V. J. DIEFENDERFER.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED OCT. 30, 1911.

1,046,280.

Patented Dec. 3, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

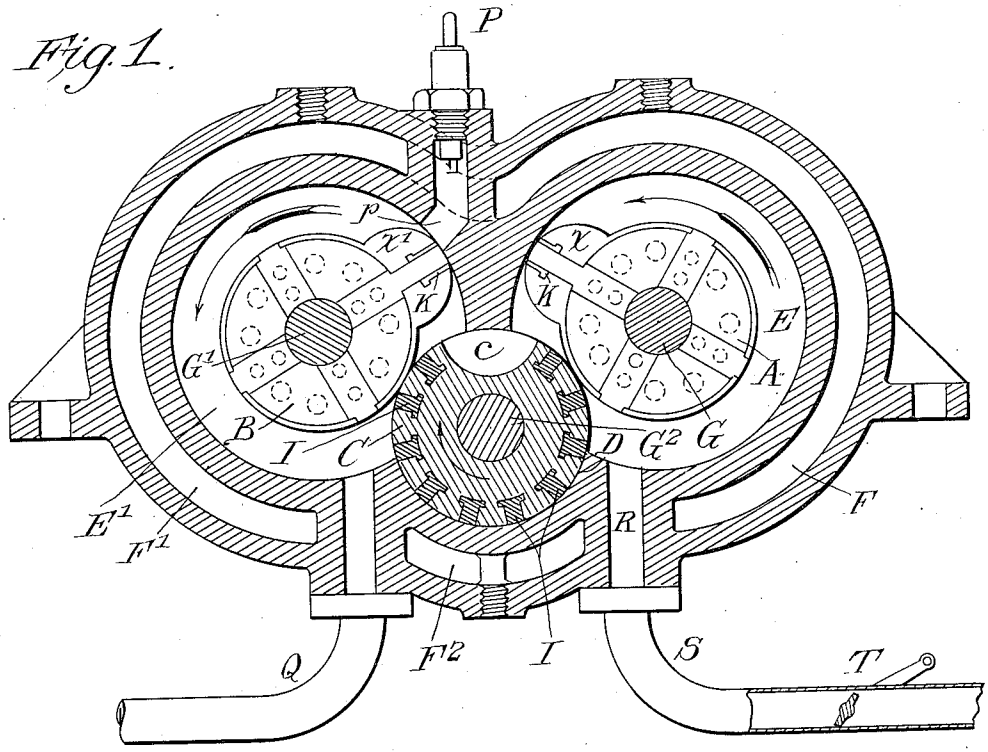
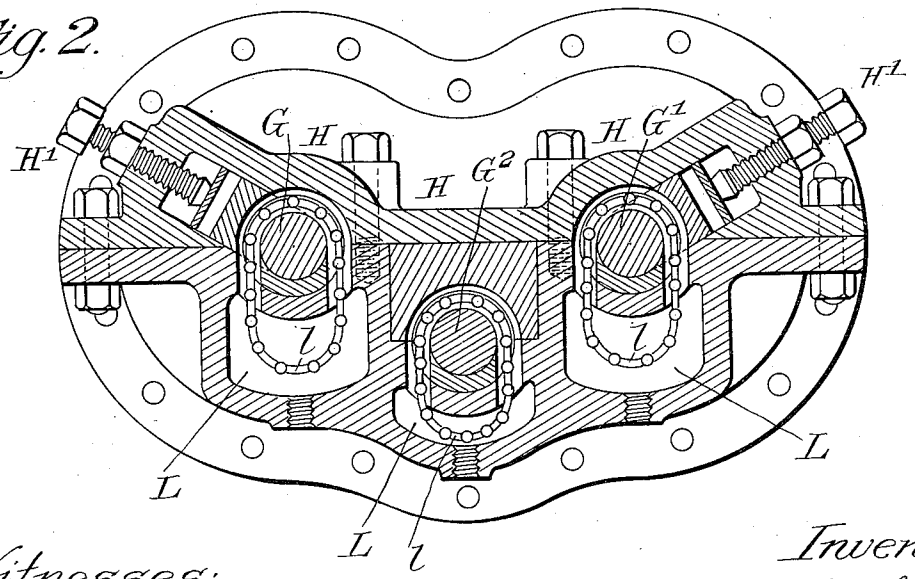


Fig. 2.



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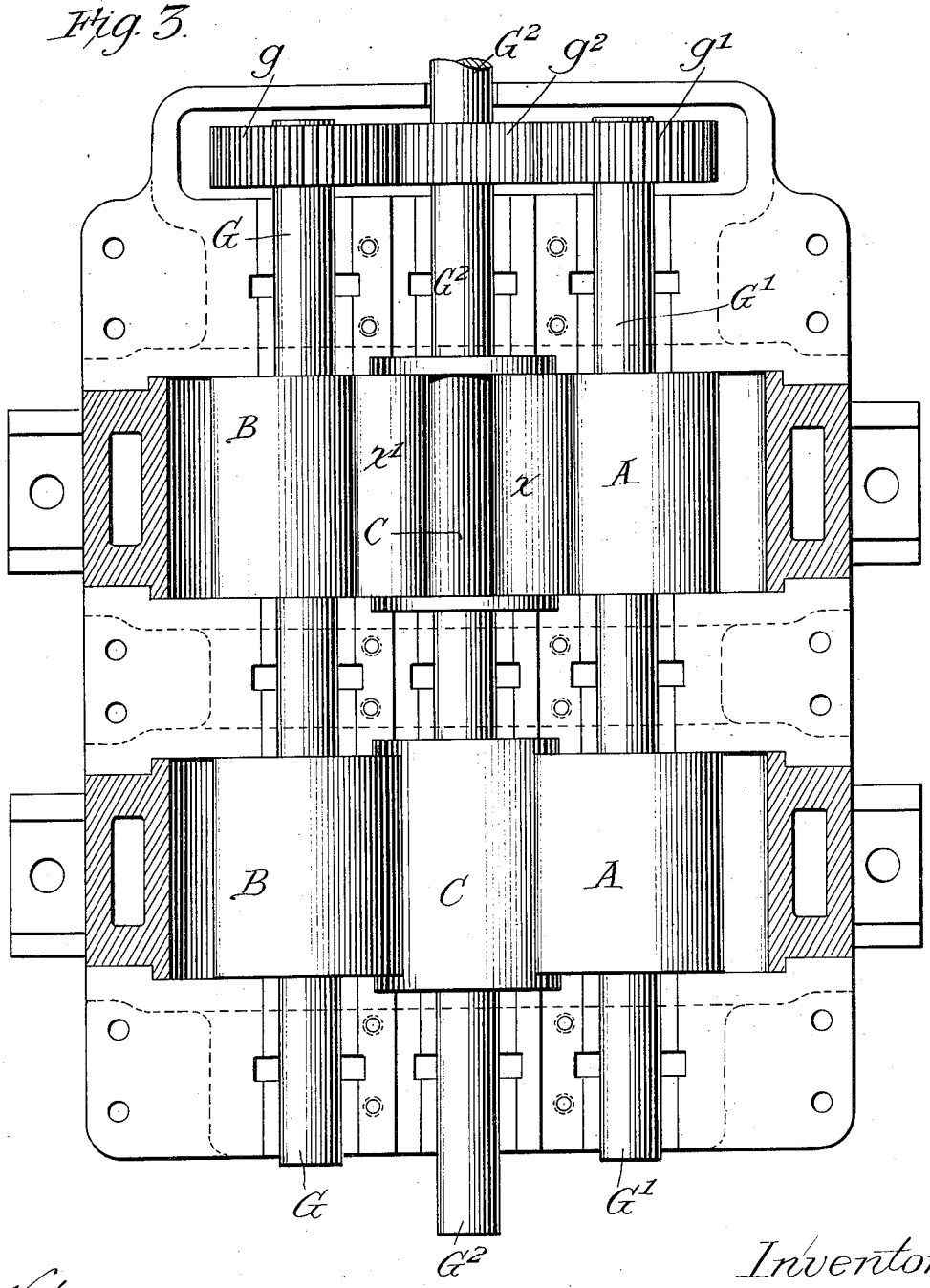
3 SHEETS—SHEET 2.

Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

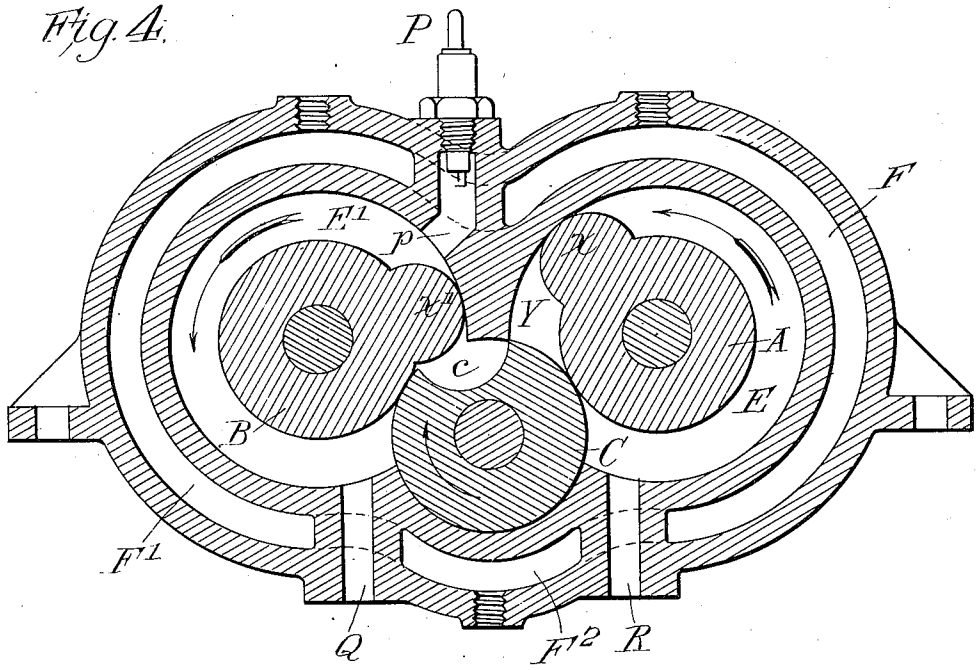
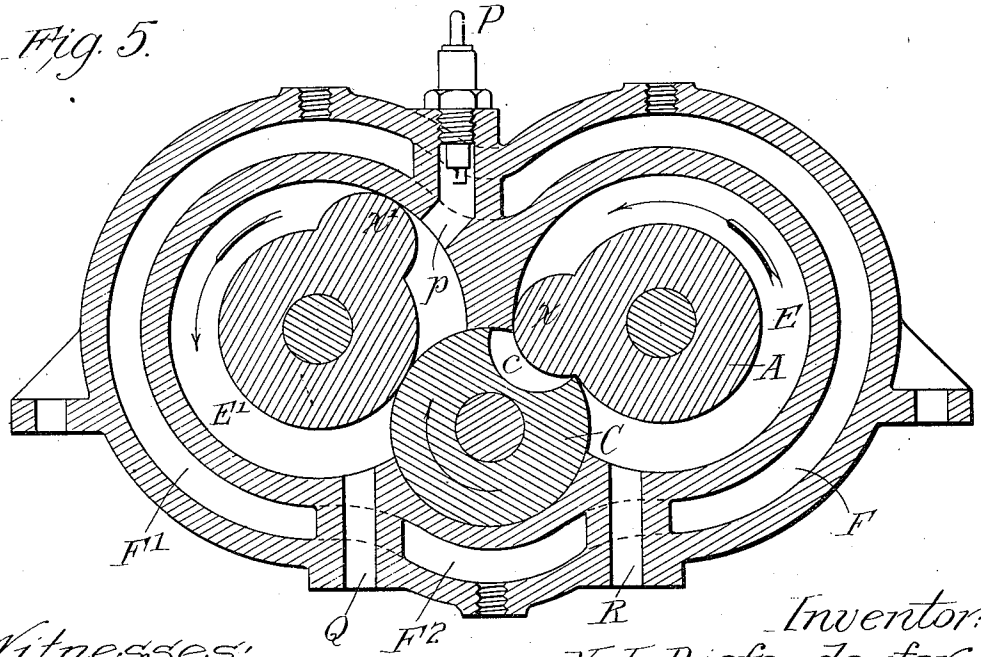


Fig. 5.



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UNITED STATES PATENT OFFICE.

VICTOR J. DIEFENDERFER, OF ALLENTOWN, PENNSYLVANIA, ASSIGNOR OF ONE-THIRD TO CHARLES E. LEHR, OF BETHLEHEM, PENNSYLVANIA.

INTERNAL-COMBUSTION ENGINE.

1,046,280. Specification of Letters Patent. Patented Dec. 3, 1912.

Application filed October 30, 1911. Serial No. 657,395.

To all whom it may concern:

Be it known that I, VICTOR J. DIEFENDERFER, a citizen of the United States, residing in Allentown, in the county of Lehigh and State of Pennsylvania, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention relates to internal combustion engines of the rotary type in which the explosive or combustible mixture is drawn into and compressed and fired in annular chambers within which pistons are rotated, and my invention is embodied in an engine of this class in which the explosive or combustible mixture is drawn into an annular chamber by a rotary piston-carrying member and is compressed therein and expelled therefrom to another annular chamber where the mixture is ignited, expands and propels another piston-carrying member arranged in said chamber.

The object of my invention is to so improve engines of this class that two or more rotary piston-carrying members or rotors, as they are usually called, operating in annular chambers may coöperate with an intermediate rotor or abutment in such manner that one piston-carrying rotor may be operated to compress the combustible mixture in its annular chamber and deliver it by the way of an intermediate or abutment rotor to the annular chamber of the other piston-carrying rotor where the mixture is ignited, causing it to explode and propel said rotor.

By my improvements an explosion may be had during each revolution of the engine and the number of explosions may be increased by the addition of other rotors, thus causing a uniform rotation of the engine and eliminating the necessity for the use of fly-wheels. By my improvements also the use of sliding pistons and some of the valves, cams, etc., often employed in this class of engines is avoided.

In carrying out my invention I employ three rotors of the same size and arrange two of them in the same horizontal plane while the other or intermediate rotor is overlapped by the others, being preferably in a plane slightly below that of the other two. Each of the outer rotors carries a fixed piston operating in an annular chamber while the intermediate or abutment rotor which is in rolling contact with the other two is recessed to receive, at proper times, the pistons of the outside rotors and this recess acts as a port to permit the passage of the compressed mixture from one annular chamber to the other. The shafts of the three rotors are geared to rotate at the same speed and are mounted to turn in adjustable bearings.

An igniter is provided which is operated at proper times to ignite charges compressed by one rotor and delivered through the recessed abutment to the other rotor.

In the accompanying drawings, Figure 1 shows a vertical section through an internal combustion engine embodying my improvements with the piston-carrying rotors in end elevation. Fig. 2 shows a vertical section through the bearings of the rotor shafts and parts associated therewith. Fig. 3 is a longitudinal section through the engine and shows in top plan an organization in which two abutment rotors are arranged in tandem on the same shaft, and two piston-carrying rotors are arranged in like manner on each shaft on opposite sides of the shaft of the abutment rotors. Figs. 4 and 5 are sectional views somewhat diagrammatic and with some parts omitted illustrating the operation of the engine.

I preferably employ three rotors A, B and C of the same diameter, the two outer rotors A and B having their axes in the same horizontal plane, while the intermediate rotor C is shown as arranged below the plane of the others, although it might be arranged above them. The outer rotors overlap, or are overlapped by, the intermediate rotor and have a rolling contact therewith. The outer rotors A and B carry pistons x, x', while the intermediate or abutment rotor is formed with a recess c adapted to receive the pistons x, x' at proper times as the three rotors revolve and to provide a channel for the passage of the combustible mixture from one rotor chamber to the other.

The engine casing is suitably constructed to receive the three rotors, and the intermediate rotor operates in a chamber D between the two chambers E, E′ of the piston-carrying rotors. Jackets F, F′, F² are provided for the circulation of water or other cooling medium. The shafts G, G′ and G² of the rotors extend through suitable bearings H and are geared together at g, g', g^2 to revolve at the same speed. The bearings

of the outside rotors are provided with adjusting devices H′ to compensate for wear and to hold the outside rotors in close contact with the intermediate rotor. Preferably, as shown, the bearings are arranged for chain oiling, chambers L being provided for oil and chains *l* being employed which pass around the shafts and hang in the oil so that as the shafts revolve the chains are also revolved and thus thorough lubrication is maintained. The abutment rotor is provided with radially movable spring pressed packing strips I to provide a tight connection between the periphery of this rotor, and the walls of the chamber D, and it may also be provided with suitable packings at its ends. Each piston *x*, *x′* is provided with a packing strip K which is preferably spring pressed and has a slight radial movement sufficient to provide a tight connection between the outer end of the piston and the walls of the chamber E or E′ in which it moves. The ends of the rotors are provided with suitable packings which are indicated but which need not be described.

At the top of the chamber E′ near the center of the casing is shown a sparking plug P connected by an ignition passage *p* with the chamber E′ and at the bottom of the chamber E′ is an exit or exhaust passage Q which may lead to a muffler or to the atmosphere. On the other side of the engine the chamber E connects with an inlet passage R joining a pipe S provided with a valve T which may be operated either automatically or by hand to regulate the supply of the explosive or combustible mixture to the chamber E.

The mixture is drawn into the chamber E by a revolution of the piston *x* and during the next following revolution this mixture is compressed and at the same time another charge is drawn in. The rotors revolve in the directions indicated by the arrows, the pistons *x*, *x′* and recess *c* occupying the relative positions indicated in Figs. 1, 4 and 5. When the piston *x* reaches the position shown in Fig. 4, the mixture is under high compression in the space Y and immediately after this the recess *c* opens to the space Y as shown in Fig. 1 and the compressed mixture passes to the chamber E′ behind the piston *x′*. The parts then assume the position shown in Fig. 5, the passage between the chambers E, E′ being closed and the ignition passage *p* being open. At this time the sparker is operated and the explosion occurs. The rotors are then actuated by the explosion of the gases until the piston *x′* passes the port R when the gases exhaust. This operation is repeated during each revolution of the rotors and the arrangement is such that the intermediate rotor acts as an abutment for the mixture being compressed and also for the mixture being fired, and it furthermore provides the means for establishing at the proper times only communication between the compression and explosion chambers.

The engine may be reversed by providing another sparking plug in the chamber E and may be built with any desired number of rotors to obtain any desired number of impulses during each revolution.

I claim as my invention:

1. An internal combustion engine, comprising a casing having two annular chambers one for compression and the other for expansion, two rotors carrying pistons operating in said chambers, and an intermediate or abutment rotor in rolling contact with the other two and having a recess for passing the pistons at the proper times and for also permitting the flow of the compressed mixture from one annular chamber to the other.

2. An internal combustion engine, comprising a casing having two annular chambers one for compression and the other for expansion, two rotors carrying pistons operating in said chambers, an intermediate abutment rotor in rolling contact with the other two and having a recess for passing the pistons and for also permitting the flow of the compressed mixture at the proper time, and means for igniting the compressed mixture in the expansion chamber.

3. An internal combustion engine, comprising a casing having two annular chambers one for compression and the other for expansion, two rotors carrying pistons operating in said chambers, and an intermediate or abutment rotor in rolling contact with the other two and which acts as a valve and has a recess for permitting the flow of the compressed mixture from one annular chamber to the other and for also receiving the pistons as they rotate.

4. An internal combustion engine, comprising a casing having a chamber to which the combustible mixture is admitted and a chamber provided with an exhaust opening, two rotors carrying pistons operating in said chambers, one to compress the mixture and the other to be driven by the explosive gases, and an intermediate rotor in rolling contact with the other two having a single recess for passing the pistons at the proper time and through which the compressed mixture flows directly from one chamber to the other.

5. An internal combustion engine, comprising a casing having a chamber to which the combustible mixture is admitted and a chamber provided with an exhaust passage, two rotors carrying pistons operating in said chambers, one to compress the mixture and the other to be driven by the exploded gases, and an intermediate rotor overlapped by the other two and in rolling contact therewith having a single recess for passing the pistons at the proper times and through which

the mixture flows directly from one chamber to the other.

6. An internal combustion engine, comprising a casing having two annular chambers one for compression and the other for expansion, two rotors carrying pistons operating in said chambers, two separate parallel shafts to which said rotors are secured, an intermediate or abutment rotor in rolling contact with the other two and having a single recess for passing the pistons at the proper times and which at times directly connects the compression and expansion chambers and permits the flow of the compressed mixture from one chamber to the other, a shaft to which the intermediate rotor is secured, and gearing connecting this shaft with the shafts of the other two rotors.

In testimony whereof, I have hereunto subscribed my name.

VICTOR J. DIEFENDERFER.

Witnesses:

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A. E. WOLLMUTH.