

(No Model.)

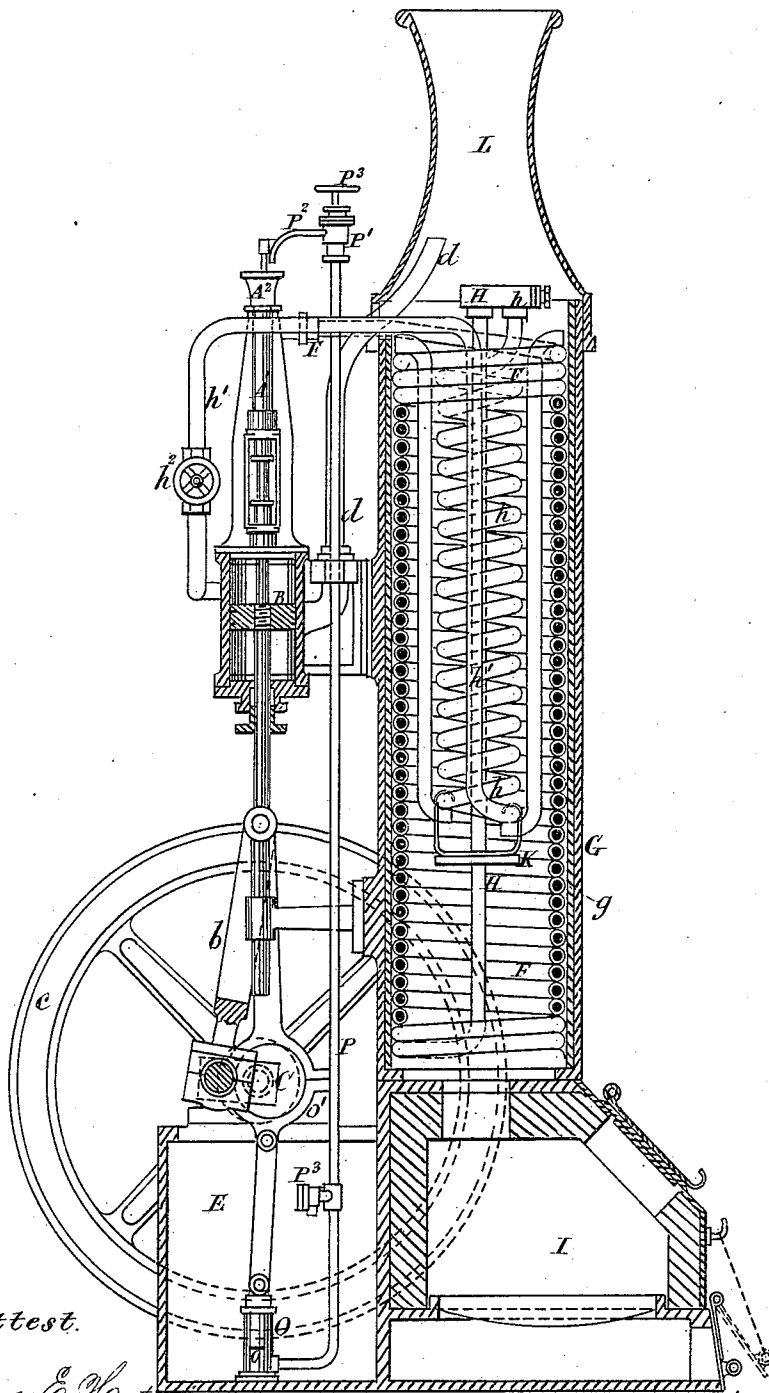
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H. DAVEY.
Motive Power Engine and Generator.

No. 238,767.

Patented March 15, 1881.

FIG. 1.



Attest.

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Inventor:

Henry Davey,
By James L. Norris
Atty

(No Model.)

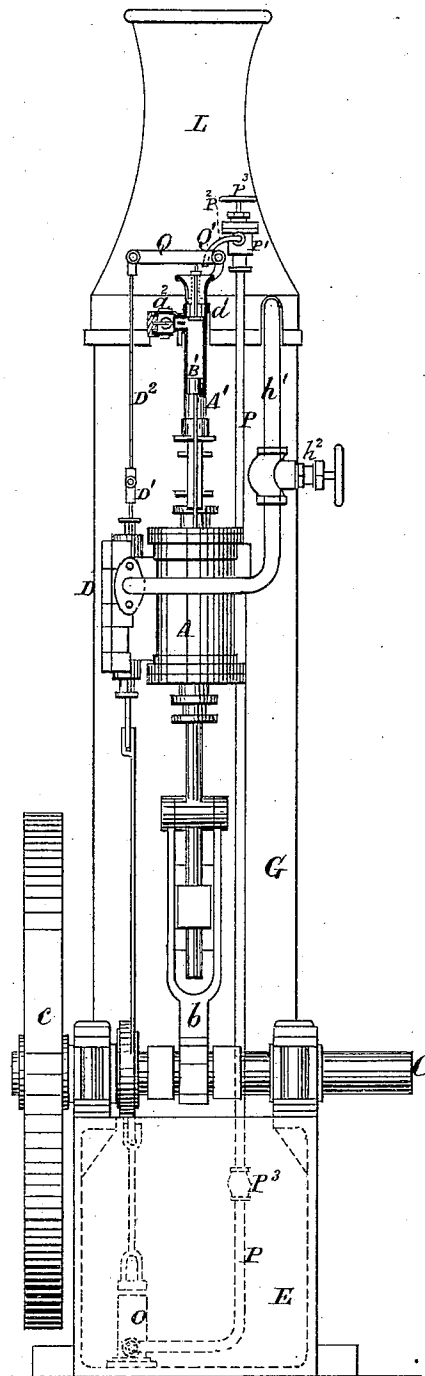
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FIG. 2



Attest.

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UNITED STATES PATENT OFFICE.

HENRY DAVEY, OF LEEDS, COUNTY OF YORK, ENGLAND.

MOTIVE-POWER ENGINE AND GENERATOR.

SPECIFICATION forming part of Letters Patent No. 238,767, dated March 15, 1881.

Application filed January 6, 1881. (No model.) Patented in England March 3, 1879.

To all whom it may concern:

Be it known that I, HENRY DAVEY, a citizen of England, residing at Clarendon Road, Leeds, in the county of York, England, have invented a new and useful Improved Motive-Power Engine and Generator, (for which I have obtained a patent in Great Britain, No. 844, bearing date March 3, 1879,) of which the following is a specification.

My invention relates to the construction of motive-power engines worked by fluid-pressure, in combination with means of generating the working-fluid, arranged in a simple and compact form, and in such a manner as to avoid risk of explosion. For this purpose I provide a metal casing, preferably of cylindrical form, spreading out to a greater width at the base, and tapering at the top to form a chimney-tube of smaller diameter, which may be surrounded by a casing containing the feed-water for the engine. The widened part at the bottom constitutes a fire-chamber, which I line with fire-brick or other refractory material, fixing therein a fire-grate, and providing lateral fire and ash doors. From this fire-chamber the products of combustion pass, by apertures in the crown of the lining, into the upper part of the casing, which contains a coil or several coils of tubes of small diameter, bent into helical form and occupying the greater part of the space within the casing, so as to leave only narrow and subdivided passages for the products of combustion in the interstices between the convolutions of the coils. This part of the casing is preferably lined with refractory material to avoid waste of heat. On the outside of the casing, near its top, I fix a cylinder fitted with a piston, the rod of which passes through a stuffing-box in the bottom of the cylinder, and is linked by a connecting-rod to a crank on a shaft which is mounted in bearings on the lower part of the casing. Thus the casing constitutes the framing of the engine. The upper end of the cylinder has ports governed by a slide, the jacket of which communicates by a pipe with the lowest convolution of the coil, or that part of the coil which is next the fire-chamber. The lower end of the cylinder has, according to one arrangement, passages fitted respectively with suction and discharge valves. The suction-passage has a funnel-mouth open to the air, into which

mouth a stream of water, regulated by a cock or valve, is permitted to run. The discharge-passage communicates by a pipe with the highest convolution of the coil, or that part which is farthest from the fire-chamber.

The action of the engine is as follows: The piston, in making its upstroke, draws air and water by the suction-passage into the cylinder, and by its downstroke it forces the mixture of air and water into the upper part of the coil. The mixture, in its descent through the convolutions of the coil, becomes more and more heated as it approaches the bottom, whence it finally passes, as a mixture of air and steam, to the cylinder, where it effects, by its pressure, the downstroke of the piston.

In the arrangement which I prefer to employ the cylinder is made double-acting, a separate pump being provided for forcing the charges of air and water into the coil, as I will now describe with reference to the accompanying drawings, in which—

Figure 1 shows a vertical section of the generator and engine, and Fig. 2 shows a front view of the same.

A is the engine-cylinder, whose piston B is connected by a connecting-rod, *b*, to the crank on the shaft C, which carries a fly-wheel, *c*. An eccentric on the shaft C works a slide, D, which governs an eduction-passage and ports leading to each end of the cylinder A.

Above the cylinder A is a pump-cylinder, A', in which works a plunger, B', formed by a continuation of the rod of the piston B. The pump-cylinder A' terminates at top in a funnel-mouth, A², beneath which is a suction-valve, *a'*, and a discharge-valve, *a*². Into the funnel-mouth a quantity of feed-water is forced by means of a small pump, O, situated in the tank E, the water being led up through a pipe, P, having a check-valve, P', from above which an open spout, P², delivers the water. The lift of the valve P' may be increased or reduced by means of the screw P³, for regulating the water-supply to the pump, and consequently the power of the engine, the pipe P being provided with a spring relief-valve of any suitable construction at P³, for the escape of any water forced up by the pump in excess of the quantity delivered from the spout.

The pump O is worked by the same eccentric, O', that works the slide of the engine. It

has a small side opening, O^2 , through which water enters from the tank E at every upstroke of the plunger, which, in its downstroke, forces the charge up the pipe P as soon as it passes the opening O^2 . At every downstroke of the piston B and plunger B' a charge of water and air is drawn into the pump, which charge is forced by the upstroke of the plunger, in the form of fine spray, through the discharge-valve a^2 into the pipe F, which is bent into a number of convolutions, forming a coil extending down within a casing, G, lined with fire-clay g.

From the lowest convolution of the coil F a pipe, H, ascends inside the coil and leads into a second coil, h, communicating at its lower end by a pipe, h', with the jacket D of the slide. From the eduction-port of the slide a pipe, d, leads into the chimney.

Below the casing G is a fire-place, I, for which may be substituted a set of gas or oil burners, and below the coil h is a baffle-plate, K, which causes the products of combustion to pass up in close contact with the coil F. From the casing G the products pass away by the chimney L, which may be surrounded by a casing containing the feed-water. As the charge of water-spray enters the coil F it descends therein, becoming more and more heated as it approaches the fire or burners, the water being converted into steam. The mixture of heated air and steam ascends the pipe H, and after passing through the coil h, in which the steam becomes dry or superheated, it passes through the pipe h' to the cylinder, where it acts as working-fluid, propelling the piston B. After performing work the exhaust is discharged by the pipe d up the chimney L.

h^2 is a valve for regulating or cutting off the steam-supply to the cylinder.

Owing to the pump A' drawing in both water and air it is found desirable, in order to insure regularity of action, to effect the opening of the suction-valve a' by a positive motion rather than to depend upon the pressure of the atmosphere. For this purpose the slide-rod D' is connected by a link, D², to a lever, Q, pivoted at Q', and resting on the upper end of the valve-stem of a' , which is kept closed by a spring, as shown. Thus, at every downstroke of the slide, which corresponds to the suction-stroke of the pump, the valve a' is pressed open, so as to allow a charge of air and water to enter the pump.

The power of the engine may be automatically regulated by connecting the screw P³ of the valve P' to a governor of any known construction, so that on an increase of speed taking place the water-supply is diminished and the converse.

It will be evident that the steam-generator might be arranged in various other ways, such as a series of vertical or horizontal zigzag pipes in a horizontal furnace; and the engine

may also be arranged horizontally; also, the engine may be arranged as a portable or fire engine or tramway-engine.

Having thus described the nature of my invention and the best means I know of carrying it out in practice, I claim—

1. The combination, in a motor engine and generator, of an engine-cylinder and a pumping-cylinder, the pistons of which are connected together, and the pumping-cylinder being arranged to permit the simultaneous entrance of a charge of air and water at one stroke of the engine-piston, and a heated coil or congeries of pipes connected with the pumping-cylinder, and arranged so that the return-stroke of the engine-piston will deliver said charge of air and water, in the form of spray, into the heated coil or congeries of pipes, from which the resultant mixture of air and steam is delivered to the engine-cylinder for operating the piston thereof, substantially as described.

2. In a combined motor engine and generator, a pump, A', drawing in a charge of water and air through an open mouth, A², provided with a suction-valve, a' , the opening of which at the proper time is insured by imparting motion to it from the engine-slide or other moving part of the engine, substantially as herein described.

3. In a combined motor engine and generator, the combination of the cylinder A, piston B, with plunger B', pump-barrel A', with open mouth A², and suction and delivery valves a' a^2 , water-supply pipe P P², with regulating-valve P', coil F, casing G, and fire-place I, all arranged and operating substantially as herein described.

4. In a combined motor engine and generator, the combination of the cylinder A, piston B, with plunger B', pump-barrel A', with open mouth A², water-supply pipe P P², with regulating-valve P', pump O, worked by slide-eccentric O', relief-valve P³, suction-valve a' , worked by lever Q from engine-slide, delivery-valve a^2 , and heated coil F, all arranged and operating substantially as herein described.

5. In a combined motor engine and generator, the generating-coils F, into the coolest part of which the charges of water and air are delivered, in combination with the coil h, from the hottest part of which the combined steam and air flow to the engine-cylinder, substantially as herein described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 20th day of December A. D. 1880.

HENRY DAVEY.

Witnesses:

A. V. DOCKERY,
CHAS. GILLIARD.