R. BAZIN.

Rotary-Engine.

No. 211,545. Patented Jan. 21, 1879.

Fig. 1.

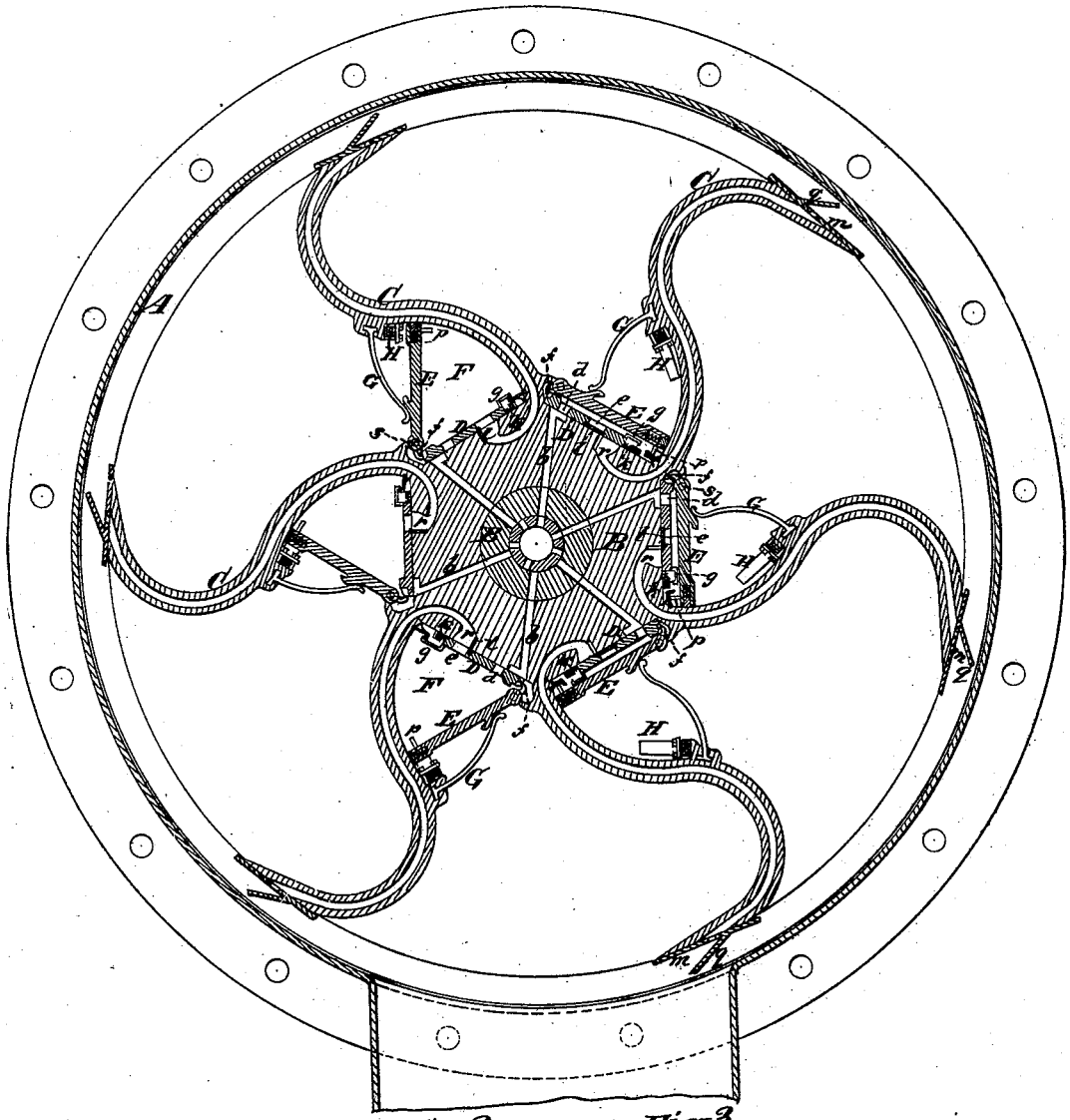

Fig. 2.

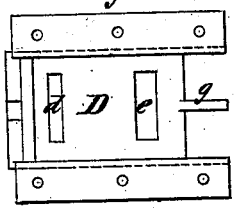

Fig. 3.

Witnesses

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IMPROVEMENT IN ROTARY ENGINES.

Specification forming part of Letters Patent No. **211,545**, dated January 21, 1879; application filed October 23, 1878.

To all whom it may concern:

Be it known that I, RAOUL BAZIN, of Condé-sur-Noireau, in the Department of Calvados, France, have invented certain Improvements in Rotary Engines, of which the following is a description, reference being had to the accompanying drawing, forming part of this specification.

This invention relates to rotary steam-engines in which the steam, as it issues from one or more bent arms, operates by reactionary pressure to rotate said arms and the shaft to which they are attached in a reverse direction to that in which the steam escapes from said arms.

In this invention the steam from the boiler is passed through the interior of the engine-shaft, which is made hollow for the purpose, and is distributed from said shaft by a series of radial passages to a corresponding number of curved hollow arms, from the outer ends of which the steam escapes to produce the necessary reactionary effect. The outer end of each of said arms is partially closed by a piece or plate, having a longitudinal slot through it of any desired width, according to the power of the engine, such piece or plate forming a stop to the too free egress of the steam, and the slot in it, through which the steam escapes, preferably being of a tapering construction in its transverse section. The steam which escapes by these slots or slits imparts a rotary movement to the hollow curved arms as it passes through them. The steam is admitted intermittently to each curved hollow arm by a slide-valve, which is controlled by a radial piston or lever-like back plate. This plate is closed by a spring against or toward said valve, but is forced away from the latter by the first shock or pressure of the steam in its way to the curved hollow arm to control the admission of the steam to said arm, said lever-like plate, as it is forced away from the slide-valve by the pressure of the steam, operating said valve to shut off further ingress of steam, and providing for the expansion of the steam already admitted, and subsequently for its escape by a subsidiary valve in the slide-valve to the curved hollow arm to produce the desired reactionary effect. The slide-valve controlling each hollow curved arm is retained in its open position relatively to the latter by a spring or other catch, which the lever-like plate, in completing its movement toward the slide-valve, liberates, and allows of said valve being moved back by a spring to its normal position for a repetition in due course of its former action.

In the accompanying drawing, Figure 1 represents a vertical section of a rotary reaction steam-engine constructed in accordance with the invention. Fig. 2 is a back view, upon a larger scale, of one of a series of slide-valves used to control the admission of steam to the curved hollow arms of the engine; and Fig. 3, a transverse section through said valve.

In said drawing the engine is represented as constructed with six hollow curved arms, three of which are shown as open to receive steam through them, and three as closed to avoid interference at any one point with the motion of the engine.

A is an outer case or cylinder, in which the reaction-wheel or rotating portion B of the engine works. Said portion B is fitted with a hollow central shaft, to which the steam is admitted from the boiler, and from which it passes by a series of radial passages, *b*, to the curved hollow arms C, subject to the control of interposed slide-valves D. Each of these valves has an admission-port, *d*, and an escape-port or outlet, *e*, through it.

When either slide-valve D is adjusted so that the port *d* is open to or in line with the radial passage *b*, which it controls, the incoming steam is admitted to the back of the slide-valve and caused to press upon the inner side or face of a radial piston or lever-like plate, E, pivoted at *s*, and forming a movable wall of a steam-receiving chamber, F. This moves the plate E away from the valve D against the pressure of a returning-spring, G, said pivoted plate in being forced away from the slide-valve by the pressure of the steam being arrested at the termination of its outer stroke by a spring, H, which presents considerable resistance, and, like the returning-spring G, is attached to a projection on the exterior of the curved hollow arm C, to which said slide-valve pertains.

During the outer movement of this pivoted

plate E, a tail, *f*, with which it is provided on the opposite side of its pivot *s*, acts upon the slide-valve D to move said valve forward on its seat, and so to close the admission-port *d* through it.

The curvature of that portion of either hollow arm C within which the outer margin of the pivoted plate E works is struck from the center of motion of said plate, to secure for it a close-working joint and prevent waste of steam. When the pivoted plate E has arrived near the end of its outer stroke away from the slide-valve, the latter has been advanced sufficiently to admit of the opening of a subsidiary valve, *l*, in the slide-valve, which subsidiary valve controls the outlet-port *e* of the slide-valve, and which valve, when open, allows of the steam escaping from the chamber F to and through the curved hollow arm C. Furthermore, as the slide-valve D approaches the end of its outer stroke it is retained in its outermost position by a hook, *g*, on the slide-valve engaging with a hinged catch, *h*, which is controlled by a spring, *i*, that serves to keep the catch in an engaged position with the hook, and that is suitably beveled to facilitate said engagement. When the slide-valve D is thus hooked or held it is restrained from being moved inward by a spring, *k*, which serves to return said valve when liberated to its normal position. Said spring *k* may be variously arranged. The outlet *e* remains open and the admission-port *d* closed during the whole of the time the slide-valve D is engaged with the spring-catch and the pivoted plate E is being moved by its spring G toward the slide-valve, and when said plate reaches the end of its inner stroke said spring gives it a sufficient impulse to cause a wedge or projection, *p*, on it to press inward the spring-catch *h*, and so liberate the slide-valve D, which is then quickly returned by the spring *k* to its normal position, opening the admission-port *d* and closing the outlet-port *e*. The same operations of the slide-valve D are produced in regular order during each action of the pivoted plate E.

As will be seen by the drawing, the inner end portions, *r*, of the hollow curved arms C are in communication, when the valves *l* are open, with the outlet-ports *e*, to pass the steam to the curved arms, where it produces the required action. The outer end of each hollow arm C is partially closed by a piece or plate, *m*, having a longitudinal slot through it of any desired shape and width. This piece or plate forms a stop to the too free egress of the steam, and determines the direction of the issuing current passing through each hollow curved arm of the engine to produce the desired effect within the arm.

To obtain an improved effect, the outer extremities of each hollow curved arm C is provided with a tangentially-arranged piece or plate, *q*, on the outer ends of said arms over or outside of the escape-aperture of the arms, the object of which is to deflect the issuing current in a direction tangential to the movement of the jets of steam issuing at the outer ends of the hollow arms.

The steam, having made its exit from the hollow curved arms C, passes into the outer case or cylinder, A, which it is preferred to construct in two equal sections, to facilitate the taking apart of the engine, and which sections are jointed and bolted together to prevent the ingress of external air. The main or driving shaft of the engine should be arranged to pass through stuffing-boxes for the same purpose.

Finally, the steam escaping from the outer ends of the hollow curved arms passes by a duct in the lower portion of the cylinder A into a condenser. The working devices connected with the condenser, the feed-pump, and the governor of the engine are all operated by or from the driving-shaft of the engine, which shaft also carries a fly-wheel to insure regularity in the motion of the engine.

In a rotary engine constructed substantially as described, the principal or rotating portion does not meet in its motion with various obstacles which are met with in other engines. As compared with reciprocating piston engines, it moves freely, with considerably less friction and wear than are incidental to the piston, slide-valve, eccentric, slides, and guides of such reciprocating piston engines. Furthermore, there is great simplicity of construction, and the several parts of the engine are solid, and require but little finishing. Likewise, direct transmission of the power is obtained without the aid of cranks, guides, and other secondary moving parts, and lubricating material is economized.

Again, the improved engine is adapted to work in both horizontal and vertical positions, and is applicable as a locomotive, portable, and marine engine. It also occupies but little room.

I claim—

1. A rotary reaction steam-engine having a series of hollow curved arms, provided at their outer extremities with perforated stops or plates, which check the too free egress of the steam from said arms, and control its passage through the hollow curved arms, substantially as shown and described.

2. The combination, with the hollow curved arms of a rotary engine, in which the escaping steam is utilized, of slide-valves for controlling the supply of steam to said arms, and radial pistons or pivoted back plates for controlling the movement of said valves, essentially as described.

3. The slide-valves which control the passage of steam to the hollow curved arms of a rotary engine, constructed with an admission-port and outlet-port through them, and provided with a subsidiary valve controlling said outlet-port, substantially as specified.

4. The combination, with the slide-valves which control the passage of steam through the hollow curved arms of a rotary engine, and with radial pistons or pivoted back plates, controlled by springs and operating to move said valves in one direction, of means for holding said valves when so moved, and springs applied to said valves for returning them after they have been released, essentially as described.

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Witnesses:
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