G. LEHBERGER.

ENGINE OR MOTOR.

APPLICATION FILED OCT. 4, 1909.

999,047.

Patented July 25, 1911.

2 SHEETS—SHEET 1.

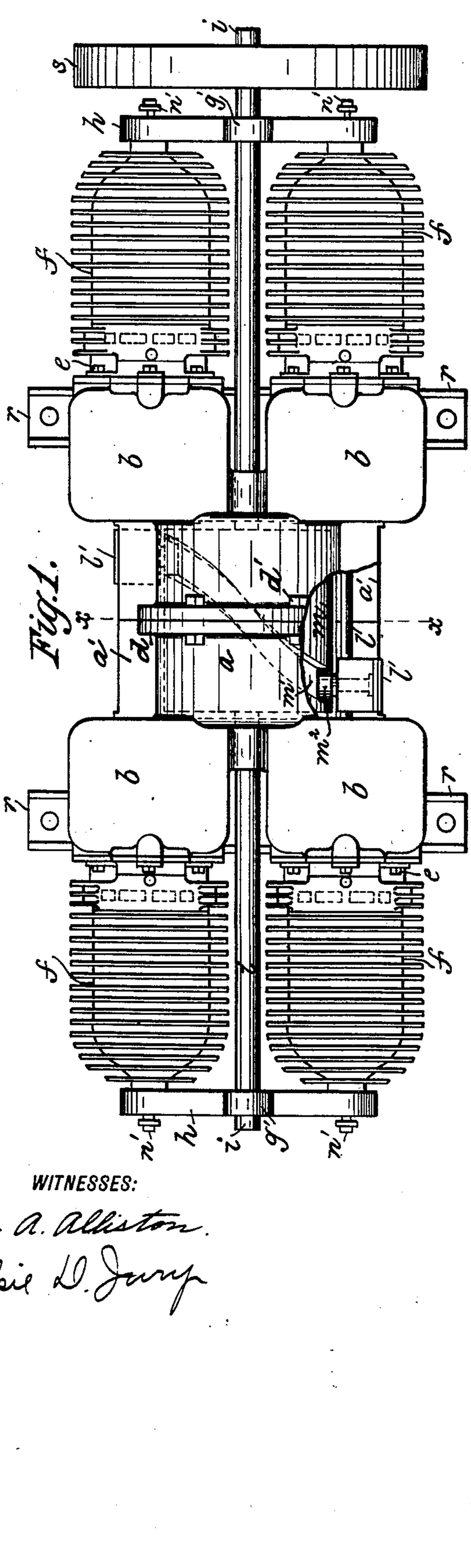

Fig. 1.

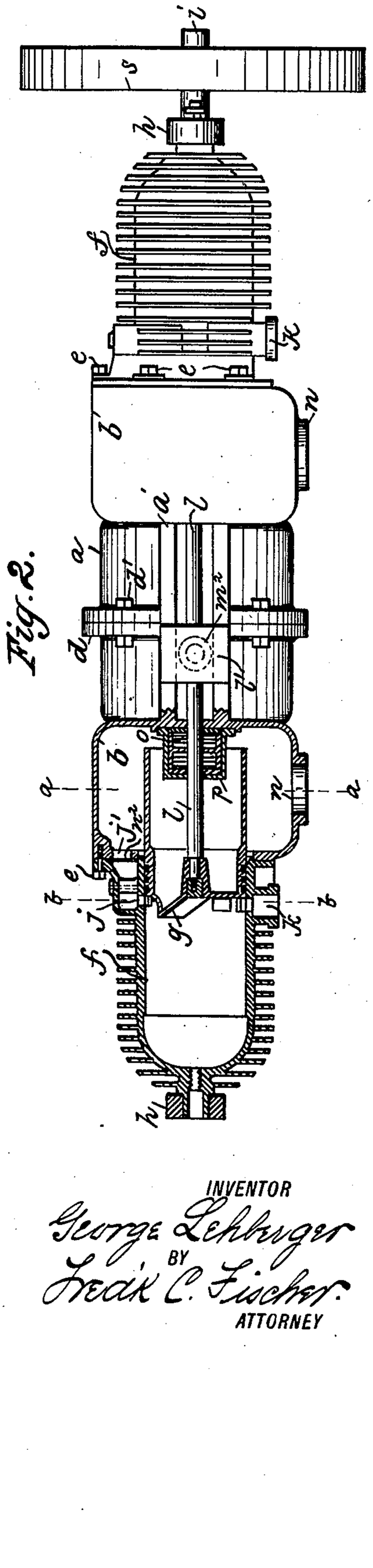

Fig. 2.

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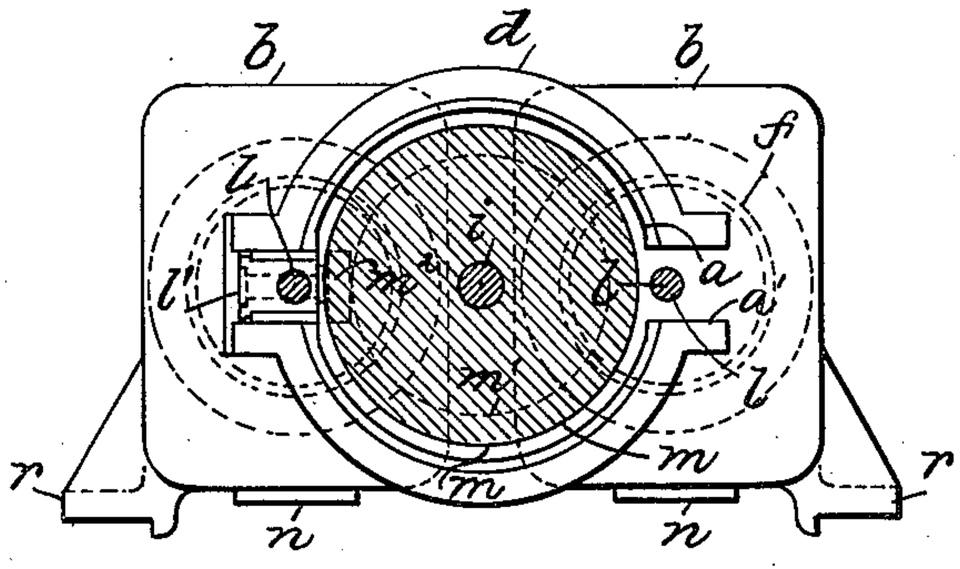


Fig. 3.

Fig. 4.

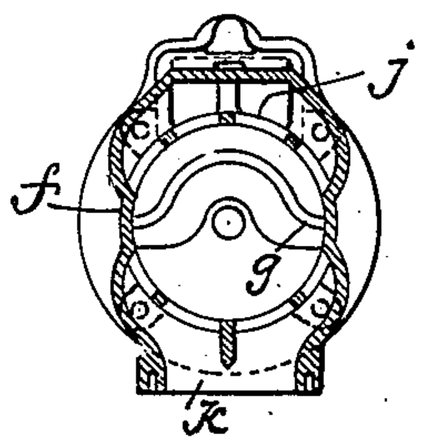
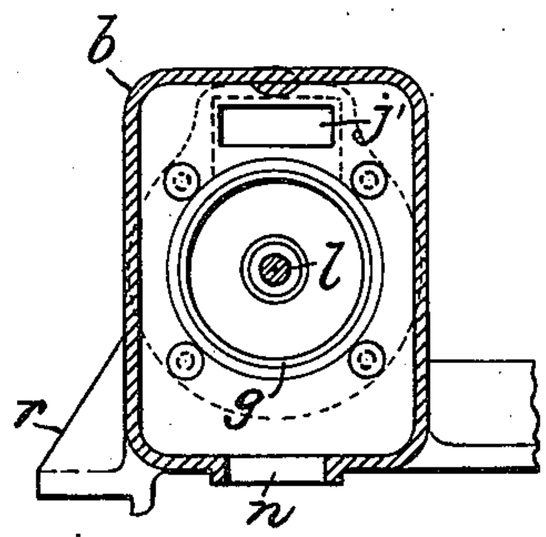


Fig. 5.



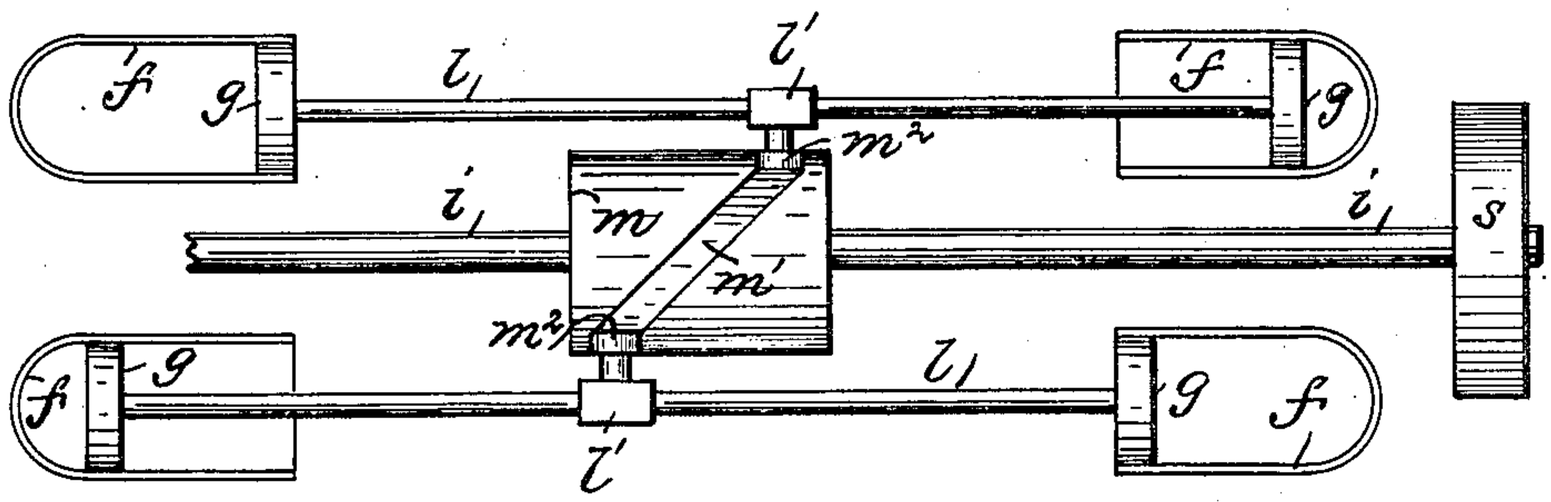


Fig. 6.

Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE LEHBERGER, OF NEWARK, NEW JERSEY.

ENGINE OR MOTOR.

999,047. Specification of Letters Patent. Patented July 25, 1911.

Application filed October 4, 1909. Serial No. 520,897.

To all whom it may concern:

Be it known that I, GEORGE LEHBERGER, a citizen of the United States, residing in the city of Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Engines or Motors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference thereon, which form a part of this specification.

This invention relates to any motors or engines in which pistons are reciprocated by a pressure fluid, but is particularly intended for gas engines to be used in air-ships and motor boats.

The objects of the invention are to dispense with the crank as a means for transmitting power from the piston to the driving shaft; to obviate the great variation of angle at which the power of the piston is applied through said crank; to enable the power to be always applied at a uniform radial distance from the shaft; to provide for a piston connected directly to a shaft parallel thereto, and to obtain other advantages and results, some of which may be hereinafter referred to in connection with the description of the working parts.

The invention consists in the improved engine or motor, and in the arrangements and combinations of parts of the same, all substantially as will be hereinafter set forth and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like letters of reference indicate corresponding parts in each of the several figures, Figure 1 is a plan view of an engine of my improved construction, part of the drum casing being broken away to illustrate the roller in engagement with the groove in the drum. Fig. 2 is a side elevation of the same, showing one of the cylinders, pistons and compression chambers in section. Fig. 3 is an end elevation in section, taken on lines *x*—*x* of Fig. 1. Fig. 4 is a sectional view of the piston chamber taken on line *b*—*b* of Fig. 2. Fig. 5 is a sectional view through the compression chamber taken on line *a*—*a* of Fig. 2; and Fig. 6 is a diagrammatic view.

The drum casing *a* which has formed integral therewith the compression chambers *b*, and the guides *a'*, is made of two castings, preferably of aluminium, identical in shape and size, chambered, for the reception of the drum *m*, and secured together in any convenient manner, as by the flanges *d* and the bolts *d'*. Secured to the integral compression chambers *b* of the drum casing *a* by means of the bolts *e*, are the fluid pressure cylinders *f* of any convenient form, preferably constructed of iron, and having pistons *g* operating therein.

The fluid pressure cylinders *f* at their extreme outer ends are connected together by a bracket *h* provided with a bearing *g'* in which is journaled the driving shaft *i*. Each of said cylinders *f* is provided in its upper surface with an inlet port *j* in line and registering with the port or passage *j'* of the compression chamber *b*. An exhaust port *k* is provided in the underside of each of said fluid cylinders *f*, and so located in reference to the inlet port *j*, as to permit the piston *g* on its rearward stroke, to uncover a portion of said exhaust port first, in order to permit the exploded gases to escape through said opening before the upper edge of the piston uncovers the inlet port *j* in order to permit the gases to enter the cylinders.

Secured to the piston rods *l* are the slide pieces *l'* which operate in the guides *a'* formed in the sides and integral with the drum casing *a*. Located in the drum casing *a* is a drum *m* mounted on the driving shaft *i*. The drum has in its peripheral surface, an endless groove *m'*, extending obliquely to the length of the drum around the same as shown. The pitch, or distance between the extreme points of the groove measured along the drum is equal to the stroke of the pistons. The slide pieces *l'* of the piston rods *l* are provided with a roller m^2 projecting into the groove; thus, as the pistons with their connected piston rods reciprocate, the drum *m* is forced continuously forward in a rotary movement and the driving shaft *i* with it.

Hydrocarbon vapor or mixture is supplied to the compression chamber *b* through the opening *n* by means of any suitable spring-controlled valve, (not shown), admitting it from said chamber into the fluid pressure cylinders through the inlet ports *j* and *j'*. The fluid pressure cylinders find their exhaust through the exhaust port *k* previously described.

At *n'*, I have shown a sparking device for igniting the fuel after it passes into the cyl-

inders *f*. Any desired form of sparking device may be used.

The cylinders on their exterior surfaces, are provided with thin circular ribs furnishing a rapid means of radiation, as is common.

Interposed between the inlet port *j* of the fluid cylinder and the port or passage *j'* in the compression chamber is a piece of gauze n^2 to prevent any flame from entering the compression chamber, which may be caused by accidental backfire.

A metallic packing *o* surrounding the piston rod *l* is inclosed in a casing *p*, which is secured in any convenient manner to the inner wall of the compression chamber *b*.

The slide piece *l'* which may be formed integral with the piston rod *l*, has a stud passing through it, which carries the roller m^2, said roller projecting into and designed to travel in the groove *m'* of the drum *m*. Fitted into the upper and lower surfaces of the slide piece *l'* are pieces which engage with the inner surfaces of the integral guides *a'*, which are formed on the outside of the drum casing *a*. A plate or cap is also secured to the outer surface of the slide piece *l'*, the overhanging portions of which engage with the outer surfaces of the integral guides of the drum casing. The drum casing *a* is provided with integrally cast downwardly and outwardly projecting ribbed lugs *r*, by which the engine or motor is firmly secured to its foundation. Within the drum casing and extending outwardly therefrom, is provided the bearing for the main or driving shaft *i*, which carries the fly-wheel *s*.

While I have illustrated a specific embodiment of my invention, I do not wish to be considered as limiting it to such a construction alone, as it is clear that various modifications might be made without departing from the spirit and scope of the invention. For example, while I have shown extending from one section of the drum casing only two cylinders in the drawings, three, four, six or any desired number can be used equally well, arranged in a circle around the driving shaft *i*, or in any other convenient manner. Furthermore, the drum *m* may be any kind of a member which will provide at a distance out from the shaft, an obliquely disposed groove, every point of which is at the same distance from said shaft. Furthermore, said drum instead of being provided with one groove for the reception of the rollers, may be provided with two or more grooves.

By my improved construction, it will be noted that the use of a crank shaft is dispensed with in transmitting power from the pistons to the shaft *i*, and as a consequence, I eliminate that vibration in running which is due to the crank. This enables the engine to be run at a higher rate of speed without danger of injury.

I claim:

1. In an explosive engine, a casing comprising interchangeable drum sections secured together and provided with integral chambers extending from said drum sections, cylinders projecting from the ends of said chambers, said cylinders being arranged in the same line and connected at their extreme outer ends with bearings, pistons in each cylinder, piston rods connecting the pistons in pairs, a shaft projecting from the casing between the chambers and cylinders, the ends of which are located in said cylinder bearings, a rotative member having a helical groove secured to the shaft and located in the drum sections, and means secured to the piston rod and in engagement with said rotative member.

2. In an explosive engine, a casing comprising interchangeable drum sections secured together, integral chambers extending from said drum section and provided with fuel ports arranged near the top in the front faces of said chambers, cylinders projecting from the ends of said chambers provided with fuel ports registering with the fuel ports in said compression chambers, exhaust ports arranged in the bottom of and leading from said cylinders, pistons in each cylinder, piston rods connecting the pistons in pairs, a shaft journaled in the casing projecting from the casing between the chambers and cylinders, a rotative member having a helical groove secured to the shaft and located in the drum sections and means on the piston rod in engagement with said rotative member.

3. In an explosive engine, a casing comprising interchangeable integral drum and compression chamber sections secured together, cylinders secured to said casing, corresponding registering fuel ports located in the corresponding faces of the compression chambers and cylinders, exhaust ports leading from said cylinders, pistons in each cylinder, piston rods connecting the pistons in pairs, a shaft projecting from the casing between the chambers and the cylinders, a grooved drum on the shaft in the drum casing and means secured to the piston rod in engagement with the grooved drum.

4. In an explosive engine, a casing comprising interchangeable drum and compression chamber sections secured together, provided with externally arranged guides integrally formed in the sides of said drum sections, compression chambers formed integral with and extending from the opposite sides of said drum sections, cylinders secured to and projecting from the ends of said chambers, a bearing connecting the ends of the cylinders, pistons in each cylinder, piston rods connecting the pistons in

pairs, a shaft journaled in the casing, and projecting therefrom between the chambers and cylinders and journaled in the bearings connecting the ends of the cylinders, a grooved drum on the shaft in the casing, a slide piece secured to the piston rod and operating in the guides formed on the casing and a roller secured to the slide piece in engagement with the grooved drum.

5. In an explosive engine, a casing comprising interchangeable drum sections secured together, provided with integral compression chambers extending from said drum sections, cylinders secured to and projecting from each end of said drum section, pistons in each cylinder, piston rods connecting in pairs the pistons arranged on the opposite sides of the casing, a drive shaft passing through the casing between and parallel with the compression chambers and cylinders, a grooved drum on the drive shaft and located within said drum sections and means on the piston rod in engagement with the grooved drum on said shaft for operating the same.

This specification signed and witnessed this first day of October 1909.

GEORGE LEHBERGER.

Witnesses:
FREDK. C. FISCHER,
C. A. ALLISTON.