F. W. LAKE.

ENGINE.

APPLICATION FILED JAN. 13, 1911.

1,040,700.

Patented Oct. 8, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

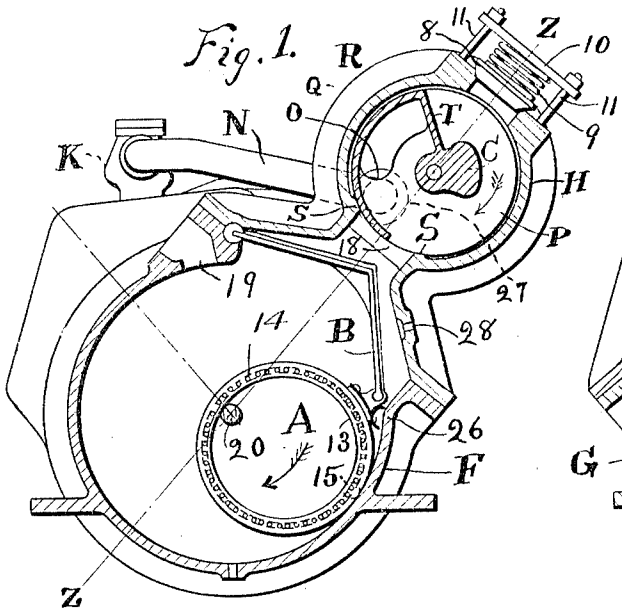


Fig. 2.

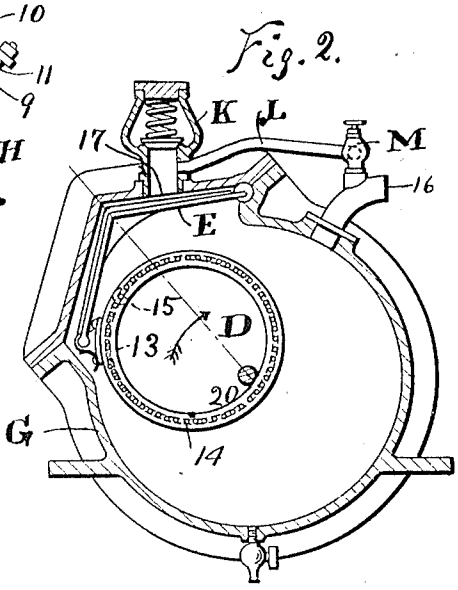


Fig. 3.

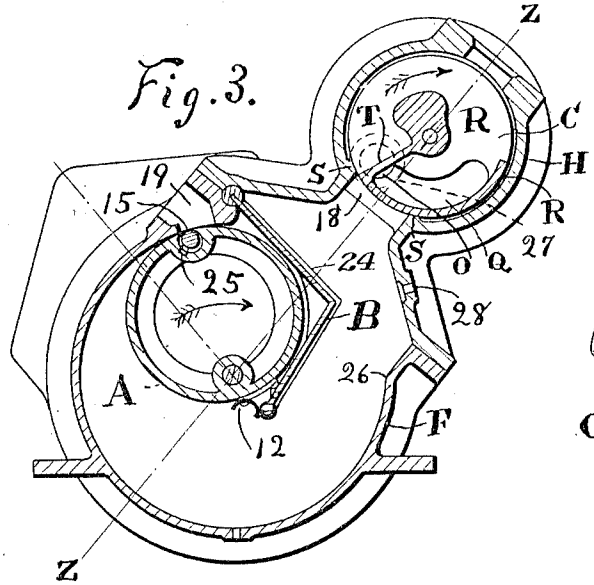
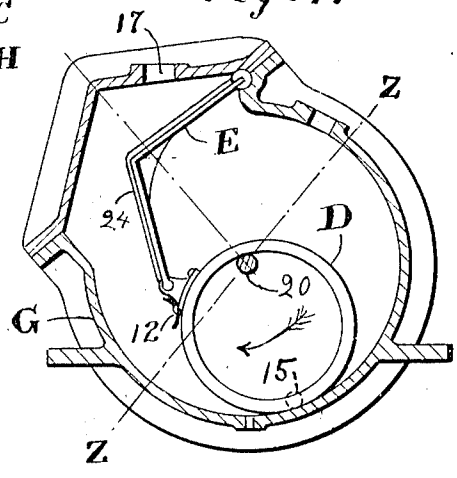


Fig. 4.



Witnesses

A. M. Hiscock.

J. B. Brooke

Inventor

Franklin W. Lake

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2 SHEETS—SHEET 2.

Fig. 6.

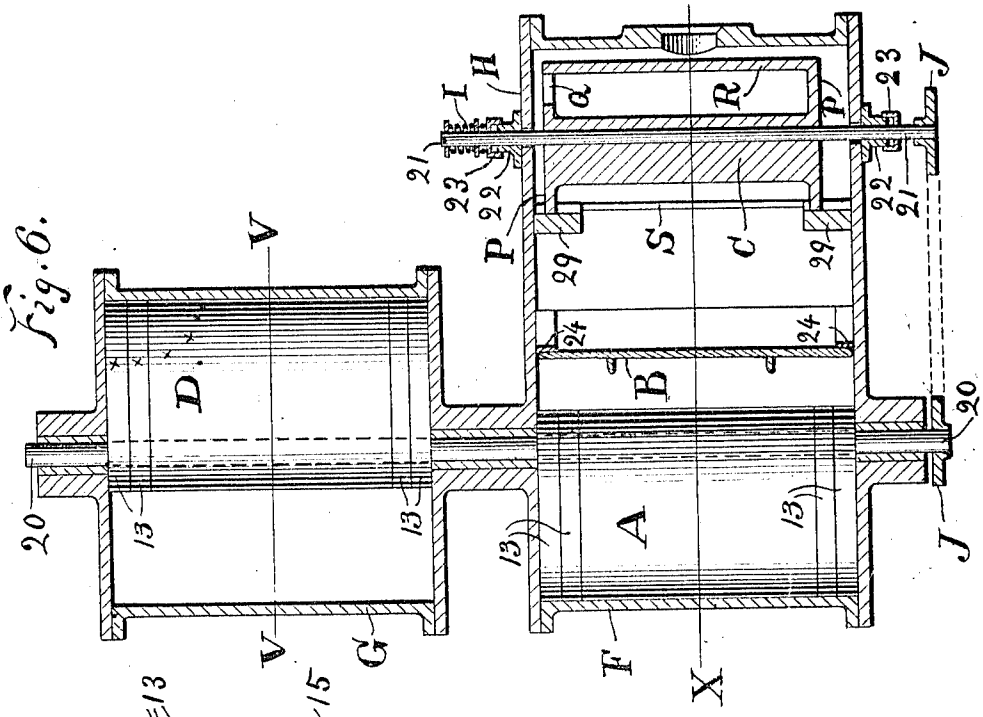


Fig. 7.

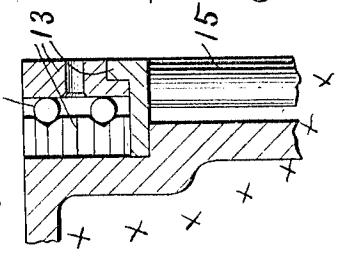
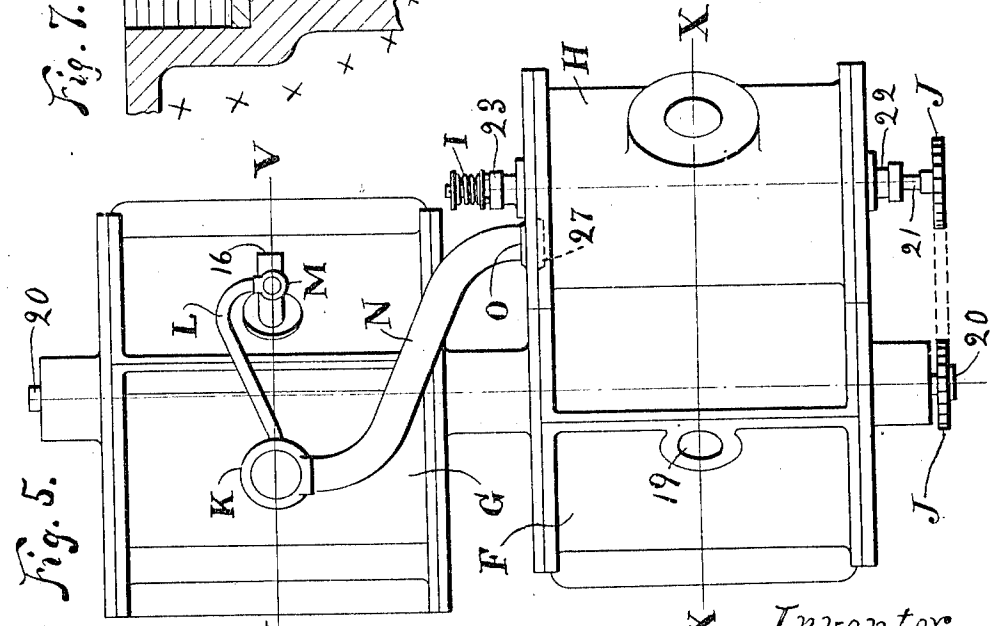


Fig. 5.



Witnesses
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Inventor
Franklin W. Lake

UNITED STATES PATENT OFFICE.

FRANKLIN W. LAKE, OF KINGSTON, ONTARIO, CANADA, ASSIGNOR OF ONE-THIRD TO JOSEPH B. COOKE AND ONE-THIRD TO ROBERT N. F. McFARLANE, BOTH OF KINGSTON, CANADA.

ENGINE.

1,040,700. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed January 13, 1911. Serial No. 602,502.

To all whom it may concern:

Be it known that I, FRANKLIN W. LAKE, a citizen of Canada, residing at 318 Queen street, in the city of Kingston, in the county of Frontenac, in the Province of Ontario, Canada, have invented a new and useful Engine, of which the following is a specification.

My invention relates to improvements in engines and the objects of my improvements are, first, to save a large per cent. of the fuel required by other engines in producing the same amount of power; second, to more perfectly utilize the first impulse of the explosion of gas in the cylinder; third, to provide perfect means of safety in case of back-firing or pre-igniting; fourth, to have a much lighter and more compact engine in proportion to the strength and durability of the same; fifth, to have only light reciprocating parts, and thereby avoid the vibration caused by the ordinary engine; sixth, to provide an easy engine to start and control without wasting of the driving element. I attain these objects by the mechanism illustrated in the accompanying drawings, which are arranged as the engine would be for gasolene. The arrows showing direction of rotation for eccentric pistons and valve.

Figure 1. is a sectional end view on line X. X. of Figs. 5 and 6 showing the position of the driving eccentric piston A and the piston plate B, and the rotary valve C, at the time the explosion takes place. Fig. 2. is a sectional view on line V. V. Figs. 5 and 6 showing the position of the compressing piston D. and piston plate E. at the time of the explosion. Fig. 3. is a sectional view on line X. X. of Figs. 5 and 6 showing the position of the driving eccentric piston A. and plate B and valve C at the time the burnt gas or exhaust is starting to escape at 19. Fig. 4. is a sectional view on line V. V. Figs. 5 and 6 showing position of compressing eccentric piston D. and plate E, at the time the exhaust port 19 is starting to open. Fig. 5. is a top view of engine showing driving cylinder F. and compressing cylinder G. and compression chamber H. Fig. 6. is a sectional view on line Z. Z. Figs. 1 and 3 but the eccentric piston A is shown at its extreme point from the compression chamber H. Fig. 7. is an enlarged sectional view of a corner of an eccentric piston, marked by crosses, Fig. 6, showing how the corners of the eccentric pistons are recessed to admit of the rings to which the piston plates are hinged and showing the ball bearings which relieve the friction between the piston plates and the eccentric pistons. In the sectional views the eccentric pistons are not in section excepting in Figs. 3 and 7.

Similar letters and numbers refer to similar parts throughout the several views.

The two eccentric pistons or cranks A and D are placed on opposite sides of the main shaft 20. Each eccentric piston making connection with the sides of the cylinders by a roller 15 Figs. 3 and 7, the roller protruding from the eccentric piston to retain the driving element keeping the same from passing between the eccentric piston and the cylinder wall.

A hole larger in diameter than the roller is bored near the edge of eccentric pistons so as to cut through the side of the same, the cut through the side of eccentric piston being less in width than the diameter of roller thus allowing the roller to come in contact with cylinder wall but preventing same from coming out farther than desired. A small groove 25, Fig. 3 is cut in one side of the hole, and a light spring in the groove keeps the roller 15 in place. The driving element filling in the opening behind the roller holding the same more firmly against the cylinder wall.

One end of the piston plates B and E are hinged to the inside of the walls of the cylinders and the other end of the piston plates are hinged to rings 13, the rings being around each end of the eccentric pistons, keeping the piston plates in connection with the eccentric pistons. The rings 13 are supplied with roller or ball bearings 14 which carry the weight of the pressure on the one end of the piston plates and apply the pressure to the eccentric pistons.

The corners of the eccentric pistons are recessed or cut away Fig. 7. so that the outside of the rings 13 set flush with the outside of the sides and ends of the eccentric pistons. The piston plate hinge is secured to the outer ring 13, Fig. 7. The rivet hole is shown (in section) in about the middle of the ring to show which ring is made fast to the hinge of the piston plate. This outer ring does not revolve but works like an ordinary eccentric band to keep the piston plate in connection with the eccentric pis-

The L shaped ring Fig. 7. covering the opening which contains the roller 15. The end of the roller 15 working against the L shaped ring. The inner ring containing the two shallow V shaped grooves Fig. 7. affords a convenient method of getting a suitable hard surface for the balls 14 of the bearing. The L shaped ring, and the inner ring with the V shaped grooves, revolve with the eccentric piston, but are left free to move around the same, so as to distribute the wear around the rings.

The hinge connecting the piston plate to the rings 13 may consist of a light casting of the same length as the eccentric piston, the ends of the hinge casting are riveted or otherwise secured to the outer rings 13, the hinge casting not touching the eccentric piston between the rings. The other part of the hinge can be a roller (perhaps a piece of shafting) of the same length as the hinge casting, the roller being inserted into the casting from the end, the piston plate being firmly secured to the roller.

The edges of the piston plates B and E are fitted with light strips 24, Fig. 6, which work against the heads of the cylinders, to retain the gas. The light strips 24 are loosely riveted to the piston plate, or the strips 24 can be inserted into a groove in the edge of the piston plate, and a light spring behind the strips keeps them in contact with the heads of the cylinder. There is also a curved plate 12, Fig. 3 one edge of which is attached to the hinge of the piston plates, the plate 12 not being rigidly secured to the hinge, it does not press hard against the eccentric piston, only when the driving element comes against it, then the plate 12, is held firmly against the eccentric pistons, keeping the gas from short circuiting there.

The rotary valve C works in the compression chamber H. The rotary valve C consists of two disks P. P. one at each end of the valve and from one disk to the other is a cylindrical plate R which works against the machined faces S. S. closing the opening 18 thus retaining the gas in the compression chamber H until the roller 15 touches the point 26, Figs. 1 and 3. The rotary valve also has a baffle plate T. The baffle plate is from the front edge of the cylindrical plate to the center of the valve, and extends the whole length of the same. The two disks P. P. work on two end bridges 29, Fig. 6. There is a circular shaped opening Q through the one disk P. the opening Q passing over the opening O in the end of the compression chamber. The opening O admits the gas into the compression chamber from the compressing cylinder. When the opening Q starts to pass opening O the incoming gas drives out the burnt gas from behind the baffle plate T, around the shaft 21 and so out from the compression chamber before the cylindrical plate R entirely closes the opening 18. The baffle plate T keeping the incoming gas from going directly out but instead causing it to take the course to drive out the burnt gas. The incoming gas continues to have passage from the compressing cylinder G into the compression chamber H until opening Q has passed opening O after which firing occurs.

The disk P which contains the opening Q slides against a small washer like plate 27, which encircles the opening O, such disk P closing the opening O when the two openings O and Q are not together.

The disk P containing the opening Q is held against the plate 27 by a spring I, which is on the valve shaft 21. In case of a back fire in the compressing cylinder G, or pipe N, the spring I allows the disk P to leave the plate 27 and thus relieve the pressure from the explosion in the compressing cylinder or pipe N.

The valve shaft 21 turns in flanged bearings 22. The bearings 22 are supplied with glands 23 to contain packing, to keep the gas from escaping. The flanges 22 are adjustably connected to the compression chamber, so the cylindrical plate R can be kept in proper relation to the machined faces S. S. The rotary valve C is driven by a sprocket chain on equal sprocket wheels J. J.

On the compression chamber H the safety valve plate 8 is held against the valve seat by a stiff spring 9, which is under a bar 10, the bar having a hole in each end, and has two stud bolts 11, connecting it to the compression chamber, so by turning down the nuts on the bolts 11 the desired pressure is given to the valve plate 8. When the engine is running the nuts on the safety valve bolts 11 are turned down until there is no escape at the safety valve, when an ordinary explosion takes place, but should there be a backfire or pre-ignition when the cylindrical plate R has the opening 18 closed then the safety valve would give the necessary relief from the over pressure.

To relieve the compression before the compressing eccentric piston D, when starting the engine or when the full charge of gas is not necessary for the amount of work required, there is a passage or pipe L which taps the discharge from the compressing cylinder and connects to the intake of the same, thus allowing the circulation through the pipe L of the amount of gas not required. But by closing the valve M in the pipe L then the whole charge is driven through the pipe N into the compression chamber. Thus avoiding the burning of an unnecessary amount of gas, or discharging unburnt gas, but taking the whole charge when desired. The valve M can be arranged to be operated by governors if desirable to do so.

The gasolene vaporizer or carbureter is

connected at 16 and the vapor is drawn in the compressing cylinder by the turning of the compressing eccentric piston D, while the gas that is before the piston D and piston plate E is driven out at 17 through the check valve K, through the pipe N, through the round opening O, through the opening Q into the compression chamber H, and when the cylindrical plate R leaves one side of machined surface S the gas comes through opening 18, against driving piston plate B and eccentric piston A when it is exploded by a firing plug which is inserted at 28. The pressure from the explosion on piston plate B and eccentric piston A forces the eccentric piston A around turning the shaft 20. The movement of eccentric piston A drives out the remaining burnt gas before it, through the opening 19 and when the roller 15 passes the opening 19 the driving charge is relieved from confinement, but not before the strength and energy of the same has been well spent.

The cylindrical plate R closes the opening 18 while the roller 15 moves from opening 19 to point 26 when the new charge comes against piston plate B and eccentric piston A.

The engine arranged for gasolene as described would be kept from undue heat by putting atomized water through the engine with the vapor or gas. The major portion of the lubricating oil also would be given with the gasolene.

I do not claim as my invention all eccentric pistons driven by gas or steam or all devices to keep the driving element from short circuiting in connection with eccentric pistons, but

What I do claim as my invention and desire to secure by Letters Patent is:

1. In combination with an engine, a casing, the casing having openings for the admission of the driving element and the exhaust, a shaft passing through the casing, a cylinder shaped eccentric piston rigidly secured to the shaft and arranged to rotate within the casing, the side of the eccentric piston which is farthest from the shaft arranged to work close to or against the cylindrical part of the casing, a piston plate one end of which is hinged to the casing between the openings for the admission and exhaust, and the other end of the piston plate coming in contact with the side of the eccentric piston, the piston plate thus forming a wall or partition from the casing to the eccentric piston between the intake and outlet openings in the casing, a recess or extension of the casing forming a receptacle for the piston plate sufficient to admit the whole of the piston plate, thus allowing the piston plate to leave the path of the eccentric piston, so the eccentric piston can make complete revolutions, substantially as described.

2. In combination with an engine, a casing, the casing having openings for admission and exhaust, a shaft passing through the casing, an eccentric piston rigidly secured to the shaft and arranged to rotate within the casing, the side of the eccentric piston which is farthest from the shaft arranged to work close to or against the cylindrical part of the casing, a roller (15) inserted in the side of the eccentric piston, the opening containing the roller being larger in diameter than the roller and cutting through the side of the eccentric piston, thus allowing the side of the roller to protrude far enough to work against the cylindrical part of the casing, a piston plate hinged to the casing, the hinge being between the intake and exhaust openings and the piston plate connecting with the side of the eccentric piston, a recess or extension of the casing forming a receptacle for the piston plate so the piston plate can leave the path of the eccentric piston, substantially as described.

3. In combination with an engine, a casing, the casing having openings for admission and exhaust, a shaft passing through the casing, an eccentric piston rigidly secured to the shaft and arranged to rotate within the casing, the side of the eccentric piston which is farthest from the shaft arranged to work close to or against the cylindrical part of the casing, a roller inserted in the side of the eccentric piston and arranged to work against the cylindrical part of the casing, a piston plate one end of which is hinged to the casing, the hinge being between the intake and exhaust openings, the other end of the piston plate coming in contact with the side of the eccentric piston, bands or rings (13) encircling the eccentric piston, the one end of the piston plate being hinged to such rings, thus keeping the piston plate in continual connection with the eccentric piston, the said rings being sufficiently loose to allow the eccentric piston to rotate within the same, a recess or extension of the casing forming a receptacle for the piston plate, substantially as set forth.

4. In combination with an engine, a casing, the casing having openings for intake and exhaust, a shaft passing through the casing, an eccentric piston rigidly secured to the shaft and arranged to rotate within the casing, the side of the eccentric piston which is farthest from the shaft arranged to work close to or against the cylindrical part of the casing, a roller inserted in the side of the eccentric piston and arranged to work against the cylindrical part of the casing, a piston plate with one end hinged to the casing and the other end connecting with the eccentric piston, bands or rings encircling the eccentric piston to which one end of the piston plate is hinged, the eccen-

tric piston to rotate within the said rings, balls or rollers ( ) inserted between the said bands or rings and the eccentric piston, such balls or rollers thus arranged to take the pressure applied to the piston plate to avoid friction, a recess or extension of the casing forming a receptacle for the piston plate so the piston plate can leave the path of the eccentric piston and the eccentric piston can make complete revolutions, substantially as described.

FRANKLIN W. LAKE.

Witnesses:
A. M. HISCOCK,
J. B. COOKE.