A. WINNIER.

COMBUSTION ENGINE.

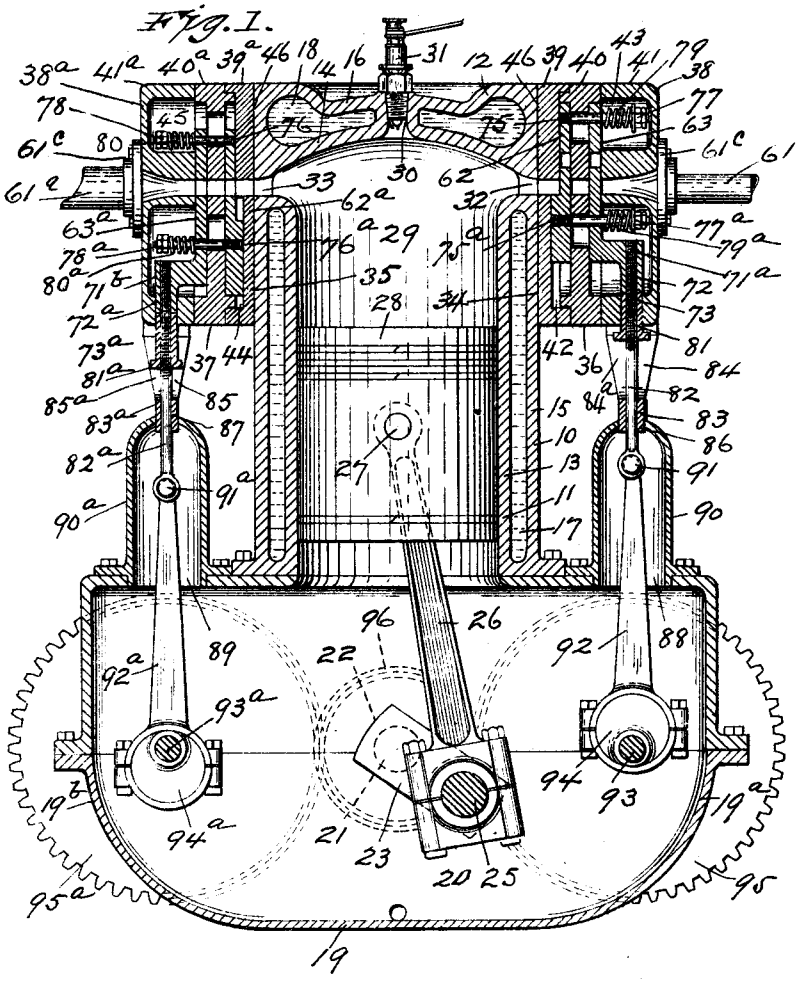
APPLICATION FILED MAR. 22, 1911.

1,066,564.

Patented July 8, 1913.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
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E. M. Jerke.

Inventor
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By his Attorney
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2 SHEETS—SHEET 2.

Fig. 2.

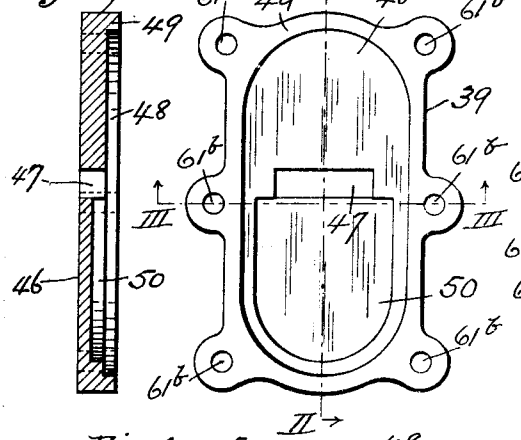


Fig. 3.

Fig. 4.

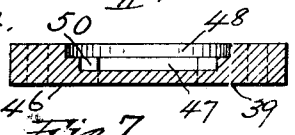


Fig. 5

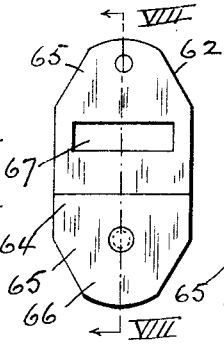


Fig. 6.

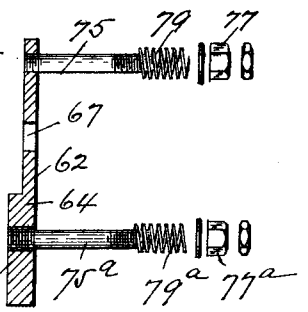


Fig. 8.

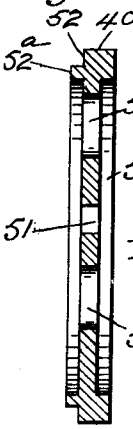


Fig. 7.

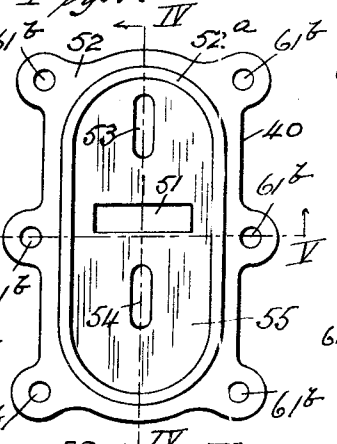


Fig. 9.

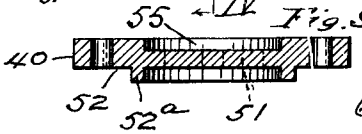


Fig. 10.

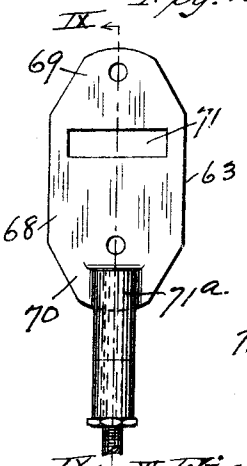


Fig. 11.

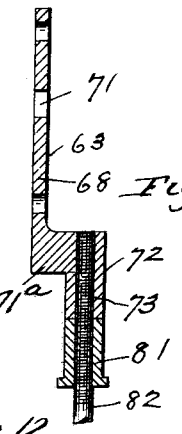


Fig. 12.

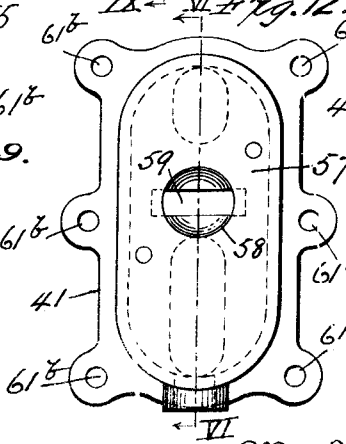
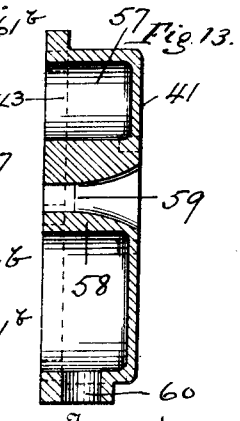


Fig. 13.



Witnesses:

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UNITED STATES PATENT OFFICE.

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COMBUSTION-ENGINE.

1,066,564. Specification of Letters Patent. Patented July 8, 1913.

Application filed March 22, 1911. Serial No. 616,189.

To all whom it may concern:

Be it known that I, ALBERT WINNIER, a citizen of the United States, and a resident of Dorchester, county of Suffolk, and State of Massachusetts, have invented certain new and useful Improvements in Combustion-Engines, of which the following is a full, clear, and exact specification.

This invention relates more particularly to a class of combustion engines of the four-cycle type.

My invention has for its object primarily to provide a hydrocarbon internal combustion engine of a four-cycle type which is adapted for use to propel automobiles, wagons, carts, boats and the like, and which is so constructed that charges of the motive agent admitted into the compression chamber may be exploded at every alternate revolution of the crank-shaft; and to provide a combustion engine wherein the parts thereof are of a simplified form so that when assembled and in operation will permit of being economically lubricated and which are not susceptible of being easily damaged or worn.

Another object of the invention is to provide new and novel forms of valves for the inlet and outlet ports wherein forms of slides are employed which are adapted to effectually control the admission of the charges of the motive agent into the compression chamber and allow a thorough direct exhaust of the exploded products from said chamber regularly at intermittent intervals.

A further object of the invention is to provide a combustion engine composed mainly of parts designed to be interchangeable so as to allow one engine in event of being damaged to be conveniently repaired by applying thereto certain parts from another engine, if desired.

A practical embodiment of the invention is represented in the accompanying drawing forming a part of this specification in which similar characters of reference indicate corresponding parts in all the views, the said invention being more fully described hereinafter and then pointed out in the appended claims.

In the drawing, Figure 1 is a longitudinal vertical section through one form of combustion engine embodying my invention. Fig. 2 is a view of one face of one of the back-plates of the valves of the engine. Fig. 3 is a section taken on the line II—II of Fig. 2. Fig. 4 is a section taken on the line III—III of Fig. 2. Fig. 5 illustrates a plate of one of the slides of the valves of the engine. Fig. 6 is a section, partly in detail, taken on the line VIII—VIII of Fig. 5. Fig. 7 is a view of one face of one of the intermediate plates of the valves of the engine. Fig. 8 is a section taken on the line IV—IV of Fig. 7. Fig. 9 is a section taken on the line V—V of Fig. 7. Fig. 10 is a view of one face of one of the slides of the valves of the engine. Fig. 11 is a section taken on the line IX—IX of Fig. 10. Fig. 12 is a view of one face of one of the front plates of the valves of the engine, and Fig. 13, is a section taken on the line VI—VI of Fig. 12.

The combustion engine 10 has a cylinder 11 which is preferably vertically disposed in my type of engine, and upon the upper end of said cylinder is provided a head or cap 12 which may be formed integral with or separate from the cylinder. Spaced apart from the walls 13 and 14 of the cylinder and head, respectively, is an outer jacket 15 and 16 so as to provide chambers 17 and 18 which are preferably arranged so as to communicate with each other for circulating water therethrough whereby the cylinder may be kept at a proper working temperature. Provided upon the lower end of the cylinder 11 is a crank-casing 19 which may be of the usual or any preferred form or may consist of a plurality of parts, in order to permit access to the crank-pit 20 therein when it is desired to clean or repair the engine and said crank-casing has oppositely directed extensions 19^a and 19^b. Journaled substantially midway of two of the opposed walls of the crank-casing 19 and between the extreme ends of the extensions 19^a and 19^b is a crank-shaft 21 of a crank 22 comprising plates 23 connected by a transverse crank-pin 25 having held thereto one end of a connecting rod 26. At the opposite

end of the connecting rod 26 is a wrist-pin 27, and upon said wrist-pin is a piston 28 adapted to reciprocate in the cylinder 11.

Above the piston 28 in the cylinder 11 is a combustion chamber 29 in which the gaseous-fuel is compressed prior to explosion, and in the head 12 is a threaded opening 30 for reception of a spark plug or igniting device as 31, of any suitable form which may be adapted to explode the gaseous-fuel within the combustion chamber 29. Through an upper part of the cylinder 11 is provided an intake port 32 for admission of charges of the motive agent into the combustion chamber 29 and in the upper part of said cylinder opposite to the intake port 32 is an outlet port 33, through which is exhausted the exploded products of combustion from the chamber 29. Upon the cylinder 11 and surrounding the inlet port 32 and exhaust port 33 are provided substantially rectangular flat faces 34 and 35 upon which are held valves 36 and 37 for controlling the inlet of the charges of the motive agent into the compression chamber 29 and to permit said compression chamber to be directly exhausted of the exploded products of combustion.

Each of the valves 36 and 37 are alike in formation and size, and are adapted to be operated consecutively at alternate revolutions of the crank-shaft 21. Each of the valves 36 and 37 has a casing 38 and 38^a which is substantially rectangular in shape, and is preferably composed of a back-plate, 39 and 39^a, an intermediate-plate 40 and 40^a, and a front-plate 41 and 41^a. The plates 39, 40, 41 of the valve 36 are formed so that when assembled chambers, as 42 and 43, are provided therebetween, and the plates 39^a, 40^a, 41^a of the valve 37 are likewise formed so as to provide chambers, as 44 and 45, therebetween when assembled as will be hereinafter more fully described. Each of the back-plates 39 and 39^a has a flat face 46 which abuts against the flat faces 34 and 35, respectively, of the cylinder 11. In proximity to the center of each of the back-plates 39 and 39^a is an opening or port 47 which is substantially rectangular in shape and said ports 47 register with the intake port 32, and exhaust port 33, respectively, of the cylinder 11. The face of each of the back-plates 39 and 39^a opposite to the face 46 thereof is recessed, as at 48. Each of the recesses 48 is substantially oval-shaped and of sufficient dimensions to provide a narrow flange 49 upon the marginal edge of the back-plates 39 and 39^a. As shown in the drawing, the lower part of the recessed face 48 of each of the back-plates 39 and 39^a is provided a second recess 50 which communicates with the recess 48, and one edge of each of said second recesses terminates at one of the marginal edges of the openings or ports 47 of said back-plates.

Connected to each of the back-plates 39 and 39^a are the intermediate-plates 40 and 40^a. Approximately midway of each of the intermediate-plates 40 and 40^a is an opening or port 51 which is also substantially rectangular in shape and registers with the port 47 of each of the back-plates 39 and 39^a. Upon the face 52 of each of the intermediate-plates 40 and 40^a which adjoins the back-plates 39 and 39^a is formed an oval flange 52^a which is of a dimension to snugly fit within the large recess 48 of each of said back-plates. Adjacent to the upper curved end of the flange 52 is an elongated opening 53, and between the rectangular opening or port 51 and the lower curved end of said flange is a second elongated opening 54. In the opposite face of each of the intermediate-plates 40 and 40^a is provided a substantially oval recess 55 which is of the same dimensions as the space interiorly of the flange 52^a. When the intermediate-plates 40 and 40^a are connected to the back-plates 39 and 39^a, as above described, the chambers 42 of the valves 36 and 37 are provided by the space interiorly of the flange 52^a of each of the intermediate-plates and the recesses 48 and 50 of each of said back-plates.

Upon the face of each of the intermediate-plates 40 and 40^a in which is formed the recess 55 are held the front-plates 41 and 41^a, respectively. Each of the front-plates 41 and 41^a is of greater thickness than the intermediate-plates 40 and 40^a and the back-plates 39 and 39^a. In the face of each of the front-plates 41 and 41^a which abuts against the intermediate-plates is provided a deep recess 57 which forms the chambers 43 and 45 of the valves 36 and 37. A boss 58 is provided substantially centrally of each of the front-plates 41 and 41^a, and said boss extends through the recess 57 to a distance so that the peripheral edge thereof is in alinement with the corresponding faces of said front-plates and through the boss 58 is formed a rectangular opening or port 59 which registers with the port 51 of each of the intermediate-plates 40 and 40^a. Through the lower wall of each of the front-plates 41 and 41^a is an opening 60 which leads into the chambers 43 and 45 of the valves 36 and 37, and upon the face of each of said front-plates opposite to the face thereof which abuts against the intermediate-plates are pipes 61 and 61^a, each having a flange, as 61^c, which may be bolted or otherwise connected to the front-plates 41 and 41^a, respectively. The pipe 61 leads to the carbureter from which the charges of motive agent are obtained and passes through the port 59 of the front-plate 41, through the port 51 of the intermediate-plate 40, through the port

47 of the back-plate 39, then through the port 32 of the cylinder, and into the compression chamber 29. The exploded products of combustion are consecutively driven from the compression chamber 29 through the outlet 33 of the cylinder 11, through the port 47 of the back-plate 39ª, through the port 51 of the intermediate-plate 40ª, through the port 59 of the front-plate 41ª and exhausted through the pipe 61ª. In order to connect the back-plates 39, 39ª, intermediate-plates 40, 40ª and front-plates 41, 41ª when assembled to form the casings 38 and 38ª of the valves 36 and 37, respectively, in each of said plates at the edges thereof are provided a plurality of openings 61ᵇ through which may be passed bolts for connecting said plates together.

Each of the valves 36 and 37 is provided with a plurality of slides, as 62, 63 and 62ª, 63ª. The slides 62 and 63 are adapted to control the intake through the valve 36 to cylinder 11, and the slides 62ª and 63ª are adapted to control the outlet from said cylinder through the valve 37. The slides 62 and 62ª are alike in formation and each consists preferably of an elongated plate 64 having tapered or cone-shaped ends 65 and 66. Centrally of the upper part of each of the elongated plates 64 is a rectangular opening 67. Through the rectangular opening or port 67 of the slide 62 is admitted the motive agent when said rectangular port is in register with the port 47 of the back-plate 39 of the valve 36 and through the rectangular opening or port 67 of the slide 62ª is driven the exhaust when said opening or port is in register with the port 47 of the back-plate 39ª of the valve 37. The upper part of one of each of the slides 62 and 62ª is planed to approximately half of its thickness so as to provide a projecting lower part 65 which is seated in the second recess 50 of each of the back-plates 39 and 39ª for limiting the upward movement of said slides when the engine is in operation. The slides 63 and 63ª are also similarly formed, and each is composed of an elongated plate 68 having tapered or cone-shaped ends 69 and 70. Midway of the upper part of each of the elongated plates 68 is a rectangular opening or port 71. Through the rectangular opening or port is admitted the motive agent when said opening or port is in register with the port 59 of the front-plate 41 and the port 51 of the intermediate-plate 40 of the valve 36, and through the rectangular opening or port 71 of the slide 63ª is driven the exhaust when said opening or port is in register with the port 51 of the intermediate-plate 40ª and the port 59 of the front-plate 41ª of the valve 37. At a right angle from one face of the tapered end 70 of each of the elongated plates 68 is a projecting part or arm 71ª and 71ᵇ, and disposed at a right angle from the free end of each of the projecting parts or arms 71ª, 71ᵇ and in an opposite direction to the upper part of each of said plates, is formed one end of an arm 72, 72ª. Through each of the arms 72, 72ª is a threaded opening 73, 73ª. In order to compensate for any wear upon the faces of the slides 62, 63 and 62ª, 63ª resulting from their reciprocatory movement in the chambers 42, 43 and 44, 45 of the valves 36 and 37, respectively, the slides 62, 63 are connected by bolts 75, 75ª passing through openings in opposite parts of the slides 62, 63, and the slides 62ª, 63ª are similarly connected by bolts 76, 76ª passing through openings in opposite parts of the slides 62ª and 63ª. The bolts 75, 75ª and 76 76ª have one end fastened to the slides 62 and 62ª, respectively. The other end of each of the bolts is threaded, and upon said threaded ends is screwed nuts 77, 77ª and 78, 78ª. Encircling each of the bolts 75, 75ª and between the nuts 77, 77ª and the slide 63 of the valve 36 are springs 79, 79ª and said springs normally serve to yieldingly force the slides 62 and 63 toward each other, and encircling each of the bolts 76, 76ª and between the nuts 78, 78ª and the slide 63ª of the valve 37 are springs 80, 80ª also normally serving to force the slides 62ª, 63ª toward each other.

Upon the ends of the arms 72, 72ª and opposite to the ends thereof held to the arms 71ª, 71ᵇ are stuffing boxes 81, 81ª and held in said stuffing boxes as well as in the threaded openings 73, 73ª of each of the arms 72, 72ª is the threaded end of a rod, as 82, 82ª. The stuffing boxes 81, 81ª and the arms 72, 72ª of the slides 63, 63ª are movable in the openings 60 of the front-plates 41, 41ª, and upon the underside of each of said front-plates is held one end of a bracket 83, 83ª. Each of the brackets 83, 83ª have two arms 84, 84ª and 85, 85ª, and at the opposite ends of the arms of said brackets are guides 86 and 87, each of which has an opening therethrough for the vertical reciprocatory movement therein of the lower part of the rods 82, 82ª. In the top of each of the extensions 19ª and 19ᵇ of the crank-casing 19 are provided openings 88 and 89 and at the openings upon each of said extensions is held one end of a vertically disposed housing or casing 90, 90ª. The opposite end of each of the housings 90, 90ª is tapered and connected to each of the guides 86 and 87. The rods 82, 82ª extend within the housings 90, 90ª, and the end therein of each of said rods is pivoted, as at 91, 91ª by a knuckle joint or otherwise to one end of the rods 92, 92ª. Parallel with the crank-shaft 21 and journaled in opposite walls of the extensions 19ª and 19ᵇ are counter-shafts, 93, 93ª each having a wrist interposed in a part thereof

within the said extensions, and upon the wrists are eccentrics 94, 94ª which are provided upon the opposite end of each of the rods 92, 92ª. Each of the counter shafts 93, 93ª extends beyond one wall of the extensions 19ª and 19ᵇ of the crank-casing 19, and upon the extended parts of said shafts are gear wheels 95, 95ª, respectively, and upon the crank-shaft 21 of the engine is a gear wheel 96 which meshes with both of the gear wheels 95, 95ª. The gear-wheel 96 is one-half the diameter of the gear wheels 95, 95ª so that when rotated to make one revolution by the crank-shaft 21 the gear-wheels 95, 95ª will make one-half a revolution.

As shown in Fig. 1 the eccentrics 94, 94ª are arranged so that the valves 36 and 37 will open and close at alternate revolutions of the counter shafts 93, 93ª, therefore, with each stroke of the rods 92, 92ª and the rods 82, 82ª the slides 62, 63 and 62ª, 63ª will reciprocate within the chambers 42, 43 and 44, 45 of the valves 36 and 37, and said valves will thereby admit into the compression chamber 29 the motive agent through the intake port 32 of the cylinder 11 and allow the exploded products of combustion to be exhausted from said chamber through the outlet port 33 of the cylinder at alternate revolutions of the crank-shaft 21.

In the foregoing description I have embodied the preferred form of my invention, but I do not wish to be understood as limiting myself thereto, as I am aware that modifications may be made therein without departing from the principle or sacrificing any of the advantages of the invention, therefore I reserve to myself the right to make such changes as fairly fall within the scope thereof.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In a combustion engine, the combination with a cylinder having an intake port and an outlet port in its upper end, of two valve casings provided upon the exterior of the cylinder, one of said casings having an intake port which communicates with the intake port of the cylinder and the other casing having an outlet port communicating with the outlet port of said cylinder, both of said casings being provided with a plurality of chambers therein; a plurality of slides each movably held in one of the chambers of each of the casings, means connecting the slides of each of the casings, and means provided upon one of the slides of each casing so as to permit all the slides of one casing to be reciprocated alternately with the reciprocation of the slides of the other casing when the engine is operated.

2. In a combustion engine, the combination with a cylinder having an intake port and an outlet port in its upper end, of two valve casings provided upon the exterior of the cylinder, each of the casings comprising a plurality of plates and having a plurality of chambers therein, said plates having a common port therethrough, one of said ports communicating with the intake port of the cylinder and the other port communicating with the outlet port of the cylinder, a plurality of slides, each movably held in one of the chambers of each of the casings, means connecting the slides of each casing and adapted to yieldingly force the slides toward each other, and means provided upon one of the slides of each casing so as to permit all the slides of one casing to be reciprocated alternately with the reciprocation of the slides of the other casing when the engine is operated.

3. In a combustion engine, the combination with a cylinder having an intake port and an outlet port in its upper end, of two valve casings provided upon the exterior of the cylinder, and each having two chambers therein, one of said casings having an intake port which communicates with the intake port of the cylinder and the other casing having an outlet port which communicates with the outlet port of the cylinder, two slides, each movably held in one of the chambers of one of the casings and having openings therethrough adapted to be registered with the intake of one valve, two slides, each movably held in the chambers of the second casing, and having openings therethrough adapted to be registered with the outlet of the second casing, means connecting both of the slides in each casing whereby each pair of the slides may be moved in unison, an arm provided upon one of the slides in each casing, and means provided upon each of said arms so as to permit the slides of one casing to be reciprocated alternately with the reciprocation of the slides of the other casing when the engine is operated.

4. In a combustion engine, the combination with a cylinder having an intake port and an outlet port in its upper end, of two valve casings provided upon the exterior of the cylinder and each having two chambers therein, one of said casings having an intake port which communicates with the intake port of the cylinder and the other casing having an outlet port which communicates with the outlet port of the cylinder, two slides, each movable in one of the chambers of one of the casings and having openings therethrough adapted to be registered with the intake of one casing, two slides, each movable in the chambers of the second casing and having openings therethrough adapted to be registered with the outlet of the second casing, bolts connecting the slides of each of the casings, a spring encircling each of the bolts and normally serving to

force the slides of each casing toward each other, and means provided upon one of the slides of each casing so as to permit the slides of one casing to be reciprocated alternately with the reciprocation of the slides of the other casing when the engine is operated.

This specification signed and witnessed this twentieth day of March A. D. 1911.

ALBERT WINNIER.

Witnesses:
ROBT. B. ABBOTT,
W. S. HAUTAU.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."