No. 752,690. PATENTED FEB. 23, 1904

L. J. LE PONTOIS.

METHOD OF PRODUCING SPARKS IN THE CYLINDERS OF INTERNAL COMBUSTION ENGINES.

APPLICATION FILED AUG. 22, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1

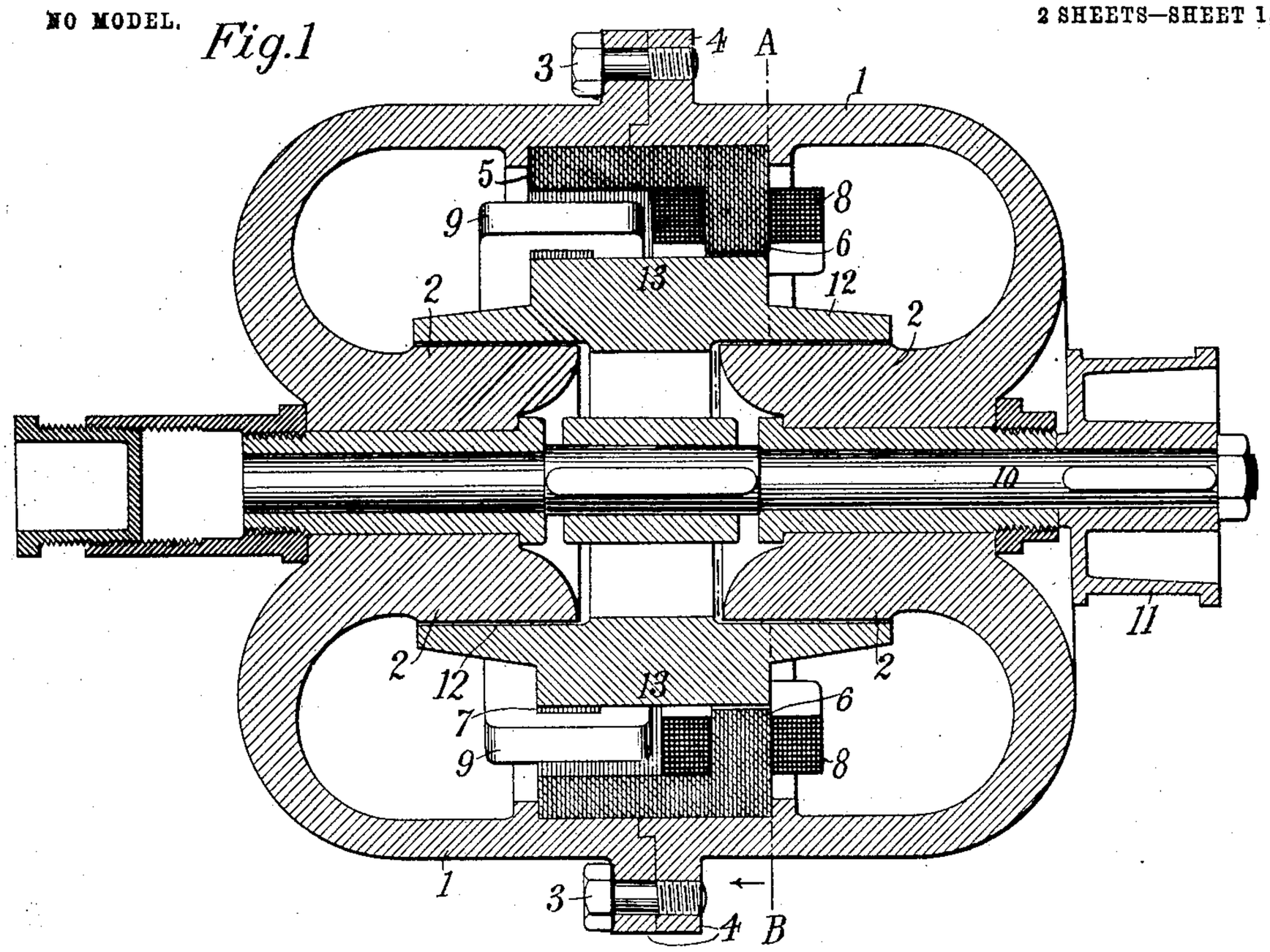
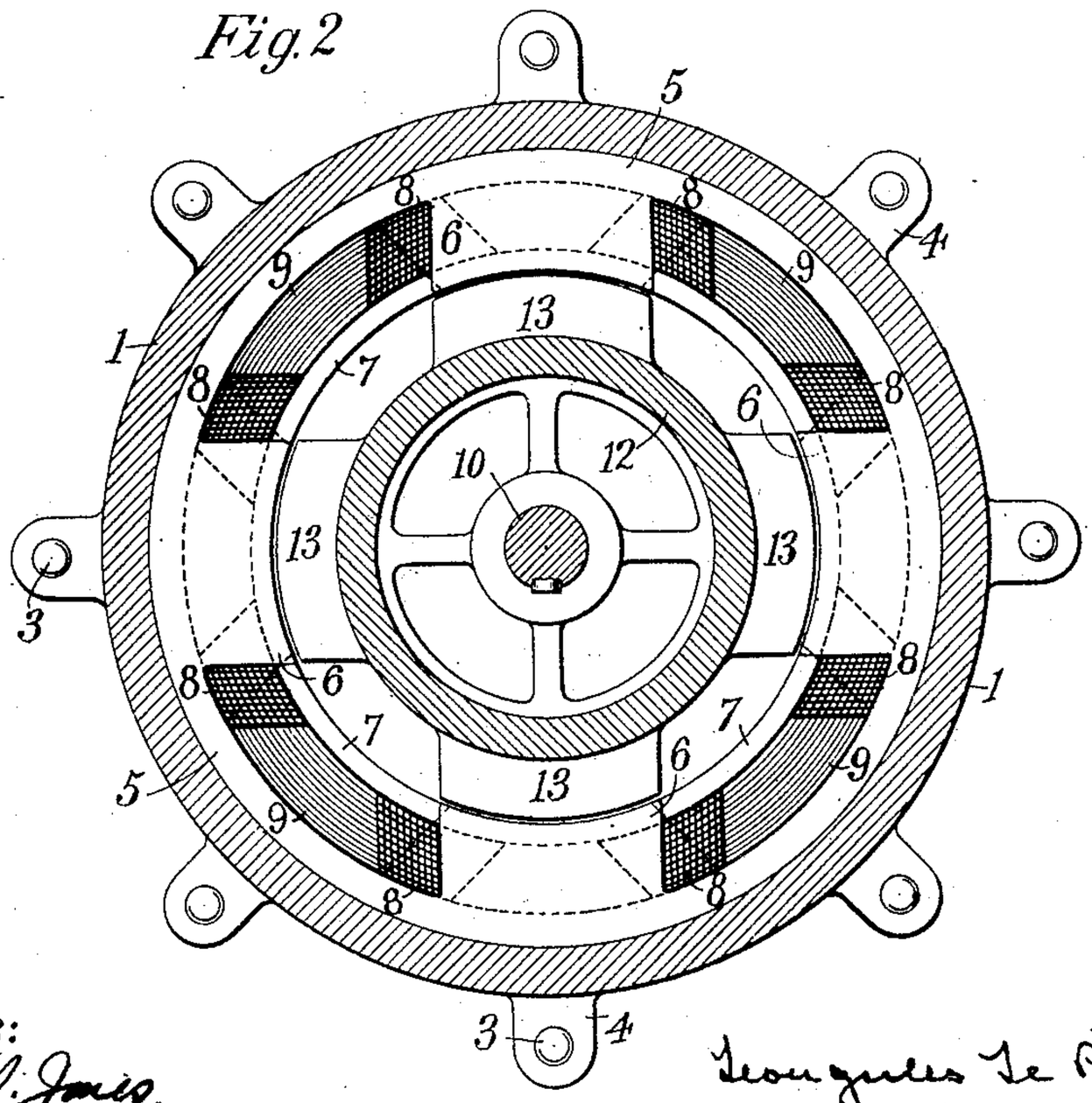


Fig. 2



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3

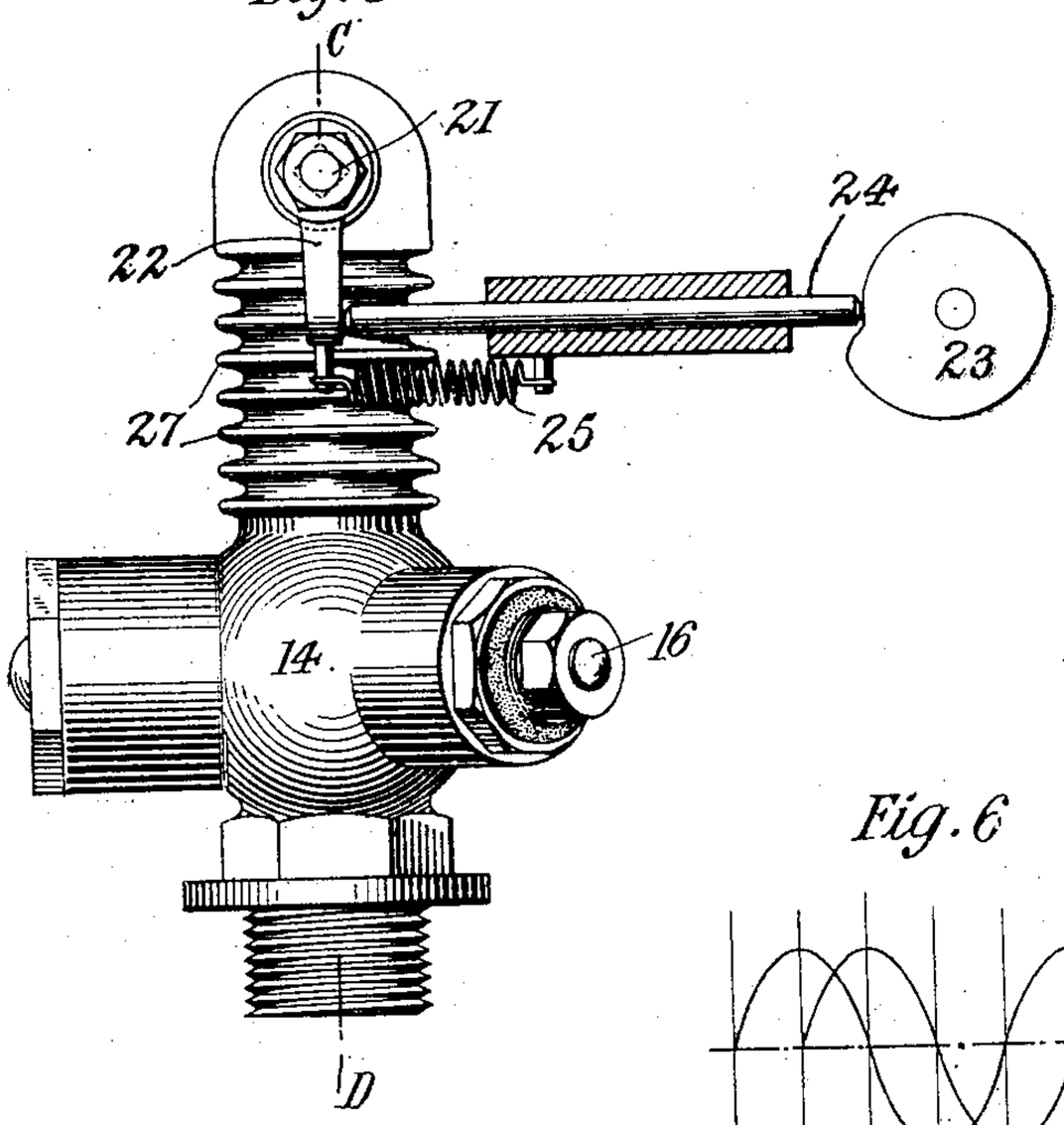


Fig. 4

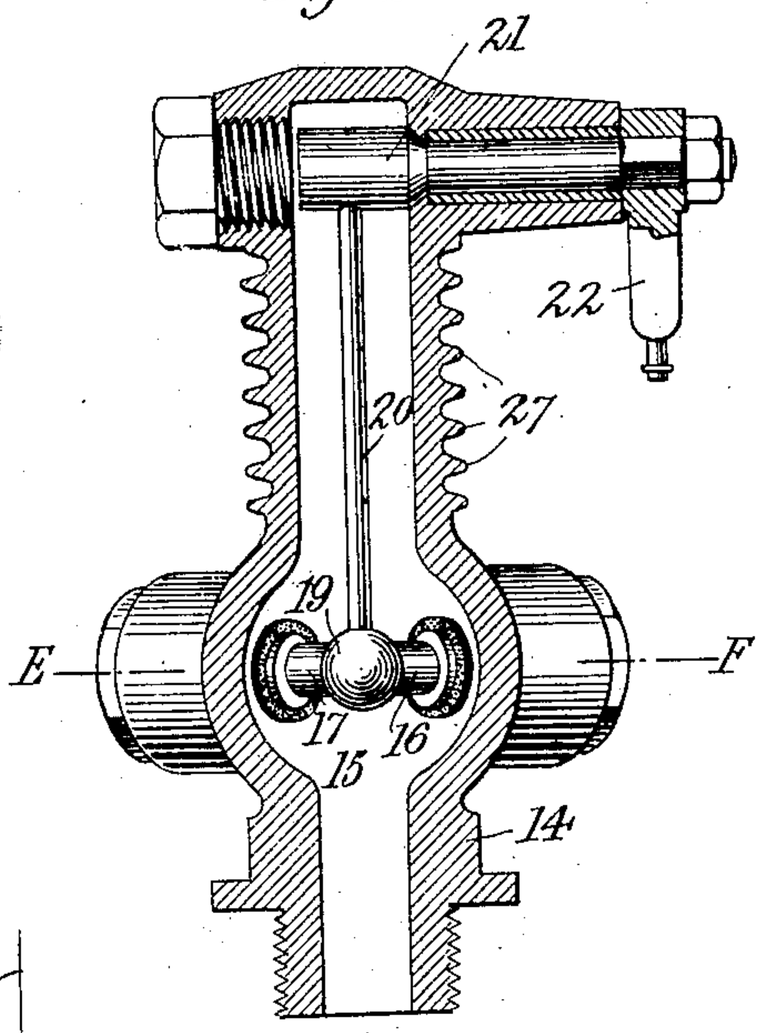
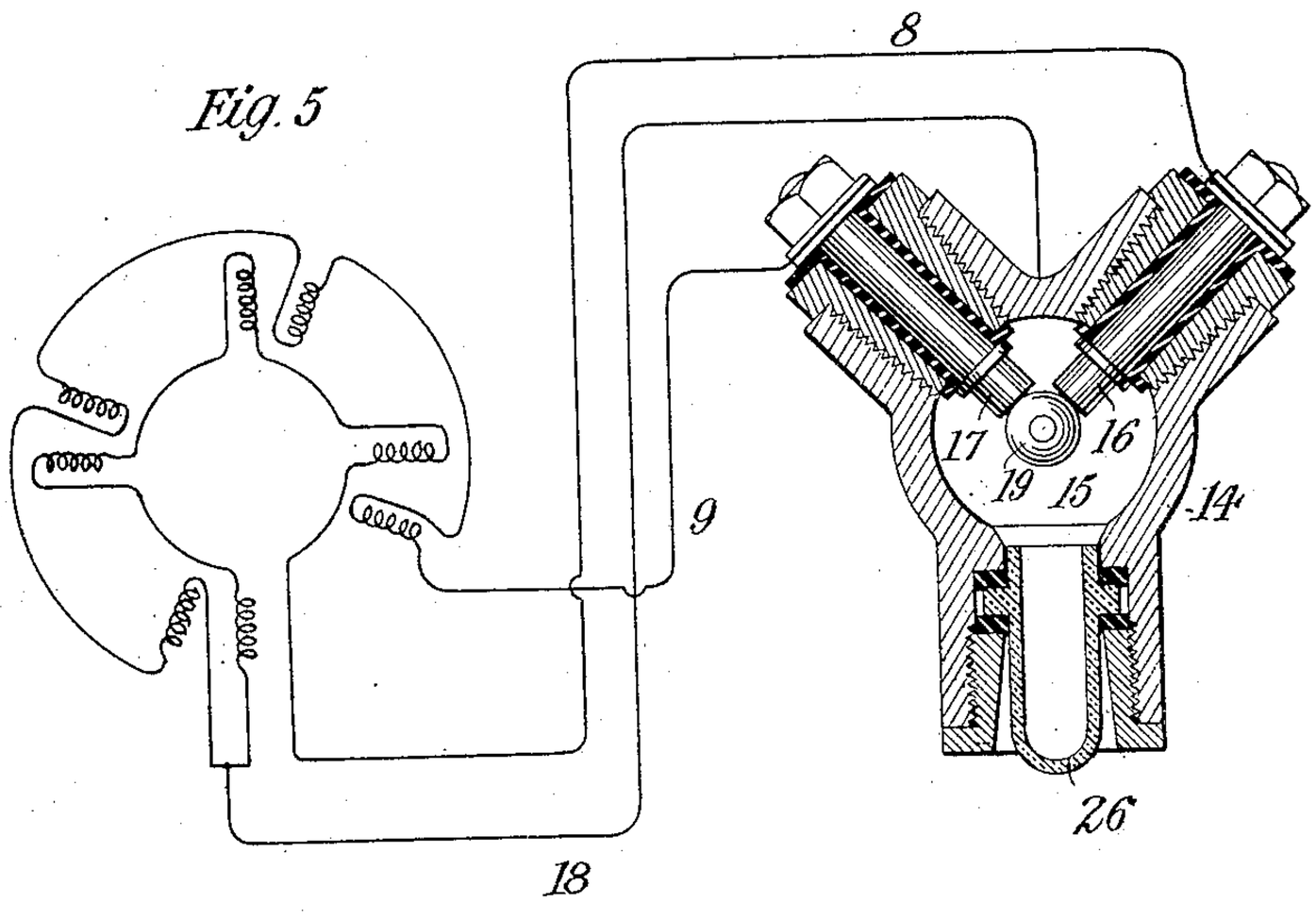


Fig. 6

Fig. 5



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No. 752,690. Patented February 23, 1904.

UNITED STATES PATENT OFFICE.

LEON JULES LE PONTOIS, OF NEW ROCHELLE, NEW YORK.

METHOD OF PRODUCING SPARKS IN THE CYLINDERS OF INTERNAL-COMBUSTION ENGINES.

SPECIFICATION forming part of Letters Patent No. 752,690, dated February 23, 1904.

Application filed August 22, 1903. Serial No. 170,399. (No model.)

To all whom it may concern:

Be it known that I, LEON JULES LE PONTOIS, a citizen of the Republic of France, and a resident of New Rochelle, Westchester county, New York, have invented a new Method of Producing Sparks in the Cylinders of Internal-Combustion Engines, of which the following is a specification.

My invention relates to a new method of producing sparks in the cylinders of internal-combustion engines. Heretofore two kinds of electric generators have been used for this purpose—namely, the continuous-current dynamo self-exciting or excited by permanent magnets and the alternating-current magneto constructed with a permanent magnetic field and a shuttle-wound armature, the latter of the two generators being the more simple and more widely adopted. In order to do effective work, it is absolutely necessary that the magneto should run at such a speed in relation to the speed of the engine that the current generated reaches its maximum intensity when the circuit is opened by the circuit-breaker in the engine-cylinder. The magneto must therefore either be driven at the same angular speed as the engine or by gears at a multiplied speed, so that the current will always reach its maximum when a spark is desired; but as the time of sparking should be regulated according to the speed of the engine or under control of the operator it has proved very difficult to secure a sufficient range of sparking by means of the magneto.

In carrying out my invention I employ an electric generator delivering two or more alternating currents differing in phase from each other, with a multiple-circuit breaker so constructed that the different currents delivered by the generator may be broken simultaneously in the combustion-chamber and so that the total heat energy of the spark or sparks resulting from the interruption of the different circuits is at any given time almost constant. It is obvious that as the currents are differing in phase one or more of them will reach sufficient intensity at the time of opening the circuit, and therefore the simultaneous opening of all the circuits will result in one or more sparks having sufficient heat value to explode the mixture in the chamber.

In the following I have described, with reference to the accompanying drawings, a structure illustrating one means of carrying out my invention, the features thereof being more fully pointed out hereinafter in the claims.

In the drawings, Figure 1 is a longitudinal sectional view of a polyphase magneto-alternator. Fig. 2 is a cross-sectional view along the line A B of Fig. 1 looking in the direction of the arrows, parts being removed for clearness of illustration. Fig. 3 is an elevation of a spark-plug adapted for use with the magneto illustrated in Figs. 1 and 2. Fig. 4 is a sectional view along the line C D of Fig. 3, showing the operative parts more clearly. Fig. 5 is a sectional view along the line E F of Fig. 4, showing the spark-plug in connection with a diagrammatic form of magneto. Fig. 6 shows in diagrammatic form the curves of the currents generated.

Similar numbers of reference indicate similar parts throughout the several views.

The magnetic field of the magneto illustrated comprises a pair of circular steel shells 1 1 permanently magnetized, each having an inward polar projection 2, also circular in shape. For convenience of construction the shells are shown as being in two parts, fastened together by bolts 3 3 in lugs 4 4. On the interior of the shells and within the air-gap between the shells 1 1 and the polar projections 2 2 are mounted two sets of discoid laminæ 5, each having four polar projections 6 6 6 6 and 7 7 7 7, respectively, the polar projections of said two sets being staggered with relation to each other, as illustrated in Figs. 1 and 2, so that the center of the polar projections of one set are approximately opposite one of the ends of the polar projections of the other set, the object being to obtain two alternating currents differing in phase a quarter-wave length from each other. Each one of the polar projections 6 and 7 supports a coil 8 and 9, respectively, the coils for each set being electrically connected one with the other, as shown diagrammatically in Fig. 5. Mounted in the magneto-shell in suitable bearings is a shaft

10, having at one end a pulley 11, operated in any convenient manner by which it is adapted to be driven. Keyed on this shaft between the polar projections 2 2 is a soft-iron shell 12, cylindrical in shape, fitting closely around the polar projections 2 2 and having four projections 13, the face of each being approximately equal in width to the length of the polar projections 6 and 7 and long enough to extend over said projections. It is obvious that the line of magnetic flux passes from shell 1 to pole 2 through the polar projections 6 and 7 and the soft-iron shell 12. As the shell 12 is rotated the projections 13 pass successively across the faces of the polar projections 6 and 7, the magnetic flux passing through each of the polar projections 6 and 7 successively, beginning to pass through one before it has left the other. The number of lines of magnetic flux threading the coils varies, the coils thus becoming the seat of electromotive forces varying according to a sinusoidal function. The polar projections 6 and 7 being displaced, so that the angular distance separating the center lines of any two adjacent poles belonging to the two different sets of laminations is equal to one-half the angular distance separating any two poles belonging to the same set and the coils also being correspondingly arranged, the electromotive force induced in the two series of coils will follow sinusoid curves ninety degrees apart from each other, as shown in Fig. 6. It is evident that at whatever speed the soft-iron core 12 is rotated the magneto will give forth two currents differing in phase by ninety degrees, the number of alternations differing according to speed, and that if the circuits of the two series of coils are opened simultaneously a spark or sparks will be produced.

The spark-plug 14 is constructed for use with a biphase current. The said plug comprises a chamber 15, in which are the insulated terminals 16 and 17, arranged at a suitable angle to each other to permit simultaneous opening of the circuits, to which terminals are connected, respectively, the wires from coils 8 and 9, the magneto being grounded through the spark-plug and engine, as shown by wire 18 in Fig. 5.

The multiple-circuit breaker comprises a ball 19 at the end of a resilient wire rod 20 on rock-shaft 21, which is adapted to be rocked by an arm 22. Arm 22 is actuated by a cam 23, moving with the gas-engine shaft, which arm pushes rod 24 against arm 22, spring 25 retracting arm 22 and rod 24 after each forward movement.

26 indicates a glass plug in the spark-plug, affording means for seeing into the chamber 15. Corrugations 27 on the spark-plug are provided to radiate the heat of the explosion-chamber, and hence keep the rock-shaft 21 cool.

It will be readily seen from the foregoing description of the magneto and the currents produced thereby in connection with the illustration in Fig. 5 that whenever the circuits are broken in the chamber 15 by the means pointed out a current is passing through one or both of the wires in such manner that a sufficient spark or sparks will always be produced to explode the gas.

It is obvious that the details of construction may be varied, that more than two currents may be generated, that the shape of the parts may be changed, or that the spark-plug may be connected to other source of polyphase current without departing from the spirit of my invention, and I do not restrict myself to any of the details shown and described.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. A method of producing sparks in the cylinders of engines consisting in simultaneously breaking two or more alternating currents differing in phase from each other.

2. The method of igniting combustible mixtures in gas-engines which consists in delivering two or more alternating currents differing in phase from each other to a multiple-circuit breaker located in the combustion-chamber, and causing the said breaker to interrupt their respective circuits simultaneously so that the total heat value of the spark or sparks produced thereby at any given time is almost constant.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

LEON JULES LE PONTOIS.

Witnesses:

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SEABURY C. MASTICK.