C. A. BAKER.

EXPLOSIVE ENGINE.

APPLICATION FILED MAY 16, 1912.

1,049,643. Patented Jan. 7, 1913

5 SHEETS—SHEET 1.

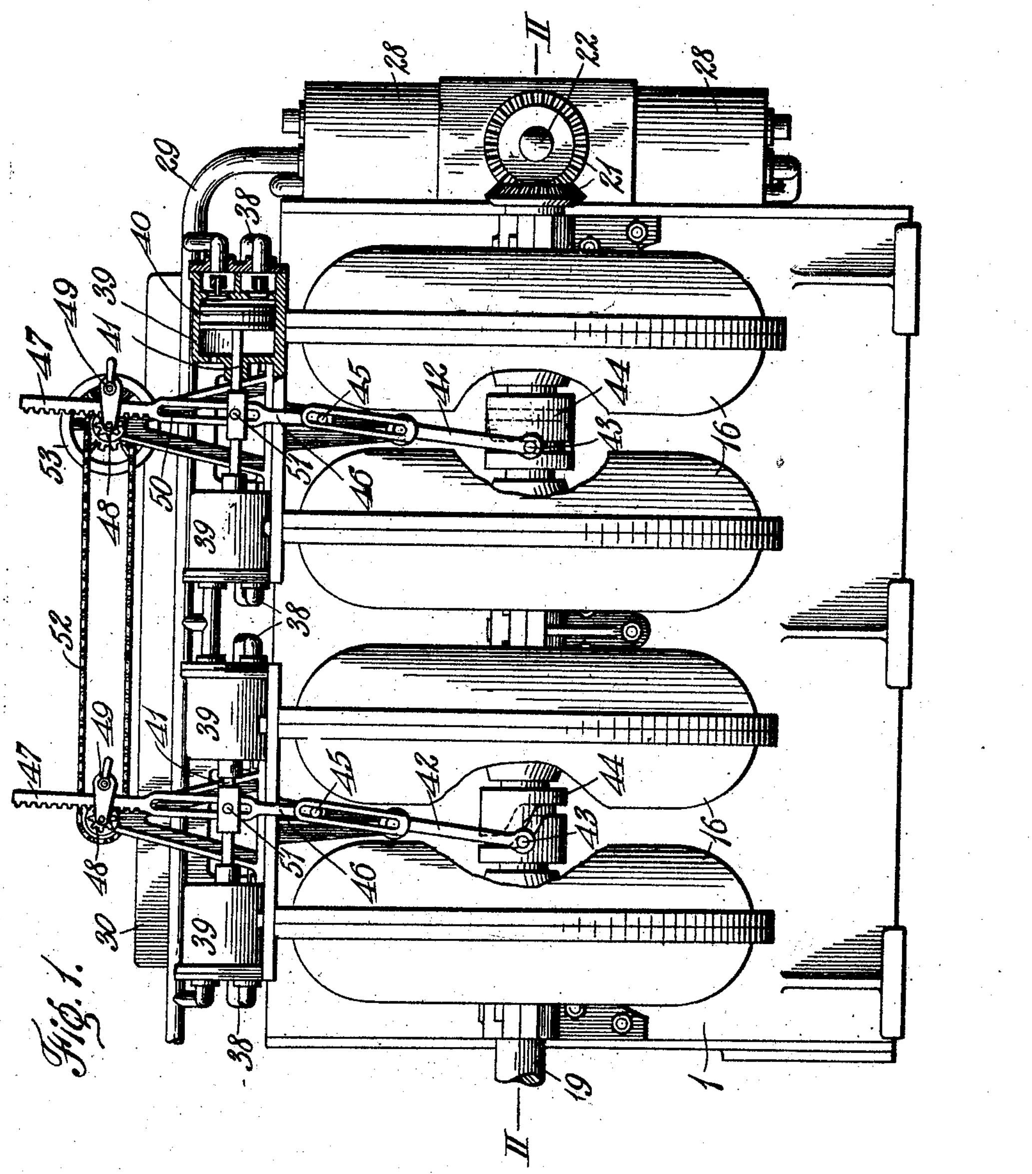

Fig. 1.

Witnesses

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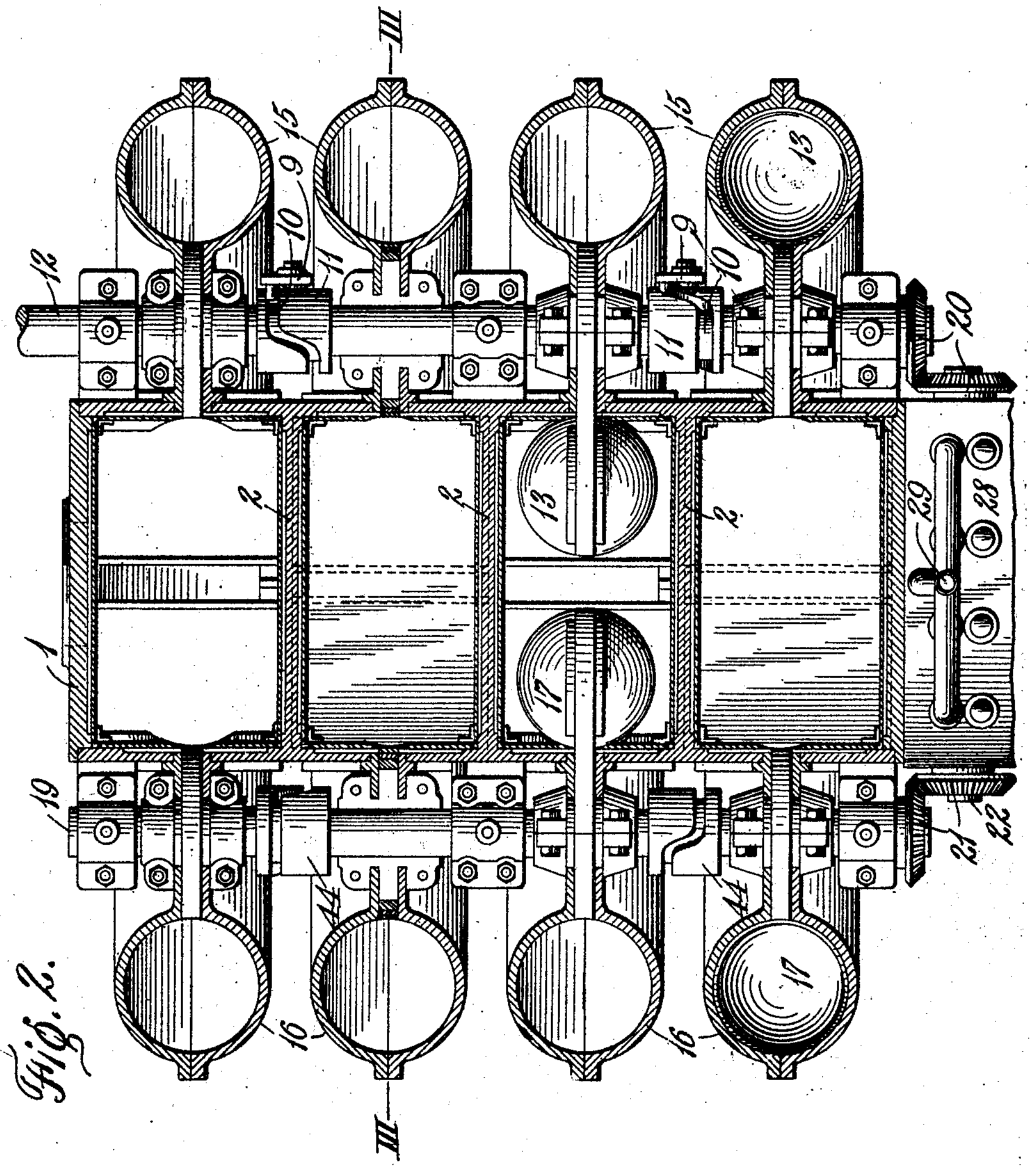

Fig. 2.

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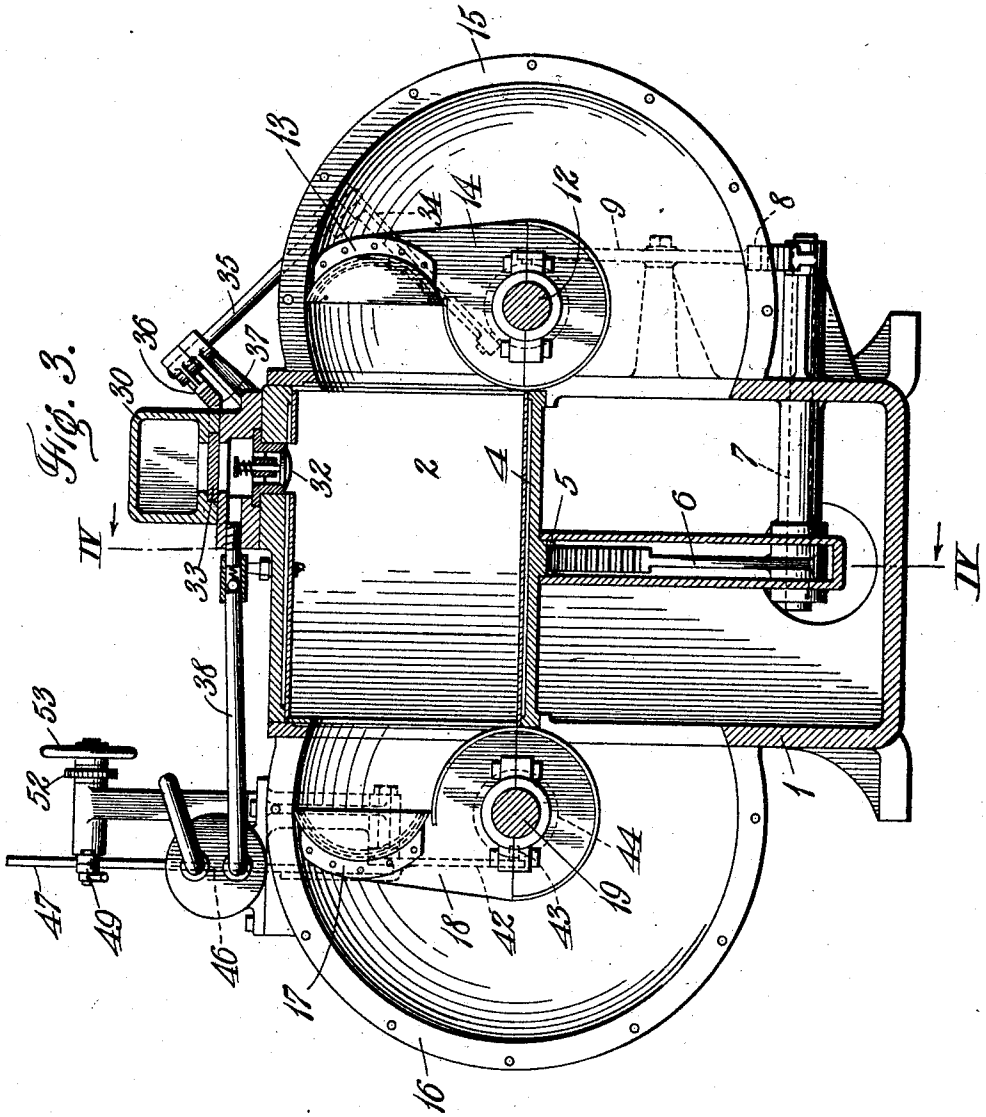
5 SHEETS—SHEET 3.

Fig. 3.



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5 SHEETS—SHEET 4.

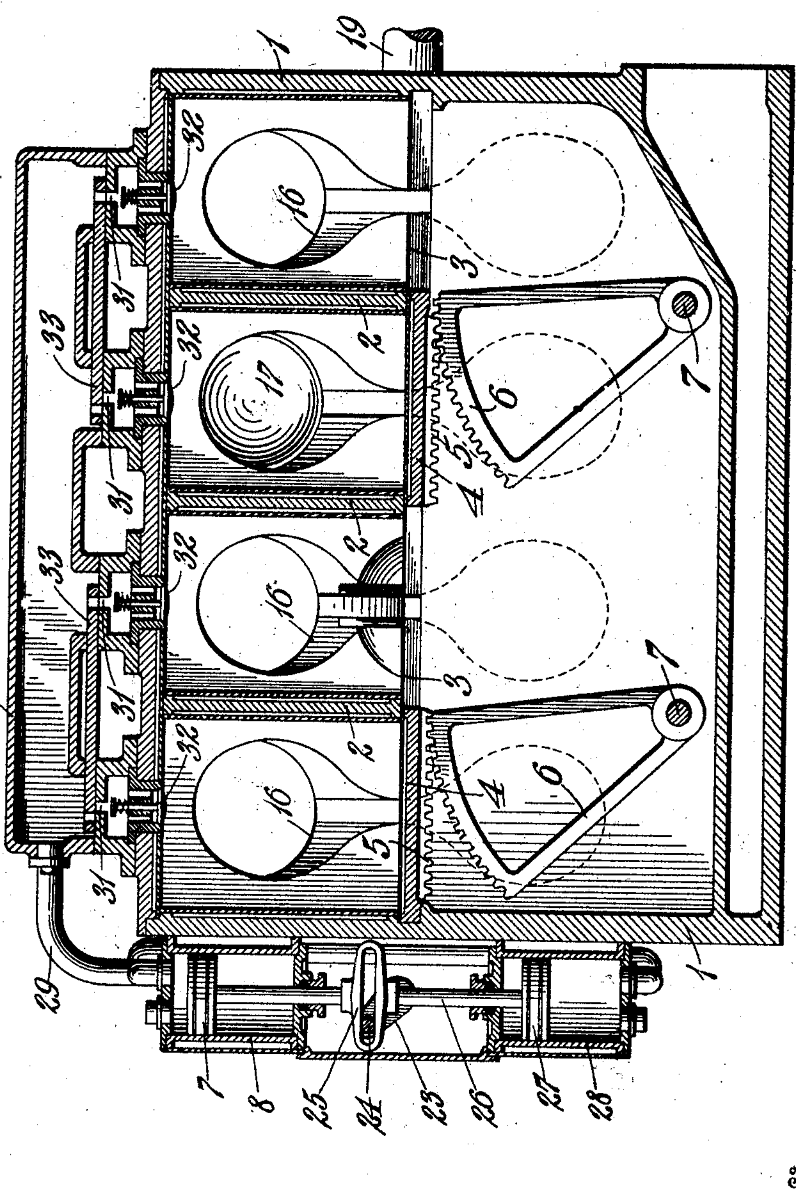

Fig. 4.

Witnesses

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5 SHEETS—SHEET 5.

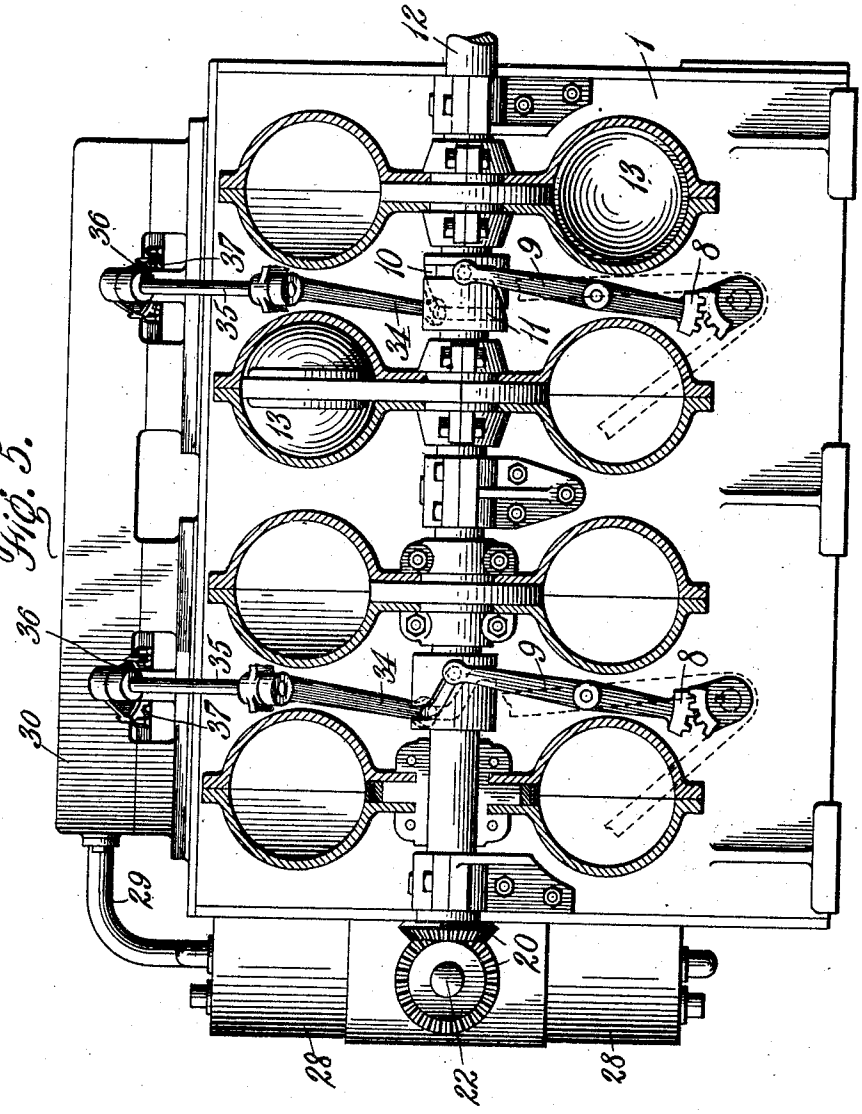

Fig. 5.

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UNITED STATES PATENT OFFICE.

CHARLES A. BAKER, OF DETROIT, MICHIGAN.

EXPLOSIVE-ENGINE.

1,049,643. Specification of Letters Patent. Patented Jan. 7, 1913.

Application filed May 16, 1912. Serial No. 697,592.

To all whom it may concern:

Be it known that I, CHARLES A. BAKER, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Explosive-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to an internal combustion engine and to a certain arrangement of the parts thereof whereby great efficiency is obtained, there being means provided for varying the mixture of the fuel to suit different requirements of service and other details of construction being included which increase the effectiveness of the motor.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a view in side elevation of a preferred form of motor that embodies features of the invention; Fig. 2, is a view in horizontal longitudinal section taken on or about line II—II of Fig. 1; Fig. 3 is a view in cross section taken on or about line III—III of Fig. 2; Fig. 4 is a view in section taken on or about line IV—IV of Fig. 3; and Fig. 5 is a view partially in section and partially in elevation taken on the opposite side of the motor from the point of view of Fig. 1.

In general terms, the motor consists of two sets of oppositely revoluble blades traversing segmental chambers in which explosion and expansion of the fuel takes place, such segmental chambers being arranged in pairs and interconnected by a base chamber and the blades of each set being mounted on a common shaft. The two shafts of the sets are interconnected to turn in unison and operate an air compressor and fuel feeding device through suitable connecting mechanism, the fuel feed mechanism including means for varying the amount of the feed.

Referring to the drawings a substantially rectangular casing 1 has internal upright partitions or cross walls 2 depending from the top of the casing to a guide-way 3 on the side walls in which base plates 4 are reciprocated longitudinally of the casing as by intermeshing rack bars 5 and segmental gears 6. The latter which are secured on suitable shafts 7, are severally operated by intermeshing segment pinions indicated at 8, one of which is carried by an oscillatory arm 9 to which motion is imparted by the cam track 10 of a cam 11. These cams are mounted on a shaft 12 journaled longitudinally of the casing to which one set of blades 13 are secured on the end of arms 14 to traverse segmental chambers 15 formed of appropriate design and material on the exterior of the casing. A similar set of chambers 16 disposed symmetrically with the chambers 15 are likewise traversed by a second set of blades 17 connected by arms 18 to a companion shaft 19 parallel to the shaft 12. A pair of chambers of each set open into the compartment of the casing formed between the adjacent cross walls thereof.

A pair of beveled gears 20 connected to the shaft 12 and a similar pair 21 connected to the shaft 19 operate a transverse pump shaft 22 having a plurality of cranks 23 corresponding in number to the pairs of segmental chambers, whose crank pins 24 travel in the slotted yokes 25 of piston stems 26 each of which reciprocate a pair of pistons 27 in oppositely disposed cylinders 28 of an air pump. The pump barrels are connected through an appropriate fitting or pipe 29 with an air chest 30 which has ports 31 each opening through outwardly closing check valves 32 into one of the compartments of the main casing. The ports 31 are controlled by suitably disposed reciprocating slide valves 33 or the like which are operated from the shaft 12 and cams 11 by rock arms 34 and rock shafts 35 that carry segmental gears 36 each in mesh with a rack 37 on the valves 33.

Fuel supply from a suitable source through a pipe 38 is injected into the air supply for each of the chambers by pumps having barrels 39 preferably disposed in pairs with pistons 40 interconnected with stems 41. Each stem is reciprocated by a rock arm 42 whose free end is provided with a cam roll 43 traveling in the path of a cam 44 driven by the shaft 19. The other end portion of the arm is longitudinally slotted and engages a stud 45 on a lever 46 that terminates in a rack bar 47 fulcrumed against a pinion 48 with which it meshes by means of a hand yoke 49. An intermediate slotted portion 50 of the arm engages a transverse pin 51 on the piston stem 41 to oscillate the latten and the stroke may be lengthened or shortened by moving the stud 45 to or from the end of the rack arm 42, as

by means of a hand wheel 53 for turning the gear 48. To insure uniformity of action of the pumps the various rock arms are interconnected for adjustment as by chain and sprocket connections shown at 52.

The parts are so disposed and arranged in timed relation that when the base wall 4 closes a compartment in the main casing 1, the companion blades 13 and 17 are substantially in the position shown in Fig. 3 with the air and fuel in compression between them ready for explosion. As a result of the explosion the blades are forced apart around the segmental chambers and a clear passage is afforded for them by the throwing of the base 4 over the companion compartment as the blades approach the lower portion of the casing chamber. The several sets of blades are so timed and disposed in relation to each other that one base slide operates for two adjacent chambers, while the fuel and air pumps are likewise arranged to furnish the proper fuel and compression at the times needed.

One feature of the construction is the mechanism which allows the variation of the fuel supply to meet different requirements of service without changing the air compression which is uniform under all conditions. By a proper disposition of the parts a substantially uniform torque is conveyed to the shafts and a motor thereby obtained which is substantially the equivalent of an eight-cylinder motor of the conventional type but which is more compact and of less weight per horse power unit. As indicated the walls of the explosion chamber may be internally jacketed with fire proof material and other provision may be made for preventing deterioration of the parts from excessive heat. It is to be understood that the usual provision is made for lubrication and other details of mechanical construction, not shown herein, are carried out in conformity with good shop practice.

Obviously, changes in the details of construction may be made without departing from the spirit of my invention and I do not care to limit myself to any particular form or arrangement of parts.

What I claim is:—

1. An explosive engine comprising a main casing with pairs of segmental, oppositely disposed chambers extending laterally therefrom and with depending cross walls dividing the upper portion of the casing into compartments each opening directly into the upper portions of a pair of chambers, a pair of parallel shafts each journaled concentrically with a set of chambers, a pair of blades secured to the shafts for each pair of chambers adapted to revolve through the latter in opposite directions, means for closing each compartment from the lower part of the casing as the blades enter the upper parts of the communicating chambers, air compressing means operated by the shafts, means for directing air therefrom into the compartments as each is closed, and means operated by the shafts for forcing fuel into the air supply to each compartment.

2. An explosive engine comprising a main casing with pairs of segmental, oppositely disposed chambers extending laterally therefrom and with depending cross walls dividing the upper portion of the casing into compartments each opening directly into the upper portions of a pair of chambers, a pair of parallel shafts each journaled concentrically with a set of chambers, a pair of blades secured on the shafts for each pair of chambers adapted to revolve through the latter in opposite directions, means for alternately closing each compartment of a pair from the lower part of the casing as the companion blades enter the upper parts of the communicating chambers, air compressing means operated by the shafts, means for directing air therefrom into each compartment as it is closed, and means operated by the shafts for forcing fuel into the air supply to each compartment.

3. An explosive engine comprising a main casing, depending cross walls dividing the upper portion of the casing into compartments, base plates reciprocable longitudinally in the casing each adapted to alternately close each compartment of a pair, a pair of segmental, oppositely disposed chambers extending laterally from each compartment of the casing, a pair of parallel shafts each journaled concentrically with a set of chambers, a pair of blades on the shafts for each pair of chambers adapted to revolve through the latter in opposite directions and timed to enter the upper parts thereof as the companion base plate closes the communicating chamber, air compressing means operated by the shafts, air distributing means operated by the shafts and adapted to supply air from the compressing means to each compartment as it is closed, and means operated by the shafts for forcing fuel into the air supplied to each compartment.

4. An explosive engine comprising a main casing with pairs of segmental, oppositely disposed chambers extending laterally therefrom, and with compartments in its upper portion each opening directly into the upper parts of a pair of chambers, means reciprocable in the casing for intermittently closing the compartments severally from the lower part of the base, a pair of parallel shafts each journaled concentrically with a set of chambers, a pair of blades on the shaft for each pair of shafts adapted to revolve in an opposite direction and to enter the upper portions of the cham-

bers as the adjoining compartment is closed, air compressing means operated by the shaft, means operated by the shafts for directing air from the compressing means into each compartment as it is closed, means for forcing fuel into the air supplied to each compartment, and means for operating the fuel supply from the shafts adjustable to regulate the amount thereof.

5. An explosive engine comprising a main casing with pairs of segmental, oppositely disposed chambers extending laterally therefrom, and with depending cross walls dividing the upper portion of the casing into compartments each opening directly into a pair of chambers, a pair of parallel shafts each journaled concentrically with a set of chambers, a pair of blades on the shafts for each pair of chambers adapted to revolve through the latter in opposite direction, a base plate for each pair of compartments reciprocable longitudinally in the casing for closing each compartment of a pair from the lower part of the casing, a rack bar on each base plate, oscillatory segmental gears meshing severally with the rack bars, a rock arm for actuating each gear, a cam on a shaft for each arm adapted to operate the latter, air compressing means operated by the shafts, means for distributing air from the compressing means into each compartment as it is closed, and means operated by the shafts for forcing fuel into the air supplied to each compartment.

6. An explosive engine comprising a main casing with pairs of segmental, oppositely disposed chambers extending laterally therefrom and with compartments in its upper portion each opening directly into the upper portions of a pair of chambers, a pair of parallel shafts each journaled concentrically with a set of chambers, a pair of blades on the shafts for each pair of chambers adapted to revolve through the latter in opposite directions, means for closing each compartment from the lower part of the casing as the companion blades enter the upper parts of the communicating chambers, a crank shaft driven by the parallel shafts, a compound air pump whose pistons are operated by the crank shaft, an air chest in communication with the pump and chambers, valves therein, rock arms geared to the valves to reciprocate the latter, cams on the shafts to oscillate the rock arms, and means operated by the shafts for injecting fuel into the air supplied to each compartment by the pump.

7. In an explosive engine having a plurality of combustion chambers, and means for supplying compressed air successively to the chambers, of fuel pumps each in communication with an air chamber, rock arms for the pumps each oscillated by the engine, a lever for reciprocating each pump adjustably fulcrumed at one end and engaged at the other in a longitudinal slot in a rock arm, and means for simultaneously shifting the pump operating levers to move their points of engagement with the rock arms in relation to the centers of motion of the latter.

8. In an explosive engine, a main casing with pairs of segmental oppositely disposed chambers extending laterally therefrom and with compartments in its upper portion each opening into the upper part of a pair of chambers, a pair of parallel shafts each journaled concentrically with a set of chambers, a pair of blades on the shafts for each pair of chambers adapted to revolve through the latter in opposite directions, means for intermittently closing each compartment from the lower part of the casing, an air chest in communication with the compartments, an air pump operated by the shaft for supplying the air chest, slide valves controlling communication between the air chest and each compartment, a rack on each valve, a gear in mesh therewith, a rock shaft carrying each gear, rock arms on the rock shafts and cams operated by the main shafts for oscillating the rock arms.

9. In an explosive engine, a main casing with pairs of segmental oppositely disposed chambers extending laterally therefrom and with compartments in its upper portion each connecting the upper ends of a pair of chambers, a pair of shafts each journaled concentrically with a set of chambers, a pair of blades on the shaft for each pair of chambers adapted to revolve through the latter in opposite directions, a crank shaft on the casing transverse to the main shafts, gearing operating the crank shaft from the main shafts, a pump operated by the crank shaft, an air chest on the casing supplied by the pump, valves reciprocating in the chest for admitting air intermittently to the casing compartments, members on the casing oscillated by the shaft, and operative connections between the oscillatory members and air chest valves for reciprocating the latter.

10. In an explosive engine, a main casing with pairs of segmental oppositely disposed chambers extending laterally therefrom and with compartments in its upper portion each connecting the upper ends of a pair of compartments, a base plate for each pair of compartments reciprocable in the casing for alternately closing the compartments of a pair from the lower part of the casing, a pair of parallel shafts each journaled concentrically with a set of chambers, a pair of blades on the shafts for each pair of chambers adapted to revolve through the latter in opposite directions, means operated by the shafts for operating the base plates in timed relation to the companion blades to close the compartments each as the companion blades are entering the upper parts of the connected

chambers, means operated by the shafts for supplying compressed air to each compartment as it is closed, a fuel pump adapted to inject fuel into each compartment, means for operating the pump in timed relation to the air pump, and means for varying the stroke of the pump to regulate the supply of injected fuel.

11. In an explosive engine, a plurality of combustion chambers, means for supplying compressed air successively to the chambers, pump barrels connected to a source of fuel supply and to the chambers severally, pistons for the barrels, stems for reciprocating the pistons, cams operated by the engine, a rock arm oscillated by each cam on a pivot between its ends and provided with a slotted outer end, levers each having an outer end engaging adjustably with the slotted portion of a rock arm and operating a piston stem, a gear forming a fulcrum for each rock arm, a rack bar on each rock arm meshing with the fulcrum gear, and means for simultaneously operating the gears to vary the points of engagement of the lever and rock arms in relation to the centers of motion of the latter.

12. An explosive engine comprising a substantially rectangular casing, pairs of segmental oppositely disposed chambers extending laterally therefrom, depending cross walls in the casing dividing the upper part of the casing into compartments each connecting the upper ends of a pair of chambers, a pair of parallel shafts each journaled concentrically with a set of chamber blades on the shaft each adapted to revolve through a chamber, the blades of companion chambers being timed to travel in opposite directions, a base plate for each pair of compartments reciprocable longitudinally in the casing below the cross walls for closing each compartment intermittently from the lower part of the casing, means operated by the shafts for reciprocating the base plates, a transversely disposed air pump shaft, driving connections between each main shaft and the pump shaft, an air pump driven from the pump shaft, an air chest in communication with the pump and with the compartments, valves controlling the admission of air from the chest to each compartment, means operated by the shafts for moving the valves in timed relation, a fuel pump for each compartment for injecting fuel into the air supply thereto, means for driving each pump from the engine shaft, and means for simultaneously varying the strokes of the fuel pump to regulate the supply of fuel.

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

CHARLES A. BAKER.

Witnesses:

LOUIS LERELLE,

AUGUST WILLMANOWSKI.