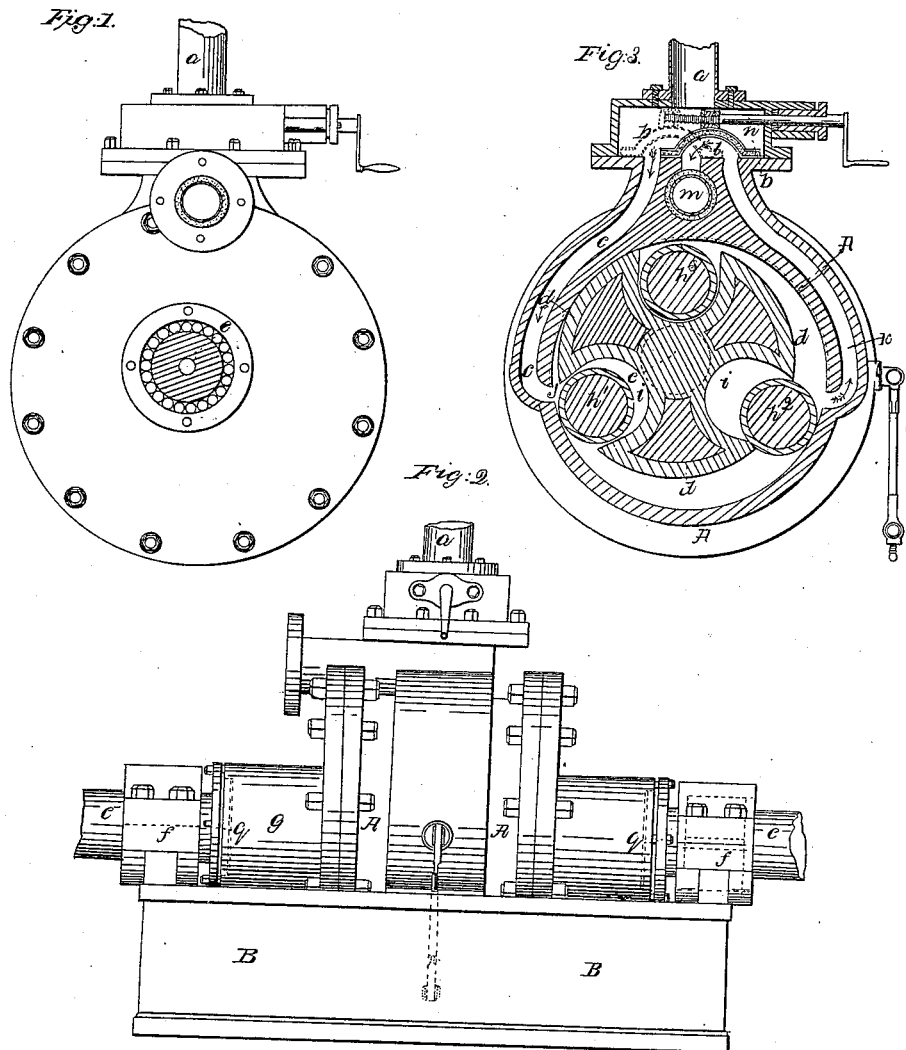


J. T. & B. BEALE.
ROTARY STEAM ENGINE.

No. 2,669.

Patented June 11, 1842.



Witnesses:
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UNITED STATES PATENT OFFICE.

J. T. BEALE AND BENJN. BEALE, OF EAST GREENWICH, ENGLAND.

ROTARY STEAM-ENGINE.

Specification of Letters Patent No. 2,669, dated June 11, 1842.

To all whom it may concern:

Be it known that we, JOSHUA TAYLOR BEALE and BENJAMIN BEALE, subjects of the Queen of Great Britain, and now residing at East Greenwich, in the county of Kent, in the Kingdom of England, engineers, have invented or discovered a new and useful invention of certain improvements in engines to be actuated by steam or other vapor, which may also be employed for raising water; and we do hereby declare that the following is a full and exact description thereof.

Our invention relates principally to those peculiar constructions of engines commonly called or known by the name of rotatory engines.

The improvements consist, firstly, in the novel arrangement or construction of the internal or working parts of such engines by means of which we are enabled by the reduction of friction to obtain (if required) an immense velocity when used as a steam engine without the liability of the engine becoming deranged or put out of order; secondly, in the adaptation or application to certain parts of our improved engines (and also to certain parts of other steam engines of different constructions) an imperfectly conducting substance the object of which is to effect a considerable saving or economization of the fuel employed in generating steam. These improved engines will from their lightness and compactness be found peculiarly adapted to all the purposes of locomotion, whether upon railways, common roads, or for steam navigation, &c., but in order that our invention may be clearly understood, and that the novel features may be more evidently seen, we have appended hereto a sheet of drawings showing our improvements in several views and sections of engines.

Figure 1 represents an end elevation of one of our improved engines; Fig. 2 a side view of the same; Fig. 3 being a transverse section taken through the middle of the engine.

A, A, A, is a hollow cylinder within which what we call a drum wheel revolves eccentrically carrying several cylindrical pistons, but we do not confine ourselves to the number which are to be actuated by the power of steam or other fluid when so used. Suppose the steam from a boiler is conducted by a pipe *a* into the valve box *b* and thence

passes by the induction passage *c* to the interior of the cylinder. The drum wheel *d* is fixed upon an axle *e*, *e* which passes through two circular apertures in the ends of the cylinder and is properly supported on stationary bearings *f*, *f* and packed in sockets *g*, *g* contiguous to the ends of the cylinder so as to render it steam tight. The apertures in the ends of the cylinders through which the axle *e* passes are eccentric to the interior of the cylinder, so much so as to cause one part of the periphery of the drum wheel *d* to work against a curved part prepared for it as at *L*, *L*, in the interior of the cylinder and thereby to produce a steam stop, consequently the steam way within the cylinder is of a crescent form. Longitudinal recesses *i*, *i*, *i*, are made in the drum wheel *d* for the reception of the loose rollers or cylindrical pistons *h*, *h*, *h*. These cylindrical pistons have no axles but are made perfectly flat at their ends and of such lengths as will enable them to fit accurately against the internal ends of the cylinder steam tight but yet capable of sliding and revolving. The cylindrical pistons *h* are of such diameters as will allow them respectively to pass freely into recesses *i* and the depths of the recesses are such as to permit the cylindrical pistons to recede within the curve of the periphery of the drum wheel.

The internal construction of the engine having now been described its mode of operating will be readily understood principally by reference to the section Fig. 3. Steam of any required pressure admitted into the engine by the induction passage *c* will first occupy the small part of the steam way marked *j* and insinuate itself into the recess *i* behind the piston, the piston fitting the recess loosely, and it will also force the piston *h*¹ tightly against the opposite side of the recess *i*, and against the internal periphery of the cylinder, forming at those parts steam tight junctions. The force of the steam then acting will cause the drum wheel *d* to be impelled around part of a revolution until the piston *h*¹ arrives at the situation of *h*². By this time a second piston, as *h*³, will have been brought into the situation of the piston *h*¹ and will there be acted upon in like manner and consequently continue the rotation of the drum wheel. When the piston *h*² passes the opening of the eduction passage *k* the volume of steam

which had been acting upon it immediately escapes up the passage *k* through the slide valve *l* into the eduction pipe *m* and thence into the atmosphere or to a condenser. It is scarcely necessary to say that a rotary power having been thus obtained that power may be communicated from the axle *e* for the purpose of producing locomotion or for the driving of other machinery.

It may here be remarked as a consequence of this construction of engine that the drum wheel in revolving causes the cylindrical pistons not only to fall by their gravity against the internal periphery of the cylinder but to be thrown outward by the centrifugal force and thereby to be kept at all times in contact with the surface of the cylinder which is further aided by the pressure of the steam acting against the pistons and they are thereby kept steam tight. When the engine is used as a pump the rollers ought to be $\frac{1}{8}$ of an inch less in diameter than shown in the drawings.

The valve *l* and eduction steam pipe *m* are covered or surrounded as seen in Fig. 3 with some material which is a bad conductor of heat such as air, sawdust, wood, asbestos or other suitable substance. The object of thus clothing this part of the engine is for the purpose of preventing the eduction steam from carrying off the heat or reducing the temperature of the induction steam passing from the boiler through the valve box into the cylinder. For unless some such precaution is taken it will be found that the temperature of the steam will become very much reduced. In reciprocating engines both sides of the piston and the internal ends of the cylinder may be similarly clothed for a like purpose.

When it is required to reverse the action of the engine, which is often the case when employed for marine or locomotive purposes it will only be necessary to turn the screw shaft *n* by means of the handle and the valve will be brought into the position shown by dots, when the steam will be supplied to the cylinder on the opposite side through the pipe *k* and make its exit through the pipe *c* in the contrary direction of the arrows thus reversing the motion of the engine. The bosses *g*, *g* and the bearings *f*, *f* are constructed in the manner shown in Fig.

1 in which *e* represents the main shaft of the engine surrounded by a sufficient number of small loose rollers all accurately turned to one size. These rollers are placed nearly in contact completely round the main shaft and prevented from escaping by end plates *q*, *q* which are properly secured as seen in Fig. 2 and the joint is made perfectly steam tight, by means of packing.

The bearings *f*, *f* of the engine are constructed in exactly the same manner as the bosses *g*, *g* and as the main shaft revolves it causes the small rollers to revolve also and be carried round with it thereby greatly reducing the friction and preventing the bearings from wearing so fast as when constructed in the ordinary manner the wearing surfaces being so much more extended.

In order to prevent any straining of the standard or base framing *B*, *B*, we have not fixed the working cylinder firmly to the base frame but hold it on one side by a jointed rod *o* (see Figs. 2 and 3) one end of which being attached to the cylinder, and the other end fixed to the framing or otherwise secured keeps the cylinder from turning and yet allows a small elastic action sufficient to prevent any serious strain.

In conclusion we desire it to be understood that the particular features of novelty which we claim are—

1. The adaptation of cylindrical rolling steam stops or pistons, in whatever way they may be used in rotatory engines or rotatory pumps, provided their construction and operation be substantially the same with that above set forth.

2. The introduction of nonconducting or imperfectly conducting substances between or around the eduction passages for the purpose of preventing the eduction steam abstracting heat from the induction steam and thereby economizing fuel.

In witness whereof we, the said JOSHUA TAYLOR BEALE and BENJAMIN BEALE, have hereunto set our hands and seals this third day of November one thousand eight hundred and forty one.

J. T. BEALE. [L. s.]
BENJN. BEALE. [I. s.]

Witnesses:

J. W. MOFFATT,
H. WRIGHT.