(No Model.)

A. CLELAND.

ROTARY ENGINE.

No. 455,863. Patented July 14, 1891.

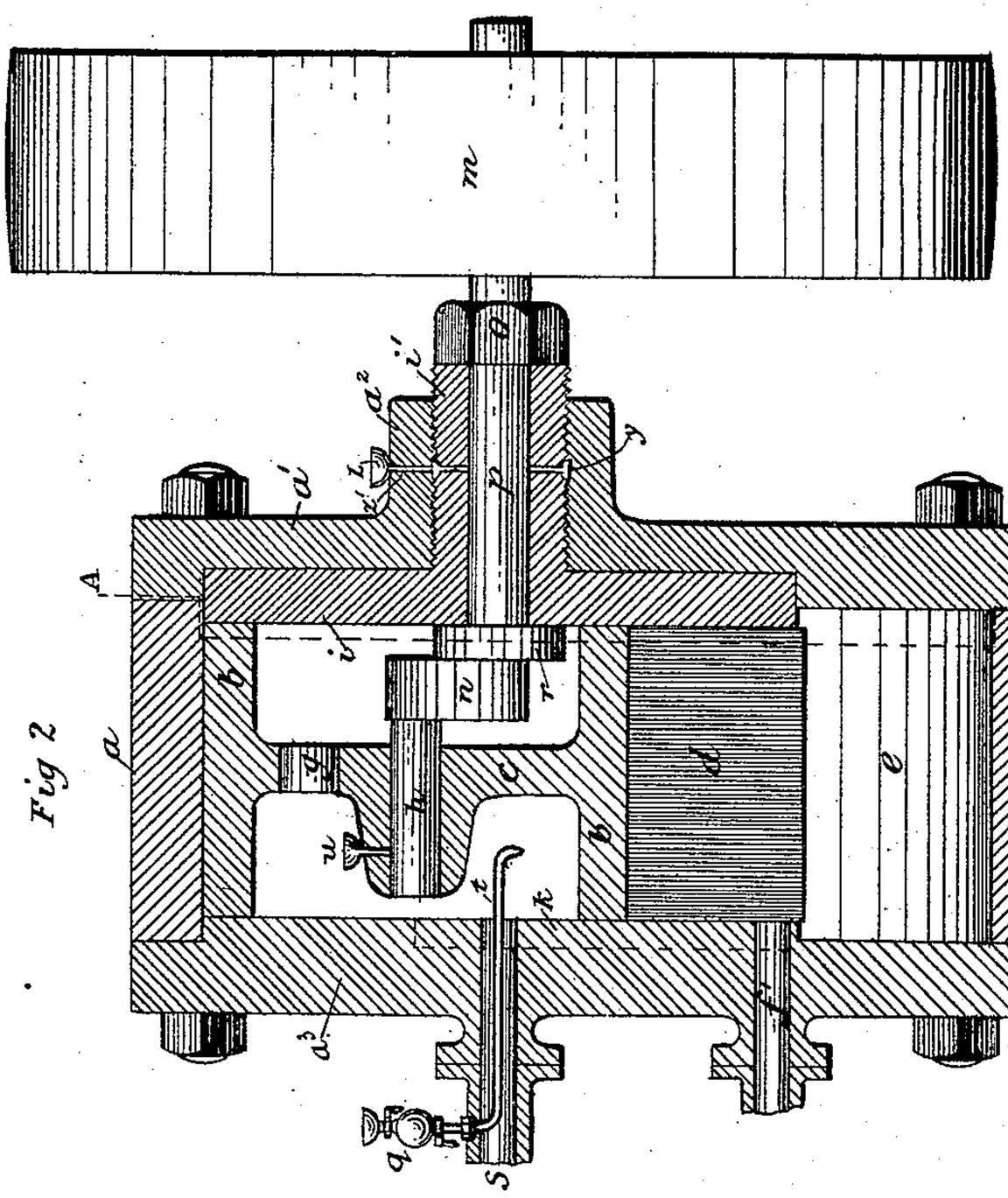

Fig 2

Fig 1

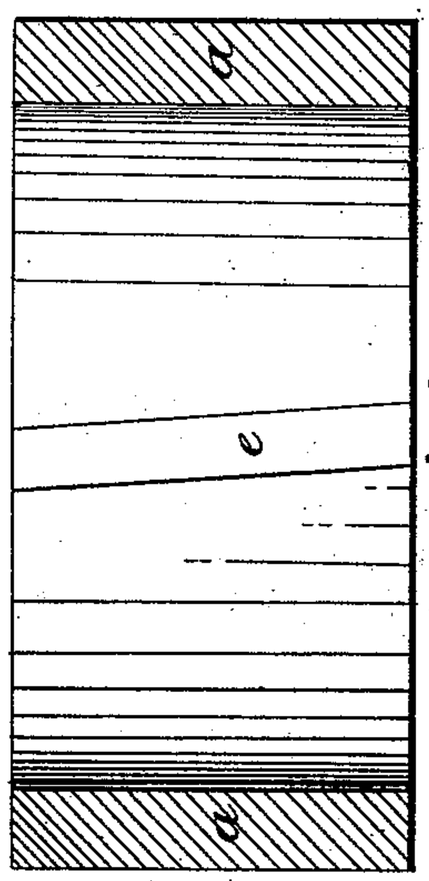

Fig 3

Witnesses:-
G. G. Turri
W. Hinton

Inventor
Alexander Cleland.

UNITED STATES PATENT OFFICE.

ALEXANDER CLELAND, OF DONALD, VICTORIA.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 455,863, dated July 14, 1891.

Application filed November 28, 1890. Serial No. 372,976. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER CLELAND, Presbyterian minister, of the Manse, Donald, in the county of Kara Kara and Colony of Victoria, have invented certain new and useful Improvements in Rotary Motive-Power Engines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same.

My invention has for its object the construction of a rotary engine for producing motive power, capable of being propelled by steam, compressed air, water, or (with slight modifications, which will be obvious) by the explosive force of gas, and which possesses such simplicity and efficiency as to constitute an improvement on the engines of the same class which are known to the inventor as hitherto designed.

Referring now to the accompanying sheet of drawings, which illustrate my invention and form a part of this specification, Figure 1 represents a view in vertical section of my rotary engine through the line A B on Fig. 2 as seen facing the piston. Fig. 2 represents a view in transverse vertical section of the engine through the line C D in Fig. 1. Fig. 3 shows a plan view of the interior of the cylinder, showing the diagonal recess for the abutment.

In all the drawings the same letters of reference are used to denote corresponding parts.

In my invention a cylindrical piston *b*, hollow at each end, with a diaphragm *c* vertically placed across the interior, revolves within an outer cast-iron case *a*, of hollow cylindrical form. One end of the case is accurately closed by a brass disk *i*, having a hollow cylindrical shank *i'* projecting outward and forming a bushing to the shaft *p*, which is outwardly connected to suitable gearing for the work required and is inwardly connected to one end of a U-shaped crank *n*, the other end of which has a crank-pin *h* attached, which passes through the center of the diaphragm *c* of the piston *b*. The pitch of the crank *n* is finely adjusted by moving outward by means of a screw-bolt *x* a wedge *w*, which is fitted into the U-shaped space of the yielding crank *n*, so as to maintain a line of contact between the exterior of the cylindrical piston *b* and the cylindrical interior surface of the casing *a*. The shank *i'* of the brass cylinder end *i* is exteriorly threaded with a male screw-thread, which engages a female screw cut on the interior of a hollow lug a^2 on the cast-iron outer cylinder-cover, the end of the shank at *o* being shaped like a hexagon nut, and projecting from the lug *i'* when the casing is bolted together. By this means the brass end *i* can be adjusted in the casing to take up wear caused by the working of the piston *b* and to insure steam-tight fitting of said piston, the wear circumferentially being overcome by the adjustment of the crank *n*, as aforesaid. The diaphragm *c* has several perforations *g g g*, sufficient to allow free passage of steam from the induction end of the casing to the other end, so that within the piston *b* there is no residual pressure in any direction. Extending across from end to end of the piston *b* and cylinder *a* and attached rigidly to the former, preferably in a plane diagonal to the axis, a blade *d* or abutment is placed. This blade is slightly longer than the stroke of the crank *n*, and its end passes into a diagonally-cut recess *e* in the outer cylinder *a*, said recess being widened below to allow the blade to oscillate as it rises and falls with the revolution of the piston *b*. The effect of placing the blade diagonally is to cause the circumference of the piston *b* to bear outwardly against interior of the casing *a* throughout its revolution. At the fixed end of the casing a^3 an induction-pipe *s* is fitted centrally to the cylinder *a* to admit steam to the interior of the hollow piston *b*, and in the same end of the casing a groove *k*, in the form of a circular arc, is cut, having a radius equal to that of the piston *b* for the admission of steam from the interior of the piston *b* into the expansion-chamber. The main shaft *p* of engine has an internal collar *r* turned upon it to work against the brass end *i* of casing *a*. The steam pressing this outward gives a steam-tight action. The cut-off is regulated by the length of the aforesaid arc or groove *k*. The end of the piston *b* completely closes the groove against the passage of steam before each revolution begins. On the other side of the blade *d* to which is the said groove *k* I place the exhaust-port *f*, which is cut in the

same immovable end of the casing a^3, in the shape of a discontinuous semi-crescent-shaped prolongation of the cut-off groove k, but, unlike said groove, going through the casing end to the exterior exhaust-pipe f'. The shape is so designed that the port is entirely covered by the rim of flat piston b at the end of the stroke and begins to be freed by the rim of said piston b for eduction of steam as the line of contact between piston b and casing a has passed the recess e, in which the abutment-blade d works. By delaying the exhaust to this moment the steam in the recess e is saved from exhausting. At the same moment also the ends of the arc-shaped cut-off groove k are opened, one into the interior of the piston b, where the live steam is, and the other into the expanding-chamber, thus beginning a new cycle.

The internal mechanism is oiled by means of an oil-duct t, which is connected exteriorly with an ordinary cylinder oil-cup q, which duct traverses the induction-pipe s and projects into the interior of the piston b. Besides generally oiling the interior, oil may, when the piston b is at its lowest position, be dropped from the end of this duct into a cup u, fixed on the bearing of the crank-pin h. The brass bearing i' of the shaft p is oiled by admitting oil from an oil-cup z through a vertical passage bored in the iron lug into an annular oil-passage in the brass shank i', from which passages lead inward radially to the shaft p. To allow for the brass being moved forward at intervals, the annular passage is made sufficiently wide by cutting away several of the screw-threads.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a rotary engine, a cylinder provided with the induction-port s and a suitable eduction-port, in combination with a piston having a central diaphragm with spacious chambers at its opposite sides and having apertures therein, as set forth, and provided with a single abutment attached thereto, and a crank-pin working in a recess of the casing and actuating the main shaft, all substantially as set forth.

2. The U-shaped crank having a wedge and screw fitted thereto, combined with crank-pin h, whereby the circumference of the piston is adjusted and made steam-tight, substantially as set forth.

3. A piston-cylinder provided with a fixed end a^3, having therein a central induction-port s and an eduction-port f', the arc-shaped groove k, and a semi-crescent-shaped groove, all substantially as set forth.

4. The fixed cylinder end a^3, having the interior narrow arc-shaped groove k for steam-passage, located as set forth, said groove having the same radius as the piston, combined with a piston having a flat rim which acts as a cut-off and regulates the cut off of steam through the port p, all substantially as set forth.

5. In combination with the piston having a flat rim and an abutment rigidly attached thereto, a cylinder end provided with the described interior narrow arc-shaped groove k on one side of said abutment and on the other side of this abutment and in the same circle with groove k, but not connected therewith, a semi-crescent-shaped groove or exhaust-passage, said passage being covered by the rim of the piston at the end of each stroke, substantially as shown and described.

6. In a rotary engine, the combination, with the cylinder, of the described means for lubricating from the same source both the chambered piston and the crank-pin inclosed therein, consisting of the combination of the oil-duct leading axially into the cylinder and into the piston-chamber, and an oil-cup within such chamber or recess, supported as described and located to receive its oil from said duct and to communicate it to the crank-pin, all substantially as set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ALEXANDER CLELAND.

Witnesses:
G. G. TURRI,
W. HINTON.