(No Model.) 2 Sheets—Sheet 1.

J. MORGAN.

ROTARY ENGINE OR PUMP.

No. 453,652. Patented June 9, 1891.

Fig. 2.

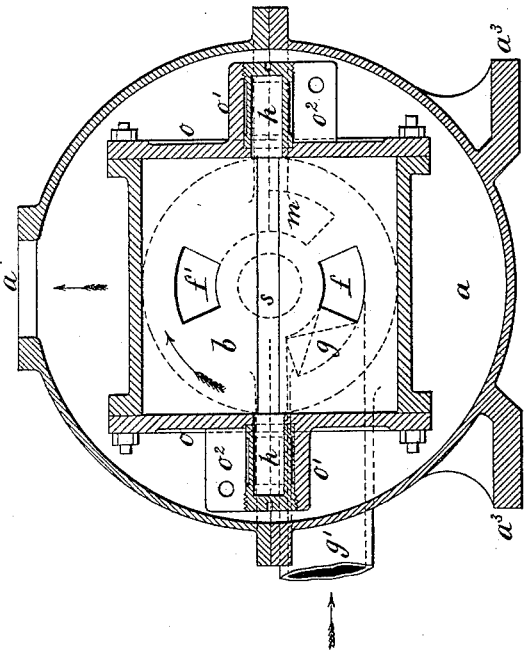
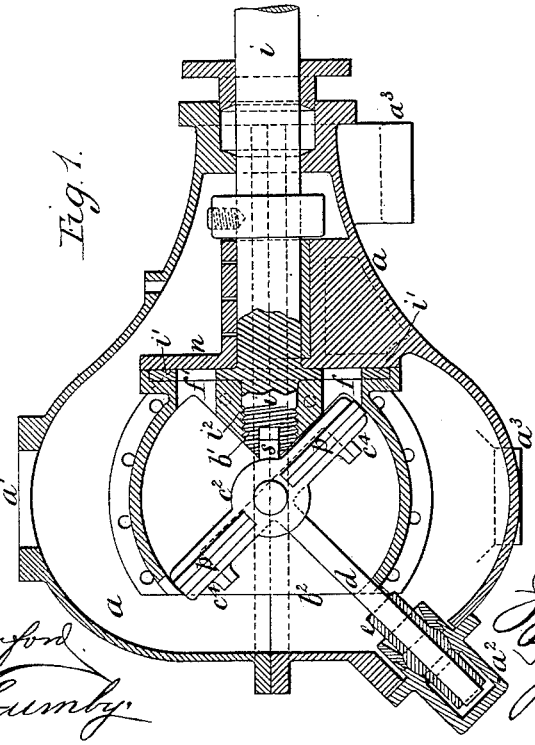


Fig. 1.



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Inventor:
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(No Model.) 2 Sheets Sheet 2.

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Fig. 6.

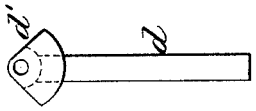


Fig. 5.

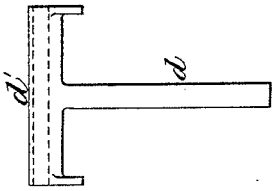


Fig. 8.

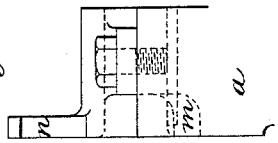


Fig. 4.

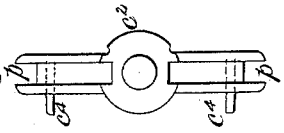


Fig. 7.

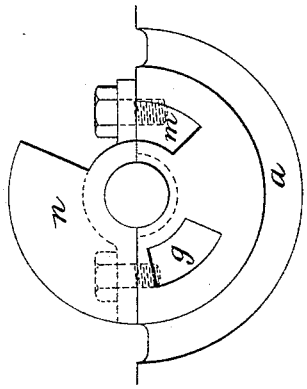
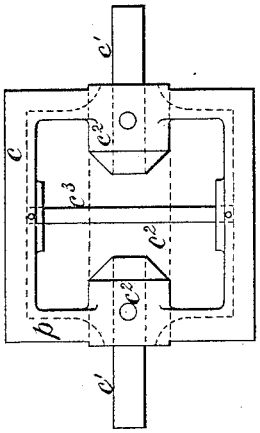


Fig. 3.



Witnesses:
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Dennis Sumby.

Inventor:
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UNITED STATES PATENT OFFICE.

JOHN MORGAN, OF MANCHESTER, ENGLAND, ASSIGNOR TO RICHARD HAMMERSLEY HEENAN, OF SAME PLACE.

ROTARY ENGINE AND PUMP.

SPECIFICATION forming part of Letters Patent No. 453,652, dated June 9, 1891.

Application filed September 17, 1890. Serial No. 365,214. (No model.)

To all whom it may concern:

Be it known that I, JOHN MORGAN, a citizen of England, residing at No. 2 Turkey Lane, Queen's Park, Manchester, in the county of Lancaster, England, have invented new and useful Improvements in Rotary Engines and Pumps, of which the following is a specification.

My invention relates to a construction of rotary engine in which the rotary motion of the engine-shaft is produced by the action of the steam in entering spaces in a casing formed between a revolving part fixed to the said shaft and a part or piston carried by an axis placed at an angle to the shaft.

I will proceed to describe the construction of the said improved engine with reference to the accompanying drawings, in which—

Figure 1 shows a longitudinal section, and Fig. 2 a cross-section, of the complete engine; Fig. 3 a plan, and Fig. 4 an end view, of the piston detached; Fig. 5 a plan, and Fig. 6 a side view, of the piston rod or shaft detached; Fig. 7, a front view, and Fig. 8 a side view, of the stationary slide-valve face.

Within the closed casing *a* is a cylinder *b*, fixed to the engine-shaft *i* in such a position that its longitudinal axis is at right angles to that of the shaft. On the shaft *i* is formed or fixed a plate *i'*, and against this plate is fixed a flat face on the cylinder *b*. The inner side of the flat face is made with a V-shaped projection, and in it are formed two ports *f f'*, which are also formed through the plate *i'* and which correspond to ports *g m*, formed in the face *n* of the casing *a*, of which ports *g* communicates with the steam-supply pipe *g'*, while *m* communicates with the interior of the casing *a*, which communicates at *a'* with the exhaust or with the steam-supply of a second engine working compound therewith. The cylinder *b* is by preference screwed with a threaded hole onto the threaded end i^2 of shaft *i*, and is secured in position on disk *i'* by setting-screws, the outer face of the disk *i'* forming a revolving valve-face working against the fixed valve-face *n* of the casing.

The ends of the cylinder *b* are closed by covers *o o*, having at the axial line of the cylinder projecting sockets *o'*, lined with bushes *h h*, into which fit the trunnions *c'* of the piston *c*. This piston is of rectangular form, as shown at Figs. 3 and 4, with a groove *p* all round for the reception of spring-packing, which fits closely against the sides and covers of the cylinder. It has a cylindrical boss c^2 for the reception of the trunnions *c'*, which are fixed therein by keying-pins, as shown. On the side of the piston next the ports *f f'* this boss extends right across the piston, as shown in dotted lines at Fig. 3, and into a groove in the apex of the V-surface *b'* is fitted a spring-packing *s*, having its edge formed to fit closely against the cylindrical surface of the boss *s*, and thus form a steam-tight separation between the spaces formed on either side of the boss by the surfaces of the piston, the cylinder, and the covers. On the other side of the piston the bosses c^2 extend only part of the way across to admit between them of the attachment of the piston rod or shaft *d*. This is held in the angular position shown at Fig. 1 by fitting with its end into a bush *e*, held by a spherical outer surface in a socket a^2, formed or fixed on the casing *a*.

The other end of the rod *d* is formed with a cross-head *d'*, of the shape shown more clearly at Figs. 5 and 6, which cross-head has a hole formed through it, through which passes a cylindrical rod or pin c^3, fixed transversely across the piston, as shown at Fig. 3. The cross-head *d'* fits with flanged ends between flanges c^4, formed on the piston, so that while the piston in being carried round by the revolving cylinder is free to alter its angular position relatively to the rod *d* in turning on the pin c^3 in a plane passing through the trunnions *c'*, the rod cannot shift relatively to the piston in the direction of the pivot-rod c^3. The cylinder *b* is formed with an opening at b^2 sufficiently large to allow of its free rotation with the piston-rod passing through it in the angular position shown.

From the above-described construction it will be seen that the action of the engine is as follows: Assuming the cylinder and piston to be in the relative positions shown in Fig. 1, and that rotation of the cylinder and shaft is taking place in the direction of the

arrow, Fig. 2, the port *f* has just opened to the steam-inlet port *g*, and consequently steam entering between the surface of the piston and the lower angular surface *b'* of the cylinder, which are close together, the thrust exerted by the steam in tending to enlarge the space between the said surfaces will force the cylinder to revolve in the direction of the arrow. Steam will continue to enter until the right-hand edge of port *f*, Fig. 2, has passed beyond the upper edge of port *g*, whereupon the supply being cut off the steam will continue to act by expansion until by the rotation of the cylinder the port *f* will have reached the uppermost position *f'*, Fig. 2, at which time the space between the piston and cylinder surfaces will have expanded to the full extent shown in the upper space at Fig. 1. On the cylinder moving beyond this position the edge of the cylinder-port will move beyond the edge of the plate *u*, and consequently the steam will escape from the said space into the casing *a*, from which it will pass to the condenser or atmosphere through the opening *a'*. At the same time the port *f'*, which will have arrived in the lowest position, will have begun to take steam from port *g*, and the above-described action will be repeated.

The casing *a* is divided longitudinally into two halves bolted together, as shown. Its lower part is charged with lubricant, and the sockets *o'* of the trunnions are made with a longitudinal slot on one side with wings o^2, so that on the rotation of the cylinder the wings o^2 dip into the lubricant and lift up a certain quantity, which passes through the slot to the interior of the bearing, thus keeping the trunnions well lubricated. The lubricant will also find its way into the socket a^2, so as to keep the rod *d* well lubricated. The casing *a* is supported on feet a^3 a^3.

It will be evident that the above-described engine, instead of acting as a motor, can also be used as a pump by driving the shaft *i*.

Having thus described the nature of this invention and the best means I know for carrying the same into practical effect, I claim—

1. In a rotary engine or pump, the combination of an outer casing having a stationary valve-face provided with ports, an engine-shaft working in bearings in said casing and carrying a fixed plate provided with ports, an inner casing fixed to the engine-shaft in such position that its longitudinal axis is at right angles to the axis of said shaft, and having on one side a flat valve-face in contact with the plate on the shaft and provided with corresponding ports, and a piston contained in the said inner casing and having trunnions fitted in bearings in said casing at right angles to the axis of the engine-shaft and provided with a rod that is situated at an angle to the engine-shaft and carried in a stationary bearing in the outer casing, substantially as described.

2. In a rotary engine or pump, the combination of an engine-shaft *i*, working in bearings in an outer chamber or casing *a*, a cylinder *b*, fixed to the shaft with its axis at right angles to the latter and working with a slide-face *i'*, having ports *f f'* in contact with a stationary slide-face *n*, having inlet and discharge ports, a piston *c*, working with trunnions *c'* in bearings in the axial line of the cylinder, and a rod *d*, passing through an opening b^2 in the cylinder, connected at one end to the piston by a hinged connection *d' c'* and held at the other end in a socket a^2 of the casing *a*, so as to lie at an angle to the shaft *i*, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 3d day of September, A. D 1890.

JOHN MORGAN.

Witnesses:
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