C. W. LINDSAY.

ROTARY EXPLOSIVE ENGINE.

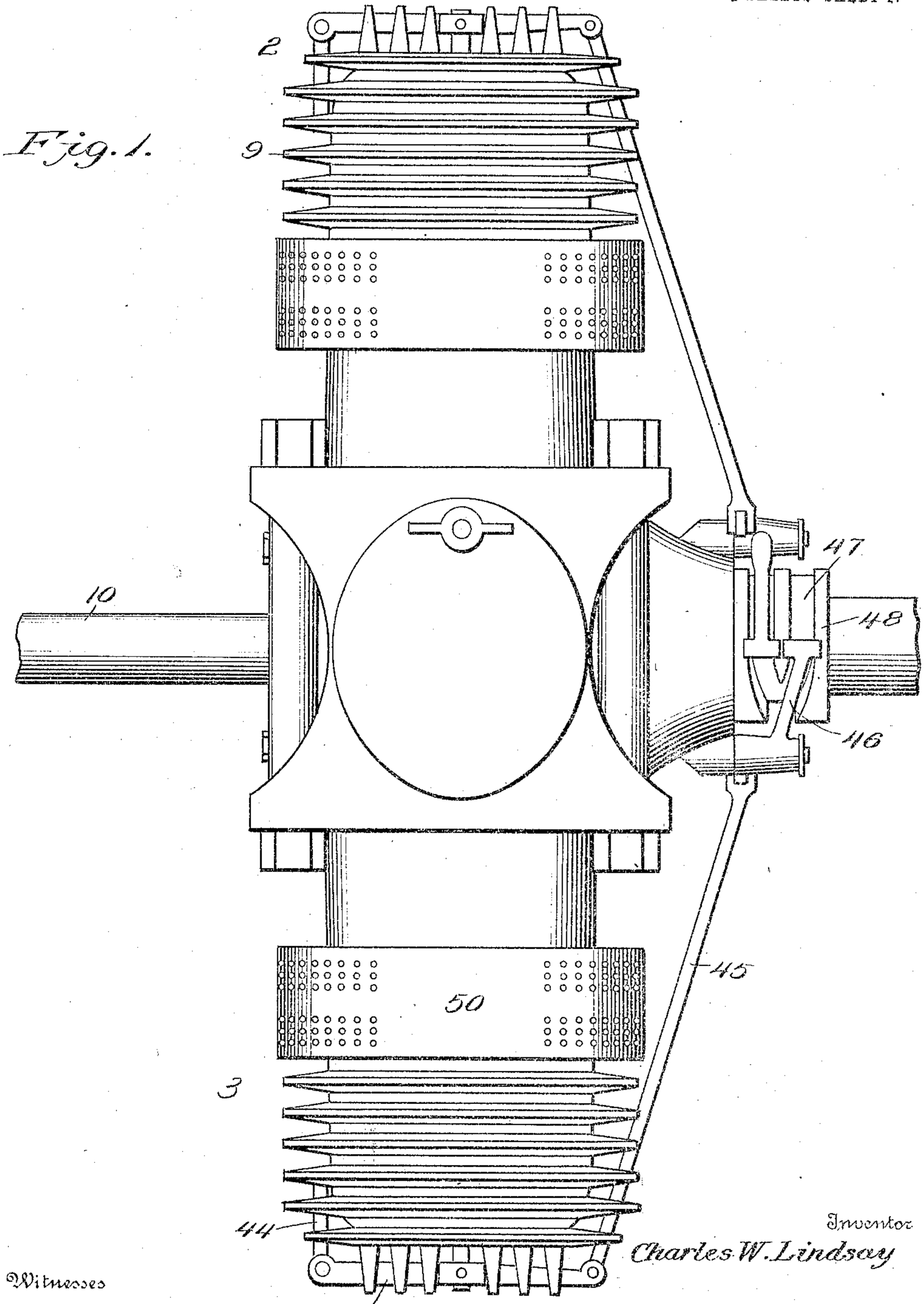
APPLICATION FILED JULY 24, 1909.

997,144.

Patented July 4, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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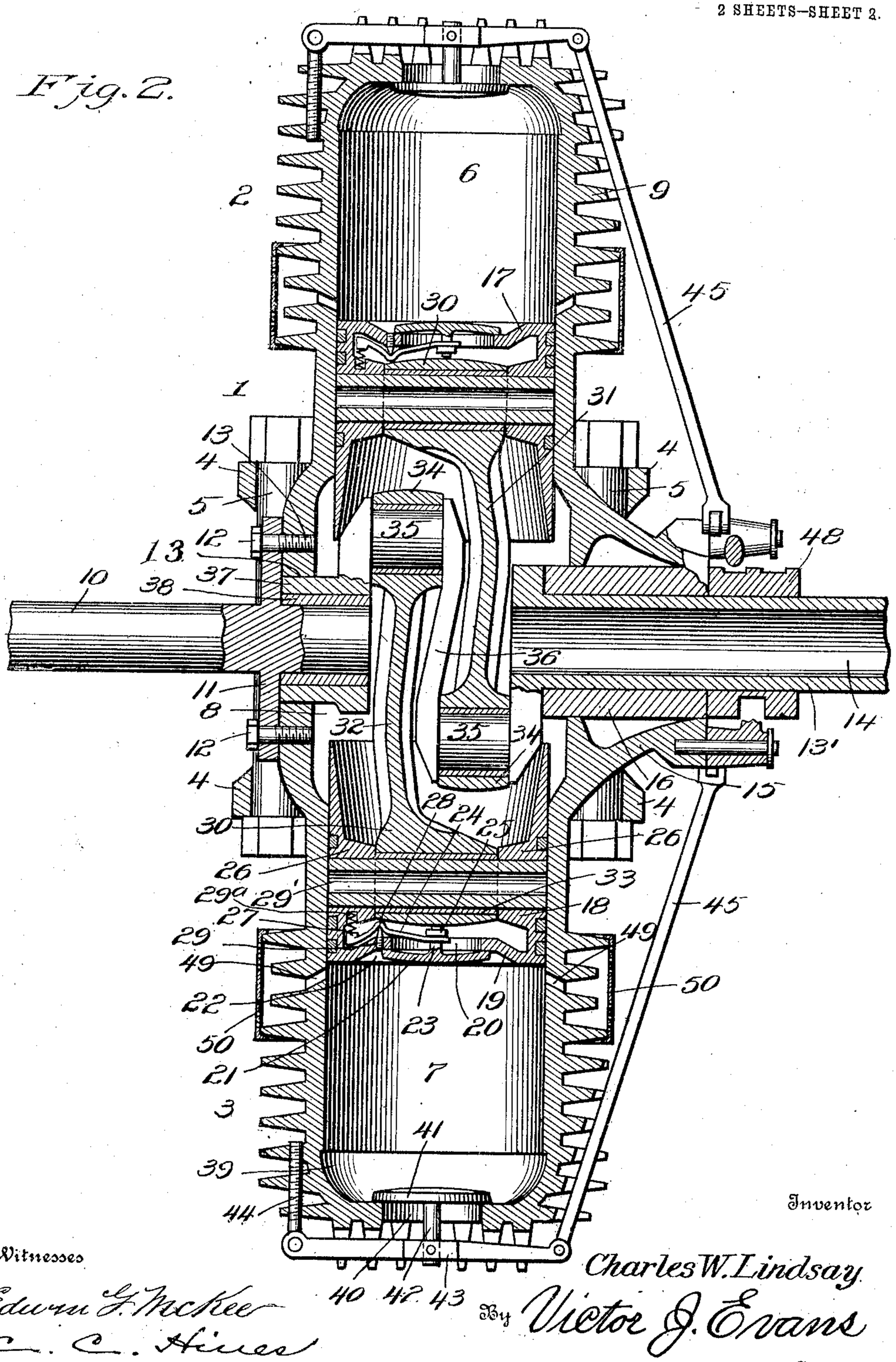
Fig. 2.



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UNITED STATES PATENT OFFICE

CHARLES WESLEY LINDSAY, OF ANTHON, IOWA.

ROTARY EXPLOSIVE-ENGINE.

997,144. Specification of Letters Patent. Patented July 4, 1911.

Application filed July 24, 1909. Serial No. 509,273.

To all whom it may concern:

Be it known that I, CHARLES W. LINDSAY, a citizen of the United States, residing at Anthon, in the county of Woodbury and State of Iowa, have invented new and useful Improvements in Rotary Explosive-Engines, of which the following is a specification.

This invention relates to rotary explosive engines of the duplex cylinder type, and its object is to provide a novel construction of parts whereby a compact arrangement is secured and increased efficiency obtained.

With this and other objects in view the invention consists of the features of construction, combination and arrangement of parts hereinafter fully described and claimed, reference being had to the accompanying drawing, in which:—

Figure 1 is a side elevation of an engine embodying my invention. Fig. 2 is a vertical transverse section of the same.

Referring to the drawings, 1 designates as a whole the engine casing, composed of a pair of sections 2 and 3 provided at their adjacent ends with outstanding flanges or extensions 4 through which are passed coupling bolts 5. The inner ends of the sections, which are disposed in opposing relation, form cylinders 6 and 7 and an interposed crank chamber 8, each of said cylinders being provided with spaced circumferential heat radiating rails 9, adapted to keep the cylinders cool.

The casing is mounted for rotation with the rotary shaft section 10 which enters one side of the crank chamber 8 and is provided with an annular flange 11 secured to the adjacent side of the crank chamber by bolts or screws 12. The crank chamber is laterally expanded at its sides and provided with an opening 13 of larger diameter than the entering end of said shaft section 10, to admit the latter and provide for the reception of the sleeve of one of the piston cranks, as hereinafter described.

The casing is adapted to rotate upon an opposite or fixed shaft section 13′ arranged in axial alinement with the section 10 and entering the offset side of the crank chamber 8. The two shaft sections are respectively journaled and bolted or otherwise fixed to a suitable supporting frame structure, not shown. The shaft 13′ is hollow to provide a fuel inlet passage 14 which communicates with the crank chamber, and extends through an opening in the adjacent side of said chamber, which side of the chamber is expanded to provide a bearing sleeve 15 between which and the shaft is arranged a bushing 16.

Arranged to reciprocate in the opposed cylinders 6 and 7 are pistons 17 and 18, which pistons are adapted to move at the limits of their power strokes into the crank chamber and are adapted to compress the explosive charges on their outward strokes within the outer ends of the cylinders, wherein said charges are exploded by any suitable type of igniting means. Each piston is hollow to form a passage for the flow of the gas or fuel mixture therethrough from the crank chamber into the outer ends of the cylinders and is provided at its outer end with a head or partition 19 formed with an admission port 20 controlled by an outwardly opening admission valve 21.

Each valve 21 is in the form of a concavo-convex disk adapted to bear against the outer face of the head 19 around the port 20 and to occupy when in closed position a cavity 22 in the end of the piston formed by inwardly offsetting said head, by which the valve is adapted to lie flush with the end of the piston to prevent possibility of deflection or injury to said valve from the forces of the explosions. The valve is provided with a stem 23 projecting through the port 20 into the hollow body of the piston and passing through an opening in the free end of a lever 24, in engagement with which it is retained by a nut 25. Bosses 26 are formed at opposite sides of the piston, as shown. The lever 24, has a counterweight 27 at its free end which is movable in the space between one of said bosses 26 and the head 19, while the intermediate portion of the lever is formed with a V-shaped recess

or offset 28 arranged to rock upon a knife-bearing 29 having a threaded engagement with the head 19. A spring 29ª is arranged in a socket in the boss 26 and bears against the counterweight slightly to coöperate therewith in normally holding the valve closed against centrifugal action, when the valve is not subjected to the suction action of the piston by which it is opened. The weight 29 also serves to counterbalance the lever and prevent its closing under centrifugal force in the operation of the engine.

Transverse pivot pins 29′ extend between the bosses 26 of the respective pistons, and pivotally engaging these pins between the bosses are the outer or sleeved ends 30 of connecting rods 31 and 32, between which sleeved ends of the rods and the pins are inserted suitable bearing bushings 33. The inner ends of the connecting rods are provided with sleeves 34 pivotally engaging wrist pins 35 on a double crank 36 arranged in the crank chamber between the two shaft sections, one end of said crank being fixed by one of the wrist pins to the inner end of the shaft section 13′, while the other end of the crank is provided with a sleeve 37 projecting into the opening 13′ of the side wall of the crank chamber and turning in contact with a bearing bushing 38 mounted upon the inner end of the shaft section 10. By this construction and mode of connecting the crank, pistons and casing, it will be understood that in the reciprocation of the pistons the casing will revolve with the shaft section 10 and upon and about the shaft section 13′, which latter remains fixed in the operation of the engine.

The pistons have a simultaneous inward and outward movement, to which end the connecting rods and crank are laterally bent or offset to permit the rods to move past one another in parallel planes into and out of the crank chamber 8. The explosive charges are simultaneously admitted through the pistons from the crank chamber into the cylinders 6 and 7, compressed on the out strokes of the pistons therein and then simultaneously exploded, driving the pistons whose cranks are arranged at an angle of 180°, inwardly on their working strokes. The pistons on their out strokes draw the fuel mixture from a suitable source of supply through the feed passage 14 in the shaft section 13′ into the crank chamber 8, and on the ensuing inward strokes of the pistons a proper proportion of this fuel mixture is admitted through the opening of the valve 21 in each piston into the outer end of the associated cylinder, in which it is compressed and exploded on the subsequent outward movement of the piston, the valves 21 closing as soon as the pressure in the explosion chambers of the cylinders exceeds that in the crank chamber to prevent possibility of ignition of the mixture in the crank chamber, as well as the exhaust of the spent gases thereinto.

The outer end of each cylinder is preferably enlarged to provide the explosion chamber 39 and is provided with a main exhaust port 40 controlled by an inwardly opening valve 41 having an outwardly extending stem 42 pivotally connected with the intermediate portion of a lever 43, which is pivotally mounted at one end upon a screw 44 fixed in the adjacent flanges 9. The opposite end of the lever, which extends transversely of the cylinder, is connected by a rod or pitman 45 with a rocker arm 46 having a projection which engages one of two cam grooves 47 in a cam collar 48 fixed to the shaft section 13. The rocker arms associated with the pitman rods 45 of the exhaust valves of the two cylinders engage and are operated by the grooves of this cam, which are properly formed to secure a timed operation of the valves in the action of the engine to exhaust the spent gases at or near the time when the pistons reach the limit of their working stroke.

In order to provide for the exhaust of a portion of the gases from each cylinder prior to the discharge of the main body of the spent gases through the ports 40, the cylinder is formed at diametrically opposite sides with auxiliary exhaust ports 49 uncovered by the piston at the limit of its working stroke and closed thereby immediately after the beginning of its outward or compression stroke. These auxiliary exhaust ports communicate with exterior exhaust chambers surrounding these cylinders, each of said chambers consisting of an annular perforated drum supported by the flanges 9 and through the perforations in which the gases are adapted to discharge in such a manner as to prevent any objectionable noise, said drums thus serving the capacity of mufflers.

From the foregoing description, the construction and mode of operation of my improved engine will be readily understood, and it will be seen that it provides and enables greater power to be applied for rotating the cylinder and transmitting power therefrom.

I claim:—

An explosive engine comprising a rotary casing having opposed cylinders and an intermediate crank chamber, the sides of said chamber being expanded and formed with bearing openings, a shaft embodying relatively fixed and rotary sections extending into said bearing openings, the fixed section being hollow and forming a fuel feed passage and the rotary section being provided with a flange secured to the expanded por-

tion of the adjacent side of the crank chamber, a double crank inclosed in said chamber, one end of said crank having a wrist-pin fixed to the inner end of the fixed shaft section and the other end of the crank having a sleeve journaled on the inner end of the rotary shaft section, hollow, valved pistons operating in said cylinders, and connecting rods coupling said pistons with the wrists of the double crank.

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

CHARLES WESLEY LINDSAY.

Witnesses:

T. O. HESTER,

J. P. WALLING.