No. 780,013. PATENTED JAN. 10, 1905.

A. N. PARNALL & E. W. CORYELL.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED JUNE 22, 1903.

4 SHEETS—SHEET 1.

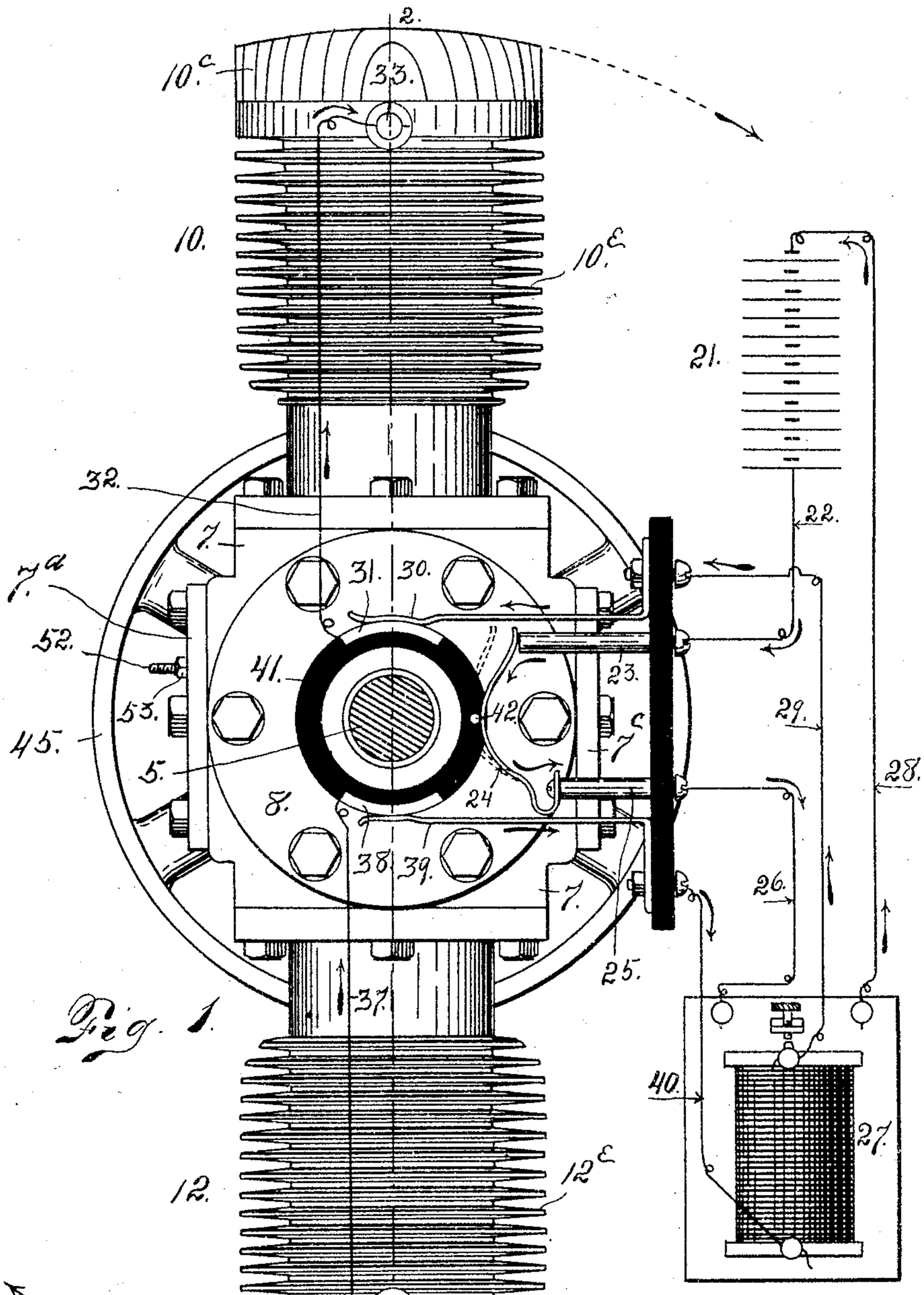

Fig. 1.

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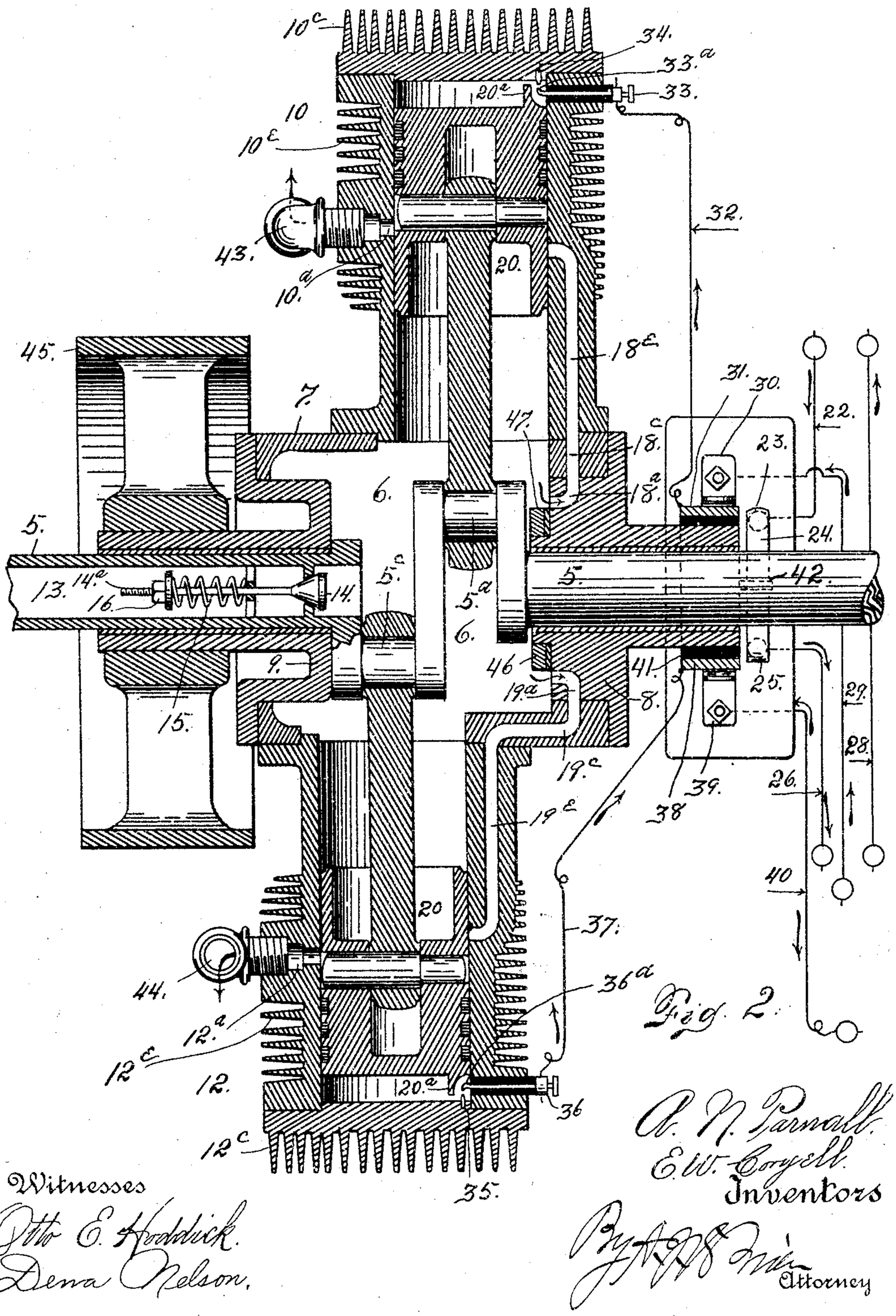

Fig. 2.

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4 SHEETS—SHEET 3.

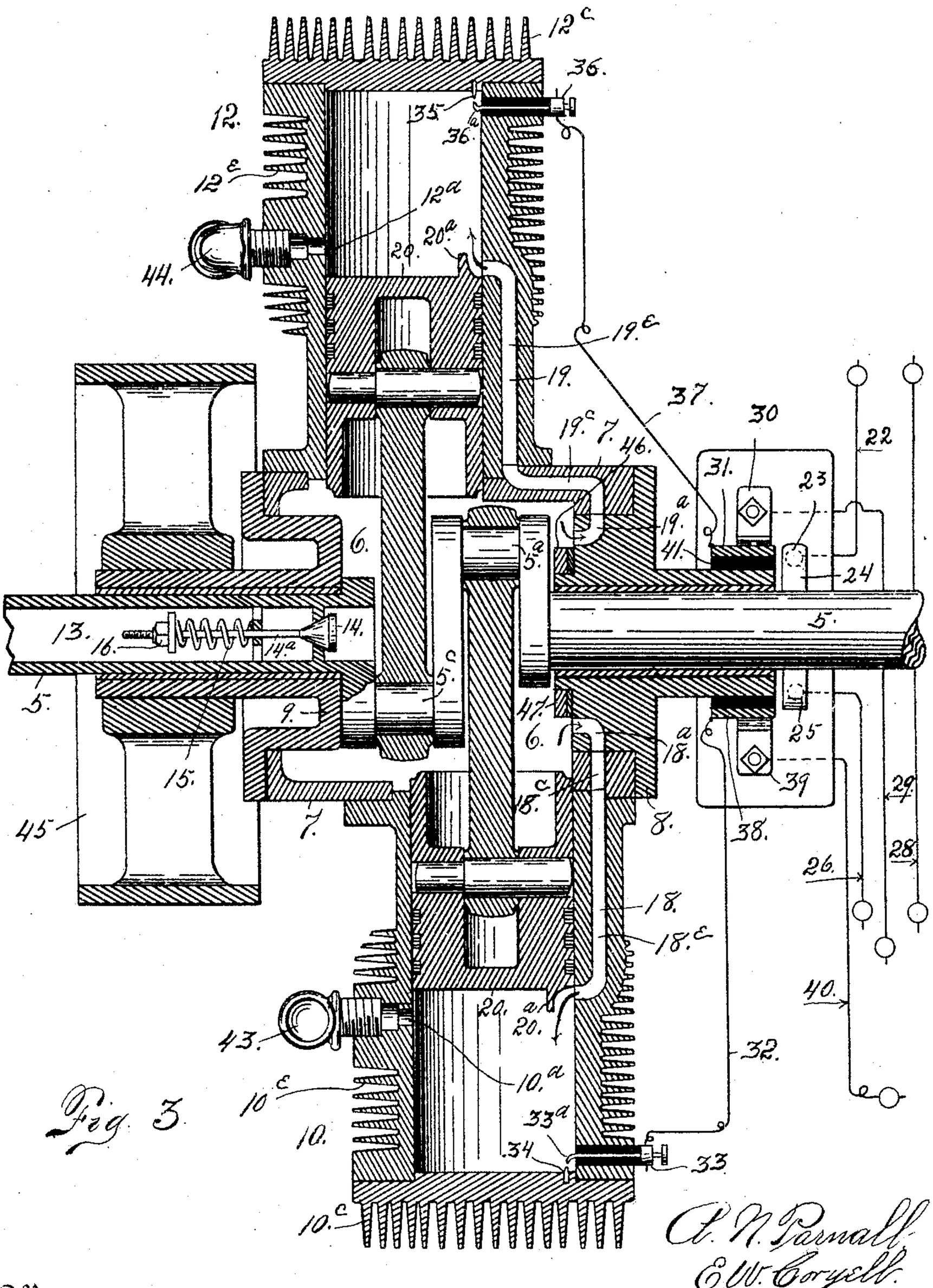

Fig. 3.

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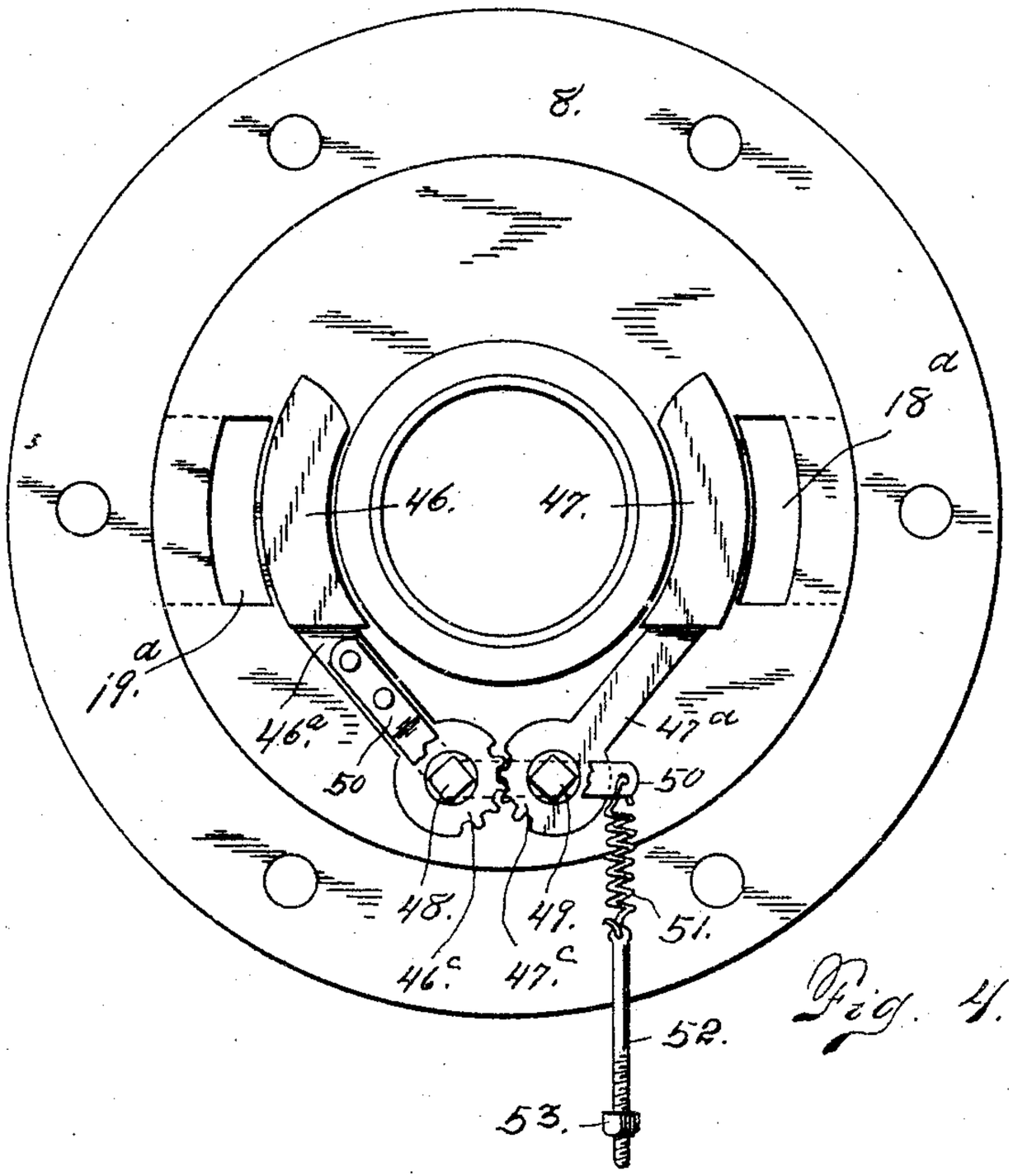

Fig. 4.

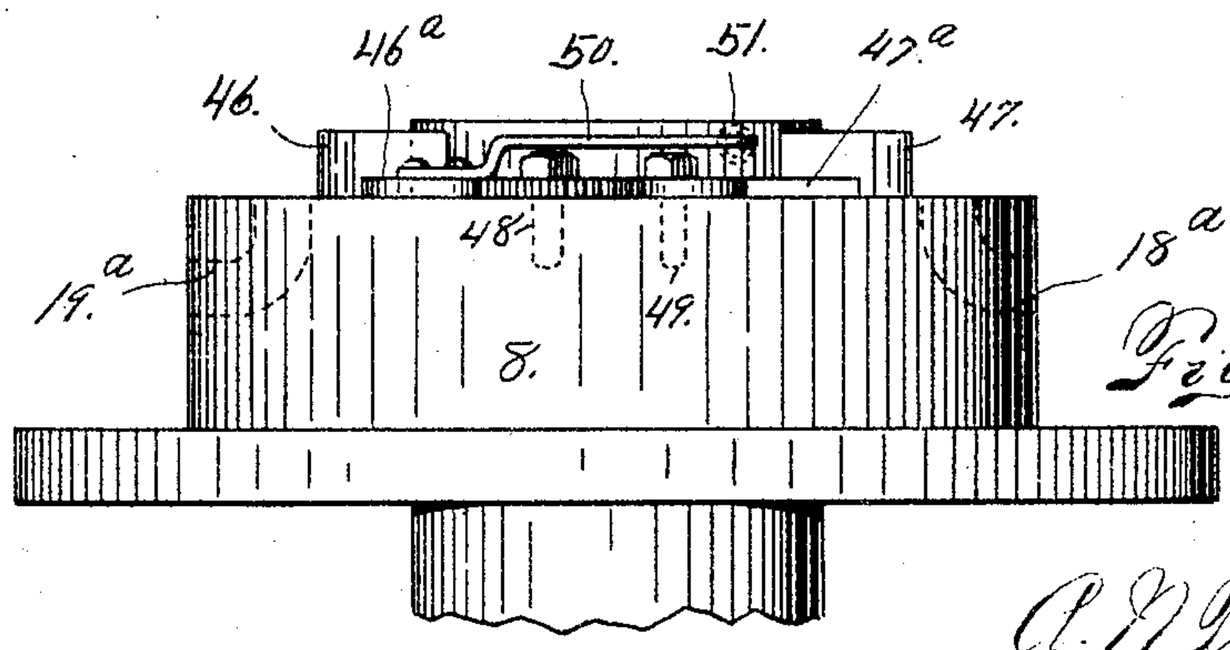

Fig. 5.

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No. 780,013. Patented January 10, 1905.

UNITED STATES PATENT OFFICE.

ALFRED N. PARNALL AND EDWARD W. CORYELL, OF FLORENCE, COLORADO, ASSIGNORS OF ONE-THIRD TO OLIVER W. BETTS, OF FLORENCE, COLORADO.

ROTARY EXPLOSIVE-ENGINE.

SPECIFICATION forming part of Letters Patent No. 780,013, dated January 10, 1905.

Application filed June 22, 1903. Serial No. 162,634.

To all whom it may concern:

Be it known that we, ALFRED N. PARNALL and EDWARD W. CORYELL, both citizens of the United States of America, residing at Florence, in the county of Fremont and State of Colorado, have invented certain new and useful Improvements in Rotary Explosive-Engines; and we do 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 the figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in gas or gasolene engines, and more particularly to that type of explosive gasolene-engines used for the propulsion of automobiles or horseless vehicles. Its object is to produce an engine of this class, more particularly for the purpose above mentioned, which is compact in form, light in weight, perfectly balanced, giving a minimum vibration, and is provided with automatic speed-governor having few parts and being under ready control of the operator.

To this end the invention consists of two revolving cylinders balanced one hundred and eighty degrees apart and whose pistons are connected with crank-pins arranged on a stationary shaft by suitable stems or piston-rods.

The invention further consists in a special arrangement for cooling the cylinders when in motion or operating in the stationary position, a governor for throttling the charge to the cylinders, the arrangement for muffling or arresting the sound of the exhaust, and other details of construction and combinations of parts, all of which we will now proceed to describe in detail and subsequently point out in the claims what we believe to be novel.

In the drawings, Figure 1 is a side elevation of our improved explosive-engine. Fig. 2 is a central vertical section of the same, taken on the line 2 2 of Fig. 1 and showing the piston-heads at the point of ignition or explosion. Fig. 3 is a similar central section showing the piston-heads at the inner end of the stroke and the ports open to clear the cylinders from the impurities incident to the explosion. Fig. 4 is an inner face view of one of the heads of the crank-chamber, showing the mounting or arrangement of speed-governor for throttling the charge-passages supplying the cylinders. Fig. 5 is an edge or side view of the same.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate the stationary crank-shaft, upon which are arranged the crank-pins 5^a and 5^c, placed one hundred and eighty degrees apart. Inclosing or surrounding these crank-pins 5^a and 5^c is the crank-chamber 6, which consists of the frame 7, provided with heads 8 and 9. These heads are loosely mounted on the stationary crank-shaft 5.

Bolted to the frame 7 diametrically opposite to each other and on a line with their respective crank-pins are the cylinders 10 and 12. For ready access to the crank-chamber we provide the plates 7^a and 7^c, which are bolted to the frame 7 and which, together with the journaled heads 8 and 9 and cylinders 10 and 12, form the gas-tight chamber 6. Communicating with this chamber 6 is a passage 13, which is bored through the stationary crank-shaft 5 on one side of the machine and is shown on the left of the cranks in Figs. 2 and 3. Arranged in this passage 13 is an automatic check-valve 14, provided with a stem 14^a, passing through a suitable guide and surrounded by a spring 15, pressing against the guide at one extremity and against a tension-nut 16, screwed upon the outer extremity of the valve-stem. By means of this nut the tension of the spring is regulated at will, and this spring normally holds the valve 14 in the closed position against its seat. This valve is opened in response to the vacuum formed in the crank-chamber during the outward strokes of the pistons. During the inward strokes of the pistons the charge of gas or explosive mixture enters the respective cylinders by way of the passage 13, the crank-chamber 6, and suitable passages hereinafter described. These passages in their entirety are designated by the numerals 18 and 19 and consist of registering ducts 18^a 18^c 18^e and 19^a, 19^c, and 19^e,

these ducts being formed in the head 8, the frame 7, and the cylinders 10 and 12, respectively, and as will be readily understood by an inspection of the drawings. The entrances to the ducts 18^a and 19^a are automatically regulated by the throttling-governor to be hereinafter described. The opposite ends of the passages 18 and 19 are closed by the piston-heads except when these heads are at their inner position, when the mixed gas is permitted to enter the cylinders.

The exhaust-ports are designated 10^a and 12^a. These ports are arranged in the cylinders 10 and 12, respectively, so as to permit the exhaust-gases to escape from the cylinders at a point near the end of the piston's stroke and just before the supply-ports are opened. The supply-ports are located opposite the exhaust-ports, but slightly nearer the crank-chamber. Small projections 20^a are formed on the piston-heads 20, as shown in Figs. 2 and 3, by means of which the explosive gases are deflected toward the outer heads of the cylinder, thus forcing the exhaust-gases from the cylinders as the new gases enter (the exhaust-ports being closed as the cylinder is filled by the return stroke of the piston-heads) and compressed for ignition by the completion of the stroke, as shown in Fig. 2. The ignition of the compressed explosives is effected as follows, referring more especially to Fig. 1 of the drawings: The primary electrical current is generated in the battery 21, from which the circuit is completed through the wire 22 and posts 23, a spring-switch 24, a post 25, a wire 26 energizing the sparking coil 27 and returning to the primary battery through the wire 28. A secondary current formed in the sparking coil is fed to the cylinder as follows: Starting from the sparking coil, it is conducted through the wire 29 to the brush 30, thence through the commutator-plate 31 to a wire 32, and thence to an insulated electrode 33. The inner end of this electrode is provided with a platinum point 33^a (see Figs. 1 and 2) and projects into close proximity to a fixed platinum point 34, mounted on the body of the engine and with the result that a spark is formed by the arcing of the current in its passage between these points. After reaching the body of the engine the current passes to a second platinum point 35, mounted on the body of the engine and projecting into the chamber of the opposite cylinder, with the result that a spark is formed by the arcing of the current between this point 34 and the point 36^a of an insulated electrode 36, mounted on the cylinder. From this electrode the current passes by way of a wire 37 to a plate 38 of the commutator, returning to the sparking coil 37, to a metal brush 39, and the wire 40, completing its circuit.

The commutator above referred to consists of an insulated collar 41, mounted on the sleeve 8^a of the journaled head 8, in which are embedded the plates 31 and 38. Secured to the insulated collar 41 is a projecting pin 42, which causes the spring-switch 24 to close the primary circuit at each complete revolution of the engine when brought into the position shown in Fig. 1.

It will be seen from the foregoing description and from an inspection of the drawings that the cylinders, with their casing, revolve from the stationary shaft as a pivoted point or center of motion, while the piston-heads revolve from their respective stationary crank-pins as pivoted points or centers of motion, the variance of their centers determining the length of their strokes.

Radiating or projecting from the cylinders 10 or 12 are the ribs or teeth 10^e and 12^e, extending in the direction of rotation or at right angles to the length of the cylinders. Ribs 10^c and 12^c are also employed, as shown in the drawings, so as to cut the atmosphere in a manner to produce the least resistance.

It will be seen that the various elements comprising the revolving part of the engine are interchangeable parts of equal weight mounted diametrically opposite each other, thus producing even momentum without the use of a fly-wheel. The exhaust-ports lead to the open air through passages 43 and 44, each consisting of an elbow and a short pipe leading rearwardly or in the opposite direction from the travel of the cylinder and communicating with the vacuum formed back of the rapidly-revolving cylinders, thus muffling the sound produced by the explosion and having its escape through the exhaust-ports.

The power is transmitted from the engine through the pulley-wheel 45, which is rigidly mounted on the journaled head 9 of the revolving frame 7. It is evident that in place of the pulley 45 a toothed wheel or gear may be substituted.

To regulate the speed of the engine, we have arranged the governor shown in detail in Figs. 4 and 5. This governor is mounted on the inner face of the journaled head 8, and throttle-valves 46 and 47 are employed. These valves are provided with arms 46^a and 47^a, respectively. These arms are pivoted to bolts 48 and 49. The pivoted ends of the arms 46^a and 47^a are provided with meshing segmental gears 46^e and 47^e, whereby their unison of movement is insured. The sliding throttles are normally held in the position shown in Fig. 4 by the tension of a spring 51, connected to a projecting arm 50, which is rigidly secured to the arm 46^a. It will be seen that the centrifugal force given to the weighted throttles as the head 8, with its frame and cylinders, are revolving around the stationary shaft as a center will cause them to travel outwardly, partially or entirely throttling the gas-supply passages 18^a and 19^a. To regulate the resistance to this centrifugal force, the spring 51 is secured to a threaded pin 52,

which protrudes through the side plate 7ª (see Fig. 1) and is threaded therein, thus enabling the governor to be set so as to throttle the speed of the engine at a predetermined velocity.

Having thus described our invention, what we claim is—

1. In an explosive-engine, the combination with a stationary crank-shaft, a chamber revolubly connected with the shaft and provided with a valve-controlled passage for the entrance of the explosive fluid, cylinders connected with the said chamber, pistons in the cylinders, the said pistons being suitably connected with the crank-shaft, inlet-passages leading from the chamber to the cylinders to allow the explosive to pass to the latter, and centrifugally-operated valves mounted in the revoluble chamber adjacent the inner extremities of the cylinder inlet-passages, the opposite extremities of the passages being controlled by the pistons only, the said valves being arranged to control the entrance of fluid from the chamber to said passages, the valves being connected to operate in unison, whereby the quantity of fluid admitted to the respective cylinders is the same.

2. In an explosive-engine, the combination with a crank-shaft, a chamber mounted thereon and provided with a valve-controlled passage for the entrance of explosive fluid, cylinders connected with the said chamber, pistons located in the cylinders and connected with the crank-shaft, inlet-passages leading from the chamber to the cylinders to allow the explosive to pass to the latter, and centrifugally-operated valves mounted in the chamber adjacent the inner extremities of the cylinder inlet-passages, the opposite extremities of these passages being controlled by the pistons only, the valves being arranged to control the entrance of fluid from the chamber to said passages, the said valves having pivoted arms provided with meshing segmental gears whereby they are connected to operate in unison and the quantity of fluid admitted to the respective cylinders is the same.

3. In an explosive-engine, the combination with a stationary shaft having oppositely-disposed cranks, a chamber revolubly connected with the shaft and provided with a valve-controlled inlet for the admission of the explosive fluid, cylinders connected with the said chamber, pistons located in the cylinders and connected with the cranks of the crank-shaft, inlet-passages leading from the chamber to the cylinders to allow the explosive to pass to the latter, centrifugally-operated valves mounted in the revoluble chamber adjacent the inner extremities of the cylinder inlet-passages, the opposite extremities of these passages being controlled by the pistons, the valves being located to control the entrance of fluid from the chamber to said passages, the said valves having pivoted arms provided with meshing segmental gears, an arm rigidly secured to one of the valve-arms, a spring connected with said arm and acting in opposition to the centrifugal force, and means for regulating the tension of the spring from the outside of the chamber.

4. In an explosive-engine, the combination with a stationary shaft having oppositely-disposed cranks, a chamber revolubly connected with the shaft and provided with a valve-controlled passage for the entrance of explosive fluid, cylinders connected with the said chamber, pistons located in the cylinders and connected with the cranks of the shaft, inlet-passages leading from the chamber to the cylinders to allow the explosive to pass to the latter, centrifugally-operated valves mounted in the revoluble chamber adjacent the inner extremities of the cylinder inlet-passages, the opposite extremities of these passages being controlled by the pistons, the valves being arranged to control entrance of the fluid from the chamber to said passages, the said valves having pivoted arms, meshing gears connected with the arms, an arm rigidly secured to one of the valve-arms, a spring connected with said arm and acting in opposition to the centrifugal force, a pin connected with the said spring and passing through an opening in the casing, its outer extremity being exposed and threaded, and a tension-nut applied to the outer threaded extremity of said pin.

In testimony whereof we affix our signatures in presence of two witnesses.

ALFRED N. PARNALL.
EDWARD W. CORYELL.

Witnesses:
FRED. HEMENWAY,
W. H. MITCHELL.