C. J. LAKE.

COMBINED RECIPROCATING ROTARY ENGINE.

APPLICATION FILED JAN. 28, 1911.

1,014,401. Patented Jan. 9, 1912.

FIG. 1.

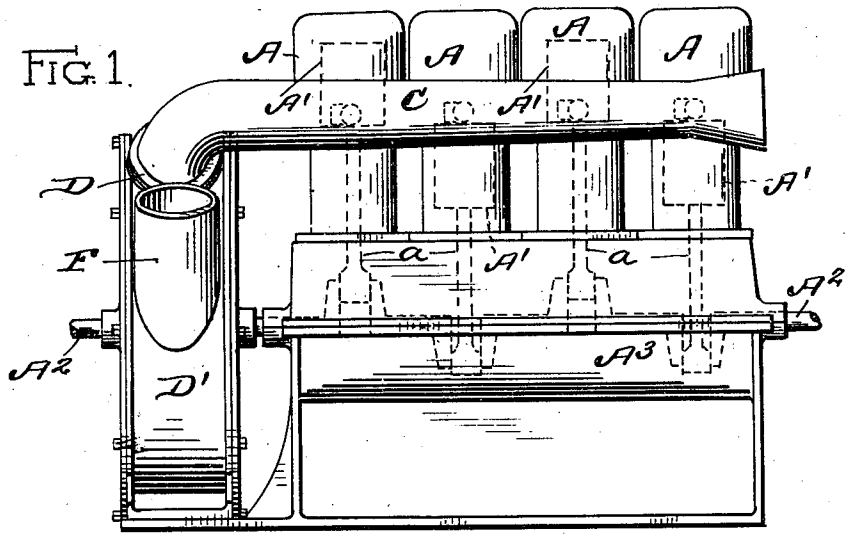


FIG. 2.

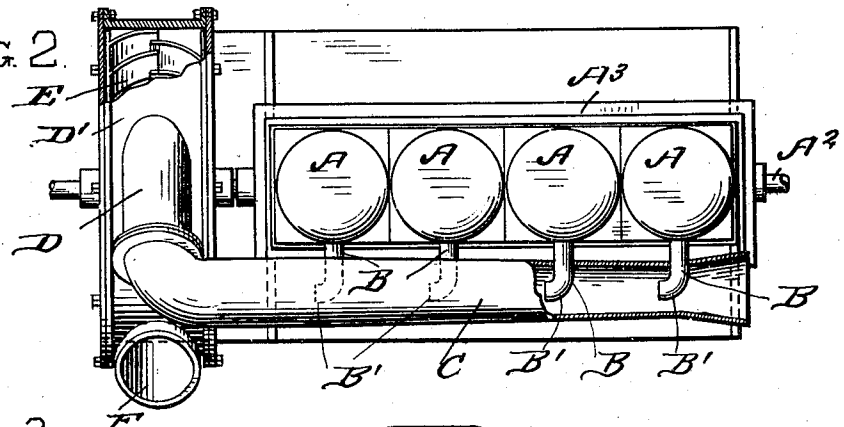


FIG. 3.

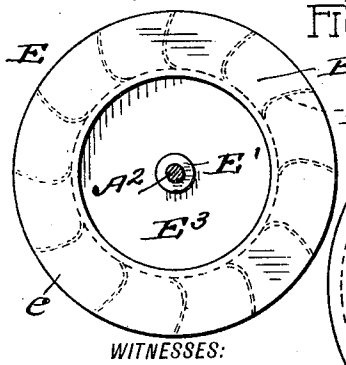


FIG. 4.

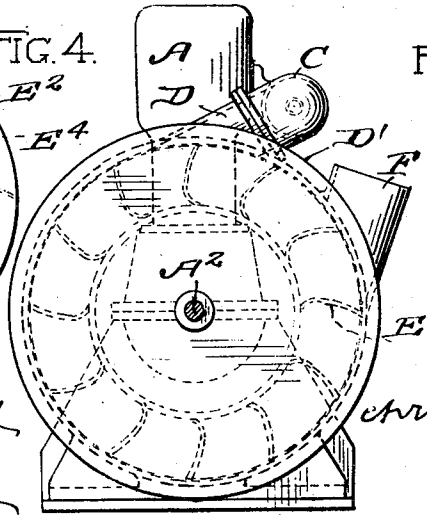
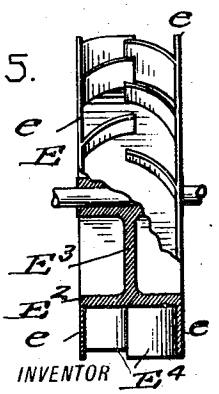


FIG. 5.



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COMBINED RECIPROCATING ROTARY ENGINE.

1,014,401. Specification of Letters Patent. Patented Jan. 9, 1912.

Application filed January 28, 1911. Serial No. 605,218.

To all whom it may concern:

Be it known that I, CHRISTOPHER J. LAKE, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in a Combined Reciprocating Rotary Engine, of which the following is a specification.

This invention relates to a "combined reciprocating-rotary engine" and consists in the reclamation and conservation of the exhaust gases expanding from the cylinders by a subsequent contiguous application of its velocity energy through a rotating motor wheel in conjunction and coöperation with the reciprocating piston action.

In present engine practice the exhaust gases which represent a considerable portion of the heat energy are expended into the atmosphere as a total loss. The reciprocating engine requires a fly wheel of considerable weight as a balancing effect and to return the piston from the power stroke and compress the new charge and to carry the piston over the center. The said fly-wheel has no part or effect in adding power to the engine and thus its weight is a dead loss except to balance the reciprocating action, and is detrimental especially when used in such vehicles as automobiles, motor boats and more particularly in airships and flying machines where the elimination of all dead weight is imperative.

Turbine engines of the explosive type where the explosions take place within or directly into a rotary wheel or motor, have been found unsatisfactory and impracticable owing to the sudden hammer-like kick or stroke of the explosions and the extreme high temperature of the gases from which injury results to the motor if it be run at a moderate or workable speed, and when run at a very high speed excessive radiation is engendered and transmission means must be employed to reduce the speed for general application which are inefficient and troublesome.

One object of this invention therefore is to obviate these difficulties by providing means to conserve and utilize the exhausting gases by directing and conveying them through a suitable conduit leading into a rotary wheel mounted upon the shaft, driven in common by the reciprocating parts of the engine and said rotary wheel.

Another object of this invention is to transmit the heat and velocity of the exhaust gases to a large volume of atmospheric air in transit through a conduit having its open air intake end formed with a funnel shaped or enlarged opening so as to take in a large volume of atmospheric air which establishes an air current commensurate with the flow of the expanding gases in its conduit where the air and gases intermingle and coöperate as an elastic power fluid to actuate and drive the rotary wheel to balance the reciprocating pistons and augment the power of the engine.

Another object of this invention is to obviate the necessity of the usual heavy balance wheel by providing a peculiar light weight construction of a bladed wheel of such design that the elastic power fluid discharged thereon will have an open but interrupted passage through said wheel whereby a series of distinct power impulses are given the wheel to cause it to revolve in correlation to the motion given by the reciprocating pistons during the passage of the fluid current through the wheel to its final exhaust to the atmosphere. In this novel combination a particular advantage recurs to the engine as the powerful initial explosions are easier and better utilized through the piston cylinder and the secondary recurring energy of this created elastic current is more efficiently utilized through the rotary wheel. Thus the disadvantages of both systems above enumerated are hereby overcome in the joint action described.

In the accompanying drawings illustrating the invention in the several figures in which like parts are similarly designated, Figure 1 is a side elevation of the engine. Fig. 2 is a plan view of same part of the exhaust conduit and part of the rotary wheel casing being shown in section. Fig. 3 is an end view of the rotary wheel. Fig. 4 is an end view of the engine. Fig. 5 is a sectional side view of the rotary wheel.

"A" designates the cylinders of a reciprocating explosive engine in which operate pistons A′ (shown in dotted lines) the connecting rods *a* of which are connected to the crank-shaft A^2 mounted in the base A^3 of the engine. From the exhaust port of each cylinder A extends an exhaust pipe B whose outer ends terminate in angular discharge nozzles B′ which are extended in the same

direction so as to cause the discharging gases from the cylinders to be directed and projected in the same path and as shown in the drawings toward the rear end of the engine. Surrounding the discharge nozzles B′ is a conduit C of substantially conical shape with its contracted air inlet end formed with a flaring mouth so that the projected exhaust gases will take in a large volume of air and intermingle and impel it with corresponding velocity through the conduit.

The discharge end of the conduit C is connected to an inlet pipe D of a casing D′ in which is mounted a rotary motor wheel E. The rotary motor wheel E is constructed with a hub E′ that is mounted upon the crank-shaft A^2 of the engine and a flanged rim E^2 that is connected to said hub by means of a central web E^3 as shown. The flanges *e* of the rim E^2 form an annular channel. Extending inwardly from the flange *e* throughout the said annular channel are a series of curved blades E^4 which are so arranged with respect to each other that as the incoming elastic fluid enters the annular passage from the inlet pipe D it will first engage one blade and be directed therefrom on to the next preceding blade on the opposite side of the annular passage and thence again to next preceding blade on the opposite side and so on around the wheel until the power fluid finally escapes through the exhaust pipe F extending from the casing D′.

It will thus be seen that I provide an exceedingly simple and highly efficient engine, in which the exhaust gases are utilized as a power medium and which also permits of the use of a light weight motor wheel in lieu of the heavy fly-wheels now employed thus particularly adapting the engine for such uses where light weights are essential.

What I claim is:—

1. A combined reciprocating rotary explosive engine, comprising a power cylinder, a power piston operating therein, a crank-shaft operatively connected to said piston, a rotary motor wheel carried by said shaft, a casing for said wheel, and a conduit open at one end and having its opposite discharging end connected to said casing for conveying the exhaust gases from said power cylinder and directing them upon said rotary motor wheel for rotating said wheel in coöperation with said power piston.

2. A combined reciprocating rotary explosive engine, comprising a power cylinder, a power piston operating therein, a crank-shaft operatively connected to said piston, a rotary motor wheel carried by said shaft, a casing for said wheel, a conduit having one end open to the atmosphere and its opposite discharging end connected to said casing, for the purpose specified, and means for directing the exhaust gases from said power cylinder into and toward the discharge end of said conduit.

3. A combined reciprocating rotary explosive engine, comprising a power cylinder, a power piston operating therein, a crank-shaft operatively connected to said power-piston, a rotary motor wheel carried by said crank-shaft, a casing for said wheel, a conduit for conveying the exhaust gases from said power cylinder to and directing them upon said rotary motor wheel, said conduit being of gradually increasing diameter toward its discharge end and having a flaring air intake end, and means for directing the gases escaping into said conduit toward said discharge end.

4. A combined reciprocating rotary explosive engine, comprising a power cylinder having an exhaust port, a power piston working in said cylinder, a crank-shaft operatively connected to said piston, a rotary motor wheel carried by said shaft, a casing for said rotary motor wheel, a conduit for conveying the gases escaping from said power cylinder and discharging them upon said rotary motor wheel, said conduit being of increasing diameter toward its discharge end and having an enlarged flaring open mouth at its opposite end, and a pipe extending from the exhaust port of said power cylinder into said conduit and having its outer end directed toward the discharge end of said conduit.

5. A combined reciprocating rotary explosive engine, comprising a power cylinder having an exhaust port, a power piston working in said cylinder, a crank-shaft operatively connected to said piston, a rotary motor wheel mounted upon said crank-shaft, said wheel having an annular channel in its periphery, and curved blades extending from the sides thereof into said channel, a casing for said rotary motor wheel, a conduit for conveying the exhaust gases from said power cylinder and directing them upon the periphery of said wheel, said conduit being open at one end and of gradually increasing diameter toward its opposite or discharge end and means for directing the gases escaping from said exhaust port into and toward the discharge end of said conduit.

6. In combination with a reciprocating explosive engine, a rotary motor mounted upon the power shaft of the engine, and a conduit for conveying the exhaust gases from the power cylinder and delivering them upon said rotary motor, said conduit being open at one end whereby atmospheric air is drawn into said conduit and delivered upon said rotary motor by and along with said gases.

7. In combination with a reciprocating explosive engine, a rotary motor mounted

upon the power shaft of the engine, a conduit for conveying the exhaust gases from the power cylinder of the engine and delivering them upon said rotary motor, said conduit being open at one end and of gradually increasing diameter toward its discharge end, and means within the conduit for directing the gases escaping from said power cylinder toward the discharge end of the conduit whereby atmospheric air will be drawn into and discharged from said conduit by and along with the gases.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHRISTOPHER J. LAKE.

Witnesses:
M. D. BLONDEL,
C. E. ADAMS.