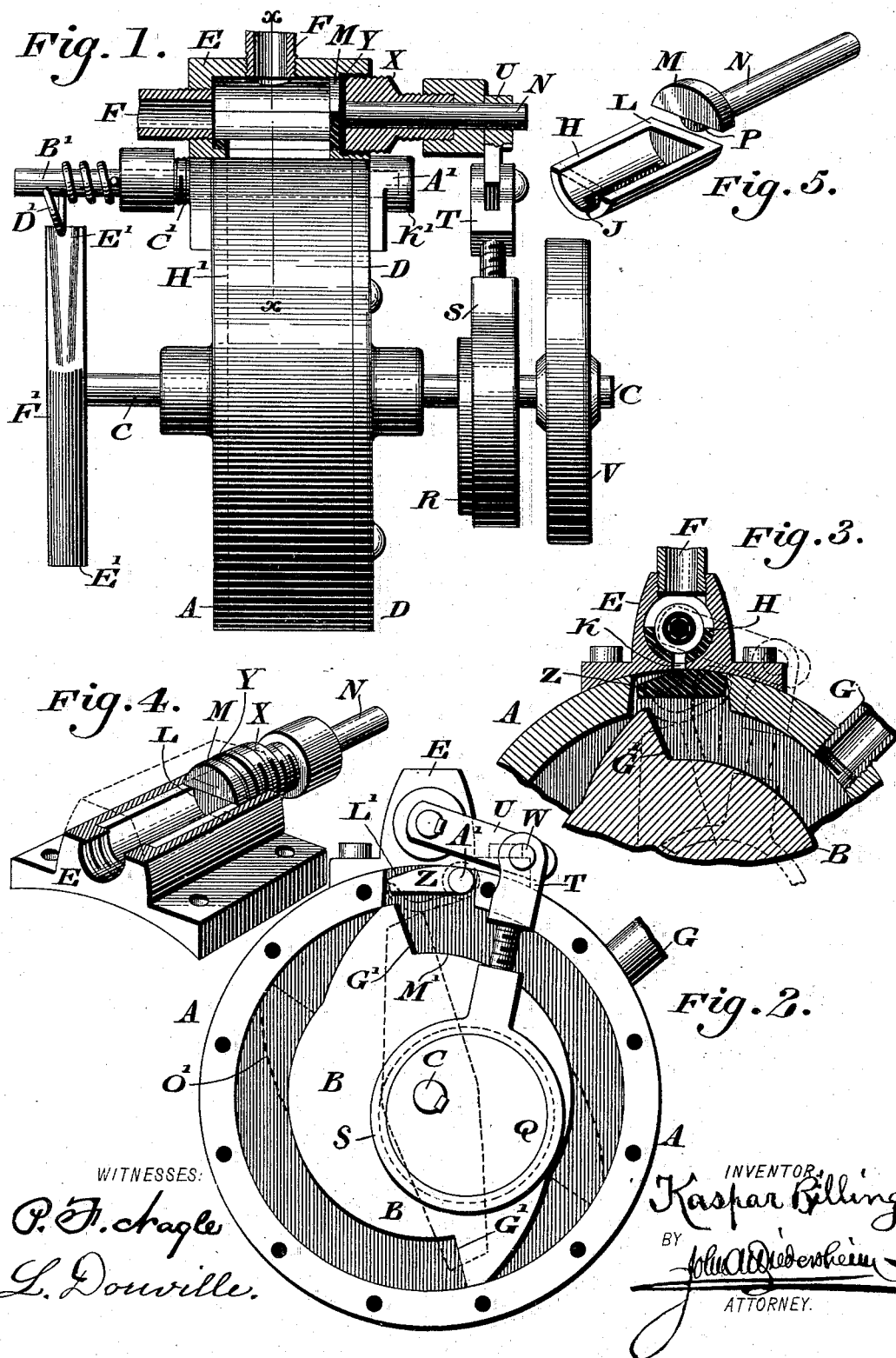


(No Model.)

K. BILLING.
ROTARY ENGINE.

No. 524,882.

Patented Aug. 21, 1894.



WITNESSES:

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ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 524,882, dated August 21, 1894.

Application filed April 16, 1894. Serial No. 507,680. (No model.)

To all whom it may concern:

Be it known that I, KASPAR BILLING, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Rotary Engines, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of improvements in rotary engines, as hereinafter described whereby the number of parts are reduced, there is less liability of breakage, and the expansive force of the steam shall be economically and effectively applied.

A further object of the invention is to construct an improved valve, and to provide means for positively actuating the same, so as to admit and cut-off the steam at proper intervals, all as will be hereinafter set forth.

Figure 1 represents an end elevation, showing the valve gear and steam inlet of a rotary engine embodying my invention. Fig. 2 represents a side elevation of the same, with the cover removed. Fig. 3 represents a vertical section of a portion on line *x, x*, Fig. 1. Fig. 4 represents a perspective view of the valve chest with the upper portion broken away. Fig. 5 represents a perspective view of the valve of the engine, and the stem thereof.

Similar letters of reference indicate corresponding parts in the several figures.

Referring to the drawings: A designates the casing or cylinder of the engine, which is bored out to the depth *H'*, and B designates the piston adapted to rotate therein, and having the wings or projections *G'*, the flat portions of which receive the impact of the steam, said piston being secured to the shaft C, which is suitably journaled in the side and cover D of the engine.

E designates the valve chest, and F designates the steam inlet, which may enter the chest either at the top or side, as shown in Fig. 1.

G designates the exhaust outlet, and H designates the valve provided with the port J, which registers at certain times with the port K, which leads to the interior of the cylinder A.

The valve H is constructed in the shape of a cylindrical shell, cut in half, to allow for ex-

pansion and contraction, and has one end closed at L, on which point the head M of the valve stem N is adapted to rest, said head being provided with a shoulder P, which abuts against the closed end L, so that any rotary movement given to the stem N will be imparted to the valve H.

The valve stem N is actuated by means of the eccentric Q which is suitably attached to the shaft C, and in the present instance is provided with a flange R, which serves as a guide for the eccentric strap or yoke S, to which is attached the knuckle joint T, which is connected with the valve stem N by means of the link U.

V designates a fly wheel, which may or may not be employed.

W designates a pin passing through the link U and knuckle T.

It will thus be seen that when the eccentric is keyed to the shaft C, and connections made to the valve stem N, as shown, the valve H will be given an oscillatory movement, alternately admitting and cutting off steam to the cylinder A.

X designates a suitable stuffing box for the valve chest, and Y designates a packing ring of composition or other suitable material, which is adapted to be screwed against a shoulder in the valve chest E. A suitable packing is also to be interposed between the cover D and the cylinder or casing A.

Z designates a clapper valve located in the recess *L'*, of the cylinder A, and supported at one end by the journal A' which has a suitable bearing in the boss K' on the cover D, and at the other end by a stem B', which extends through a suitable stuffing box C'.

D' designates a spring carried on the stem B' and adapted at proper intervals to engage the ends E' of the dog F', which is mounted on the shaft C, and rotates therewith.

The object of the clapper valve Z is to prevent live steam from blowing back through the exhaust opening G, and it will be noted that said valve is actuated initially by the impact of live steam alone thereupon, and its first movement is therefore independent of the operation of any external devices, as will be hereinafter explained.

The valve chest E is bolted or otherwise

suitably attached to the cylinder A, and as is obvious, can be placed at the bottom or side of the same.

The operation of the engine will now be apparent. Assume the parts to be in the positions shown in Figs. 1, 2, and 3. The valve H has been moved by means of the eccentric and its connections, so that port J registers with port K, and live steam is just entering the cylinder A. The pressure of the steam forces the valve Z down till it is in contact with the piston at M', so that no live steam can flow back out through the exhaust port G, and the impact of the steam on the face G' of the projection of the piston B, causes the same to revolve. When the piston reaches about the point O', indicated in dotted lines in Fig. 2, the steam will be cut-off, the valve H moving so as to close the port K, the work for the rest of the stroke being done by expansion.

When the face G' of the piston B, reaches the exhaust outlet G, the steam escapes therefrom, immediately after which one of the ends E' of the dog F' comes in contact with the spring D', rotating the stem B' and forcing the valve Z to the position shown in Figs. 2 and 3, which movement always takes place just before either of the projections G' reach the said valve Z so that the said parts are never in contact, and the engine is noiseless in operation. The parts are now in the positions shown in Figs. 2 and 4 of the drawings, and the above described operation is repeated.

It will be noticed that there is no waste of steam, since the same is positively cut-off at an early point of the stroke.

In rotary engines of large size, the valve H will have the open end, in Fig. 5, closed, as shown in dotted lines.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine, a casing, a piston therein, a steam chest containing a valve which controls the admission of steam to the cylinder, said valve consisting of a semi cylindrical shell with a port therein and having one end closed, and adapted to contact with the head of the valve stem, a valve for preventing the exit of live steam from the exhaust port of the cylinder, and means for operating both valves from the exterior of the cylinder, said parts being combined substantially as described.

2. In a rotary engine, a casing, a piston therein, a steam chest containing a valve H, consisting of a semi cylindrical shell with a

port therein, and having one end closed and engaged by the head of the valve stem, means for actuating said valve, a second valve Z pivotally supported in a recess in said casing, said valve having a stem provided with a spring adapted to be engaged at intervals by the ends of a dog F', mounted on the shaft C, which carries the piston, said parts being combined substantially as described.

3. In a rotary engine, a casing A, recessed at L', a valve Z located in said recess, having one end pivoted at A', in the boss K' on the cover D, the other end of said valve having a stem B', carrying the spring D', dog F', shaft C, piston B, exhaust G, valve chest E, valve H provided with the port J, and having one end L adapted to engage the head M of the stem N, and means for actuating said valve, said parts being combined substantially as described.

4. The herein described valve consisting of the semi-cylindrical shell H, provided with a port J, and having one end closed at L, a valve stem N having the head M, adapted to engage the part L, and means for actuating said valve, said parts being combined substantially as described.

5. In a rotary engine, a casing having an inlet and an exhaust port, a piston in said casing having projecting faces, a valve in said inlet adapted to ride on said piston, and to control the passage between said inlet and exhaust, said valve being actuated initially by steam pressure alone, and having its return movement caused by the engagement at intervals, of a dog or its equivalent, with a yielding device attached to said valve stem, a steam chest provided with a valve for controlling communication between said chest and cylinder casing, and means for actuating said steam chest valve, substantially as described.

6. In a rotary engine, a casing having inlet and outlet ports, a rotary piston having projecting faces, a valve in said inlet for cutting off live steam from the exhaust port a steam chest with a valve controlling the communication between said chest and casing, mechanism connected with the rotary piston for operating said chest valve, and a dog on the shaft of said piston adapted to contact with a spring on the journal of said inlet valve, said parts being combined substantially as described.

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Witnesses:

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