invention may be embodied in various forms, a few of which are represented in the accompanying drawing as illustrations of the diversity of form which the invention may assume without a change in its principle.

Figure 1 represents a side elevation of one form of rotary engine embodying the invention.

Figure 2 represents a vertical longitudinal section of the same.

Figure 3 represents a plan of the engine with certain portions removed.

The two cog-wheels *A A'* are secured to shafts *B B'*, which are constructed to turn in boxes *c c* formed in the casing *D*, one of the shafts *B* extending sufficiently beyond the casing to receive a pulley-wheel, *E*, to which a belt may be applied for the purpose of transmitting the power.

The teeth of the two cog-wheels should be carefully scraped, so as to engage accurately throughout their whole length and prevent the passage of steam between their contiguous faces.

The sides of the wheels, as far as the ends of the teeth and the rims, should also be carefully faced off, so that these sides may move steam-tight against the adjacent faces of the cheek-pieces *F F*, which close the ends of the spaces between the teeth of the wheels.

These cheek-pieces *F F* are fitted into sockets formed for the purpose in the casing *D*, and are constructed to be pressed against and held in contact with the adjacent sides of the cog-wheels by means of set-screws, which are not shown in the drawing.

One of the cheek-pieces is perforated to form the steam-port *e*, by means of which steam is admitted into the adjacent space between the teeth of the two cog-wheels; the steam, being supplied to this port by means of a steam-pipe which leads from the boiler, is connected with the rear side of the port, and is provided with a throttle-valve.

The steam-port *e* is arranged to admit the steam into the said space when it is at one side of the dotted line *B B'*, drawn through the axes of the two cog-wheels, so that the aggregate of the portions of the surfaces of the cog-teeth *m m*, upon which the steam can act at one side of the said space, is greater than the aggregate of the portions of the surfaces of the cog-teeth *n n*, upon which the steam can act at the other side of that space. Hence, when steam is admitted into the space between the cog-teeth, the preponderating pressure upon the teeth *m m* will cause the wheels to turn in the direction of the arrow *f*.

As the wheels turn the space is gradually enlarged by the recession of the teeth from their engagement, so that the quantity of steam admitted increases until one of the succeeding set of teeth *n* passes over the steam-port and closes it for the first space.

The steam which is now within that space is permitted to expand by the continued enlargement of the space produced by the turning of the wheels, and expansion will continue until the teeth at the advancing side of the space recede sufficiently to form an opening and permit the steam to exhaust.

Meanwhile, the tooth which closed the steam-port

to the first space has passed by it sufficiently to open it between the succeeding space between the teeth, and this space in turn receives a supply of steam to act in the same manner as the supply to the preceding space.

The steam, operating in succession upon all the spaces between the teeth of the two wheels, produces a continuous rotary motion without jar, and this motion may be transmitted directly to the machinery to be driven by the belt-pulley E and a belt, or by other transmitting mechanism.

In order that the direction of motion of the engine may be reversed, a second steam-port, *e'*, is provided at the side of the line B B', opposite that at which the first steam-port *e* is situated.

This second port is supplied with steam by means of a steam-pipe connected with it and fitted with a throttle-valve; hence, when the engine is to be reversed the throttle-valve of the first steam-port is closed and that of the other is opened, whereupon motion commences in the direction indicated by the arrow *g* in fig. 2.

The form of the engine and the shape of the cog-teeth may be varied to a great extent without changing the principle of the invention. Thus, for example, the cog-wheels of the engine thus far described are plain spur-wheels, with the teeth of both wheels of the ordinary form. Teeth of different forms are represented in profile in Figure 4, in which figure the letters indicate the same parts as the corresponding letters in the previous figures.

In the form of engine represented at Figures 5, 6, and 7, the cog-wheels A A' have conical faces similar to those of beveled wheels.

The cheek-pieces F F' are of spherical form, the one, F, convex, and the other, F', concave; and the teeth are of different dimensions, the teeth *h* of one wheel having concave sides and being very broad, while the teeth *h'* of the other wheel are very narrow.

Wheels of this construction should not have less than eight teeth on each wheel; four only are represented upon the wheels in the drawing, in order that their forms may be more clearly seen.

Figure 8 represents a transverse section of another form of engine, and

Figure 9 represents the arrangement of the teeth in profile.

In this form the two toothed wheels A A' have beveled faces, and are both constructed with broad teeth similar to those, *h*, of one of the wheels of the last preceding engine.

As the teeth do not engage with each other, a separate piece, H, is provided, to engage simultaneously in the opposite cavities between the teeth of the two wheels.

This piece H consists of two wings, *r, r*, which are secured to a bolt, *s*, so as to change their relative positions like the two parts of a hinge.

The bolt *s* connects the piece H with the spherical

casing F', which forms the cheek-piece at the outer ends of the cog-teeth.

The steam is supplied in this case by a steam-port, *e*, formed in a stationary hub, T, that surrounds one of the wheel-hubs, and the exhaust takes place through a similar port, *e'*, formed in a stationary hub, T', surrounding the hub of the other wheel, A.

The space between each set of teeth is connected with the steam-port by means of a passage, *u*, and with the exhaust-port by means of a passage, *v*. In this case the spherical cheek-piece F revolves with the wheels.

The drawing, fig. 8, represents a section of the engine taken in a plane which is at right angles to the plane in which the axes of the two wheels diverge.

In practice, I propose to use a slide-valve operating against the back face of the cheek-piece to reverse the engine, the valve being so arranged that when it is moved to the greatest extent in either direction it will open a port at one side of the line joining the centers of the wheels and close the port at the opposite side of that line, and when the valve is in its central position both ports will be closed.

The engine may be used as a condensing-engine as well as a high-pressure engine. In the former case the exterior casing may be connected with the condenser, or the condenser may be connected by a pipe with a port formed in one of the cheek-pieces at the side of the line joining the centers of the wheels opposite the side at which the steam-port is arranged.

I also propose to employ the engine as a pump, by connecting one or more of the steam-ports in the cheek-pieces with the source from which the water is to be taken.

Having thus described several modes in which I have contemplated the application of the principle of my invention, I declare that I am aware that cog-wheels have been employed in the construction of many rotary engines long previous to my invention, and therefore I do not claim them separately from the other members, which are required to constitute my new combination; but

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, substantially as before set forth, of two cog-wheels, the cheek-pieces, and the entry-port, arranged to admit steam, as described.

2. The combination, substantially as before set forth, of the two cog-wheels, the cheek-pieces, and two ports, arranged as described.

3. The combination, substantially as before set forth, of the two cog-wheels, the cheek-pieces, the entry-port, and the exterior casing.

In witness whereof, I have hereto set my hand this 18th day of April, 1870.

RICHARD DUDGEON.

Witnesses:

WALTER BUCHANAN.

JOHN F. DETMAR.