L. C. ERRANI & R. ANDERS.

Dynamic Machines.

No. 140,021. Patented June 17, 1873.

Fig: 1

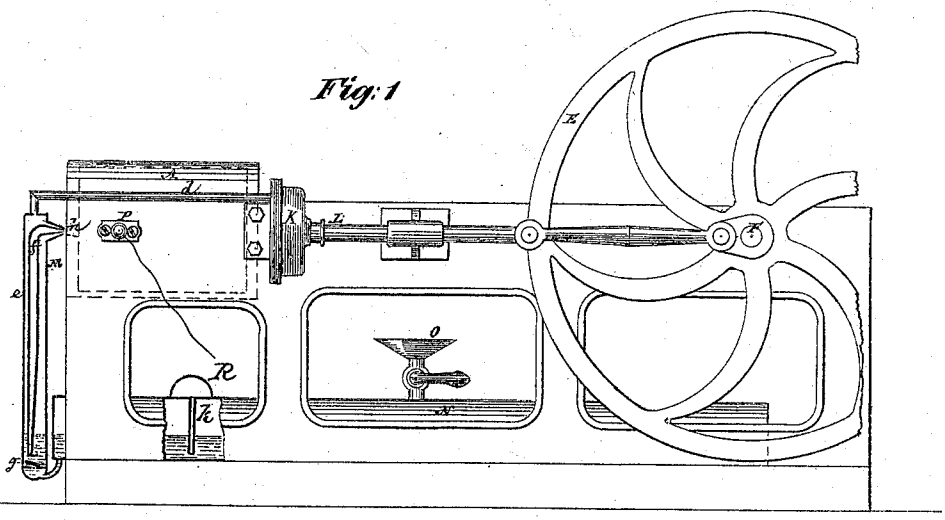


Fig: 2

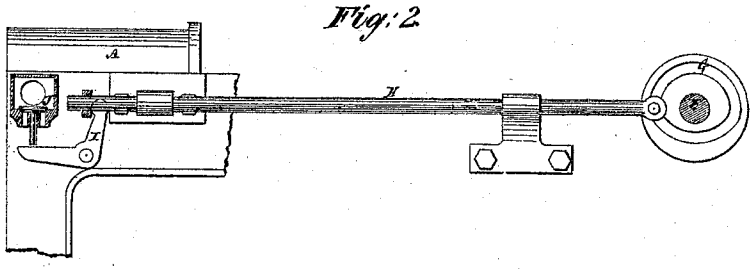
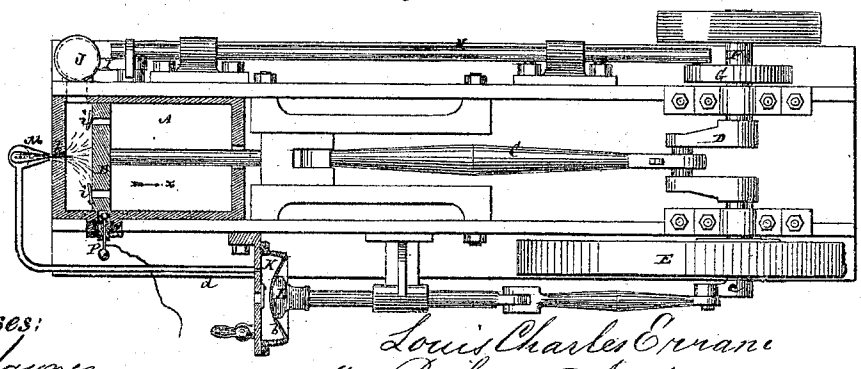


Fig: 3



Witnesses:
Fred Haynes
Fred Gusch

Louis Charles Errani
and Richard Anders
per Romyn & Allen
Attorneys

UNITED STATES PATENT OFFICE.

LOUIS CHARLES ERRANI AND RICHARD ANDERS, OF LIEGE, BELGIUM.

IMPROVEMENT IN DYNAMIC-MACHINES.

Specification forming part of Letters Patent No. **140,021**, dated June 17, 1873; application filed August 1, 1872.

To all whom it may concern:

Be it known that we, LOUIS CHARLES ERRANI and RICHARD ANDERS, both of Liege, in the Kingdom of Belgium, have invented a new and useful Improvement in Dynamic-Machines, which we term a motor without gas; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing forming part of this specification, and in which—

Figure 1 represents a partly sectional side elevation of our improved motor; Fig. 2, a side view of a valve and valve-gear pertaining to said motor; and Fig. 3, a partly sectional plan of the motor.

Similar letters of reference indicate corresponding parts.

This invention relates to a new machine for utilizing the expansive property of hydrocarbon liquids, such liquids being for use in the machine introduced in a spray into the cylinder of the engine, and there mixed with atmospheric air, and brought in contact with an electric or other igniting spark, so that the expansion following the ignition will cause the piston of the cylinder to be moved in the desired manner, and motive power thus to be obtained.

We desire it to be well understood that in this apparatus we propose to use liquids only and not gaseous fluids, this not being a gas-engine in which an explosion will take place, but an expansion engine in which the fine particles of the liquid, after having been commingled with the air, are brought into condition fit for producing the best results from the expansion consequent to ignition.

The motor, so far as its general construction is concerned, may be similar to that of an ordinary steam-engine—that is to say, it is represented as including a cylinder having a reciprocating piston within it, a crank deriving its motion from the piston, a fly-wheel on the main shaft, and valve-gear for operating a main valve connected with the engine-cylinder. Such engine may either be of single or double effect, but is shown in the drawing as composed of a single cylinder, the piston of which is actuated during only a portion of its stroke by the ignition of the mixture of sprayed hydrocarbon liquid and common air, and the motion continued or kept up during the remainder of the stroke by the impetus given to the fly-wheel of the engine.

A is the cylinder of the motor; B, its piston; C, its connecting-rod; D, the crank; and E, the fly-wheel on the main shaft F, which is, furthermore, provided with a cam, G, for giving motion by means of a rod, H, and bell-crank I, or otherwise, to a main valve, J, which may either be a slide or puppet valve, and which shuts and opens, as required, the engine-cylinder to the outside atmosphere. K is a blower, made up of a rigid case, covered by a rubber or other elastic diaphragm, *b*, against which a compresser, L, actuated by a crank, *c*, on the engine-shaft, operates to force air along a pipe, *d*, into an upright wind-chamber, *e*, of a spraying device, M, arranged in proximity to the outer end of the cylinder A. Within the wind-chamber *e* is a duct or tube, *f*, extending downward to nearly the bottom of said chamber, and below the level of the operating liquid in a tank, N, with which the chamber *e* connects at its bottom, a valve, *g*, opening upward being within the chamber *e* immediately below the tube *f*. The upper end of said tube is bent to form a nozzle, arranged opposite to an aperture, *h*, in the outer end of the cylinder, and said nozzle surrounded by another nozzle from the wind-chamber *e*. O is a filling device of the tank N, said device consisting of a cock, by which the pressure on the fluid in the tank may be regulated, and its freedom of supply to the wind-chamber *e* of the spraying device be controlled, as required. The piston B is fitted with suction-valves *i i*, and the cylinder A provided at a suitable distance from its outer end with an electric igniter, P, worked by connection with any suitable battery.

In the operation of the motor, supposing the piston B to be started inward—that is in direction of the arrow *x*—by motion given to the fly-wheel, said piston will cause the compresser L of the blower K to force air into the wind-chamber *e*, and such air be made to act partly upon the liquid in the bottom of said chamber to expel it up through the tube *f*, and partly to escape through the outer nozzle of the spraying device, along with the liquid passing out of the inner nozzle into and

through the aperture *h* of the cylinder A, where the liquid drawn from the tank is injected in the form of spray mixed with atmospheric air, so that as soon as the piston B passes the igniter P said mixture is ignited and a propelling force communicated by the consequent expansion to the piston, which carries it, the piston, to the end of its forward stroke or thereabouts, and by the impetus imparted to the fly-wheel, returns the piston again to its normal position, and repeats the operation as before, the valve J opening in due course to allow of the escape of residuum and dead air, while the suction-valves *i i* supply air to the outer end of the cylinder when the piston is moving forward up to the igniter.

The quantity of liquid injected is regulated by the filling-cock O. When this cock is entirely open the motor will stop, the whole of the air forced in by the blower then finding a free vent through said cock. If, on the contrary, the cock O be fully closed, then the supply of operating liquid will be increased. After each injection the level of the fluid in the wind-chamber *e* will fall, but the valve *g*, yielding to the pressure produced by the difference of level of the fluid in said chamber and the tank, the equilibrium is speedily restored. R is a vessel mounted on the tank N and having a dip-tube, K, extending down within the liquid in the tank, for insuring the proper opening of the valve *g*, to maintain an equilibrium when the cock O is closed. During the opening of the cock O the valve *g* will not oppose the escape of the injected air through O, as said valve will be drawn open by the suction created by the motion of the piston in direction of the arrow *x*, injection of air taking place during the motion of the piston in said direction. Moreover, the disturbance of the equilibrium, caused by the injection and spray immediately preceding such opening of the cock, will also, for the reasons hereinbefore stated, cause the valve *g* to be open at the time of the air injection. The vessel R is open to the atmosphere, and serves, thereby, to admit atmospheric pressure to the liquid in the tank N. Without such pressure the valve *g* would not at all open when the cock O is closed, and the equilibrium would not be sustained; the diameter of the dip-tube, however, being so small that the evaporation consequent to such connection with the atmosphere will be reduced to a minimum.

What we claim is—

1. The combination, with the cylinder A and piston B, of the spraying device M, for producing motive power by or from any suitable hydrocarbon liquid, sprayed within the cylinder, and mixed with air, and subsequently ignited within the cylinder.

2. The combination of the electric igniter P, with the spraying device M, the piston B, and cylinder A of the motor, substantially as specified.

3. The blower K, in combination with the spraying device M, the tank N, the piston B, and the cylinder A, essentially as described.

4. The tank N, in combination with the wind-chamber *e*, and fluid-tube *f*, of the spraying device M, the piston B, the cylinder A, and the blower K, substantially as specified.

L. ERRANI.
R. ANDERS.

Witnesses:
LOUIS I. CHRENS,
G. V. SOMMER.