(No Model.)

O. E. DAVIDSON.

STEAM MOTOR.

No. 378,663. Patented Feb. 28, 1888.

Fig. 1.

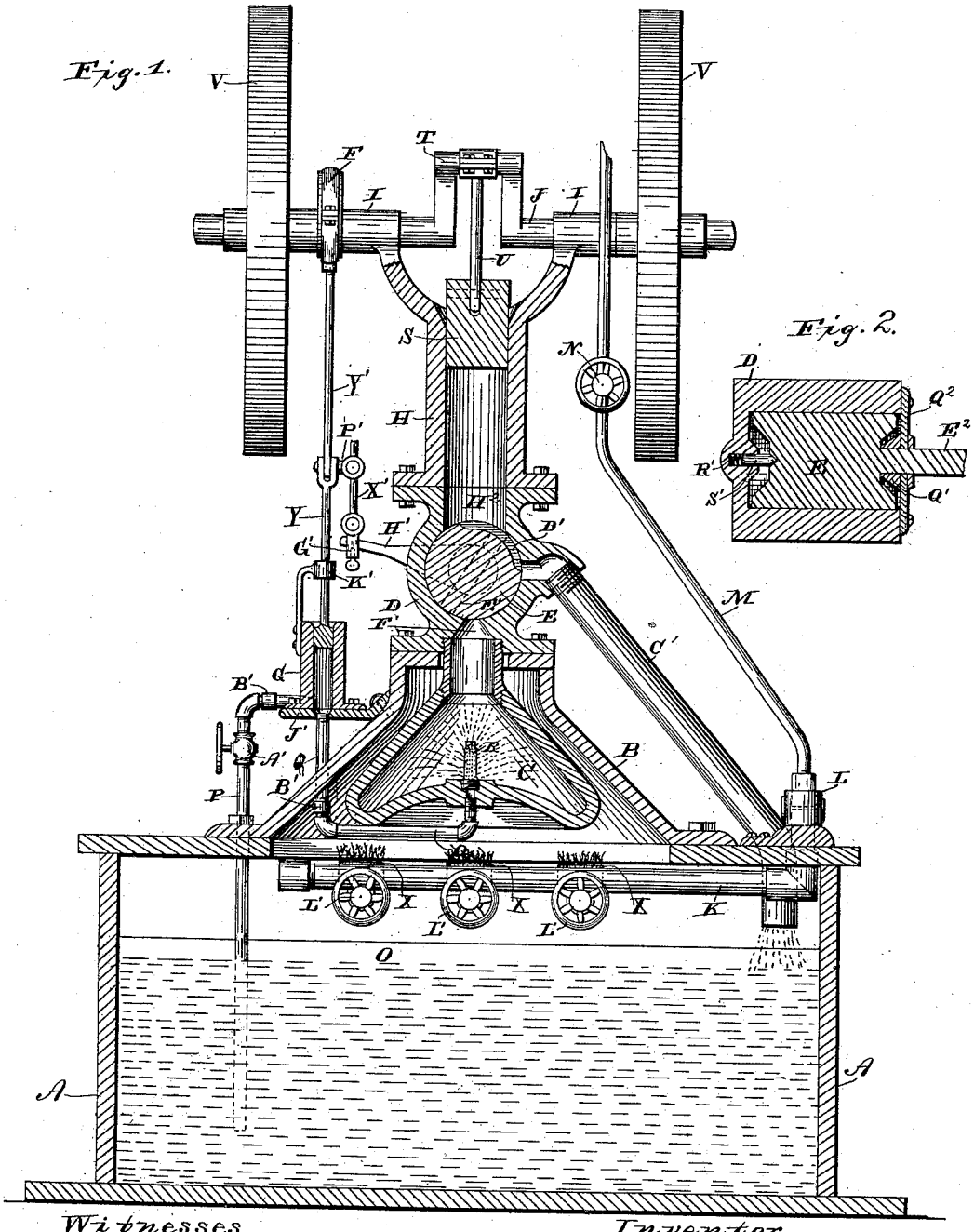

Fig. 2.

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UNITED STATES PATENT OFFICE.

OTIS E. DAVIDSON, OF NASHVILLE, TENNESSEE.

STEAM-MOTOR.

SPECIFICATION forming part of Letters Patent No. 378,663, dated February 28, 1888.

Application filed May 6, 1887. Serial No. 237,371. (No model.)

To all whom it may concern:

Be it known that I, OTIS E. DAVIDSON, of Nashville, in the county of Davidson and State of Tennessee, have invented certain new and useful Improvements in Steam-Motors; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

My invention relates particularly to that class of steam-motors in which the generation of the steam is effected by spraying or flashing water into a highly-heated generating-chamber; and it consists in certain novel details of construction and combinations of parts, which will be hereinafter fully described, and pointed out specifically in the claims at the end of this specification.

Referring to the accompanying drawings, Figure 1 represents a sectional elevation of a motor constructed in accordance with my invention. Fig. 2 is a sectional view of the cut-off valve.

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

The letter A represents the base of the motor, preferably made square in form. Upon this base is mounted a casing, B, preferably of conical form, the same being adapted to inclose the steam-generating chamber C, and held in place by means of bolts, as shown. Supported upon and connected to the casing B is a casing, D, in which is arranged a cut-off valve, E, and this casing D in turn supports the cylinder H, in which works the operating-piston S, that is connected by a pitman, U, to a crank, T, on a shaft, J, that is journaled in bearings I I, formed upon arms extending up from the cylinder H. Two fly-wheels, V V, are secured to the shaft J near opposite ends thereof.

Beneath the generator C is arranged means for heating the same to a high temperature, preferably consisting of a series of gasoline-burners, X X X, mounted on a pipe, K, which is in communication through a smaller pipe, M, and valve N with a reservoir of gasoline or other hydrocarbon liquid. The flame of the burners X X X can be controlled by means of regulators L′, in the usual manner, and the pipe K is preferably united to the pipe M by means of a flexible joint, L, in order that said pipe may be swung around laterally to permit of easy access to the burners.

The generating-chamber is preferably constructed of conical form, with its bottom concaved, as shown, so as to better collect and concentrate the heat from the burners. Arranged centrally of its bottom is a perforated head or nozzle, R, that is in communication through a pipe, Q, with a pump-cylinder, G, mounted on a base or bracket, J′, that is bolted to the casing B. Within this pump-cylinder works a piston whose rod Y, after passing through a guide, K′, is jointed to a pitman, Y′, which is operated by an eccentric, F, on the main shaft, as shown. The pump-cylinder G is also in communication through a pipe, P, and valve A′ with a reservoir or tank of water, O, contained within the base A. Each of the pipes P and Q has an upwardly-opening check-valve located in it at B′.

The generating-chamber C being kept in a highly-heated condition by the burners beneath it, each time the piston in the pump-cylinder is reciprocated by the operation of the eccentric F a supply of water is drawn from the reservoir or tank O through the pipe P into the pump-cylinder, and is there forced from the latter through the pipe Q and into the perforated nozzle or head R, issuing from the latter in the form of fine spray, which is instantaneously converted or flashed into steam.

The valve E in the valve-casing D is provided with an inlet-port, E′, which extends diametrically through it, and with a peripheral exhaust-port, D′. It is operated by means of an arm, H′, which is connected through a clamp, G′, jointed rod X′, and arm P′ to the piston-rod Y of the pump. Whenever the piston-rod of the pump makes a downstroke to force water into the steam-generating chamber, the cut-off valve E, through the described connections, is shifted so as to bring its port E′ in line with the port F′, leading from the generator, and with the port H^2, leading into the steam-cylinder H, thus admitting steam into said cylinder H and forcing upward the piston S therein, thereby through the crank T rotating the main driving-shaft. As the

piston S nears the limit of its upstroke the piston-rod of the pump is, by the operation of the eccentric F, again raised, so as to cause the valve E to be shifted till its exhaust-port D′ opens communication between the cylinder H and the exhaust-pipe C′, leading to the reservoir O, thereby causing the exhaust-steam to be returned to said reservoir. These operations take place in rapid succession, the result being the running of the motor evenly and smoothly and at a rate of speed regulated by the supply of water and gasoline, controlled by the proper manipulation of the valves A′ and N, respectively.

It will be noticed by reference to Fig. 2 that the valve E is provided with a shaft or prolongation, E^2, for the attachment of the arm H′, Fig. 1. Now, in order to prevent leakage of steam around this shaft E^2, and for the purpose of keeping the valve at all times accurately centered, I recess both ends of the valve, as shown in Fig. 2, and cause one end to cooperate with a bearing-block, Q′, formed upon or secured to the removable end Q^2 of the valve-casing, and in the other end I form a conical recessed bearing, in which projects a conical stud, S′, inserted within a socket in the casing and kept pressed forward by means of a spiral spring, R′. This spring not only keeps the stud in proper position, but tends to keep the whole valve in intimate contact with its bearing Q′ at the opposite end and prevent leakage of steam at that point.

To enable the throw of the valve E to be regulated so as to effect the cutting off or exhaustion of the steam sooner or later, and so as to properly time its movements with those of the pump supplying water to the generator, the clamp G′ is rendered adjustable upon the arm H′, and the connecting-rod x' is jointed at both ends, to enable it to accommodate itself to the position of said clamp G′. By adjusting the clamp inward and securing it by its set-screw the throw of the valve is increased, while the opposite result is effected by an outward adjustment of it, as will be readily understood.

This motor is intended to be made of small size and very portable, and is especially adapted to the driving of sewing-machines and other light machinery.

Having thus described my invention, what I claim as new is—

1. The generator made of conical form and having the concave bottom, in combination with heating appliances beneath it and means for introducing water within it, substantially as described.

2. In combination with the conical generator having the concave bottom and provided with the perforated head or nozzle located centrally, the appliances arranged for heating it.

3. The conical generator having the concave bottom and the screw-threaded upper end or neck, whereby it is rendered removable, substantially as described.

4. The combination, with the conical generator having the concave bottom, of the means for introducing or spraying water into said generator, the conical inclosing-case, and means for heating, substantially as described.

5. The combination, with the generator, of the means for introducing water or spray within it, the means for heating, the valve-casing and valve arranged above said generator and in communication therewith, and the steam-cylinder and its piston arranged above the valve-casing and mounted thereon, substantially as described.

6. The combination, with the main shaft, of the pump driven therefrom, the generator and connections between it and the pump, means, substantially such as described, for heating the generator, the cut-off valve connected to the pump, and the main cylinder and its piston connected to the crank of the main shaft.

7. The combination, with the main shaft, of the pump driven therefrom, the generator and connections between it and the pump, the cut-off valve having inlet and exhaust ports, adjustable connections, substantially such as described, between the cut-off valve and the pump, and the main cylinder and its piston connected to the crank of the main shaft.

8. The combination, with the pump, of the generator supplied from the same, the main cylinder and its piston, the cut-off valve provided with the arm, and the adjustable clamp and jointed rod forming the connection between the valve-arm and the piston-rod of the pump, substantially as described.

9. The combination, with the base, the generator, and the casing around the generator, of the laterally-swinging burners arranged within the base below the generator, substantially as described.

10. The combination, with the base, of the water tank or reservoir arranged therein, the generator and its inclosing-case, the pump, the cut-off valve, the main cylinder, and the driving-shaft, all arranged substantially as described.

11. The combination, with the base, of the water tank or reservoir arranged therein, the generator and its inclosing-case, the pump, the cut-off valve, the main cylinder and the driving-shaft and connections, and the exhaust-pipe for conveying the exhaust-steam from the exhaust-cylinder back to the water-tank.

12. The combination, with a rotary cut-off valve having recessed ends, of the bearing Q′ around the operating-shaft, and the spring-pressed stud S′, bearing against the opposite end of the valve, whereby it is pressed against the said bearing Q′ and leakage of steam prevented, substantially as described.

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