

No. 663,643.

Patented Dec. 11, 1900.

F. R. SIMMS & R. BOSCH.
SPARKING IGNITER FOR EXPLOSION ENGINES.

(Application filed Sept. 12, 1898.)

(No Model.)

2 Sheets—Sheet 1.

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Fig. 2.

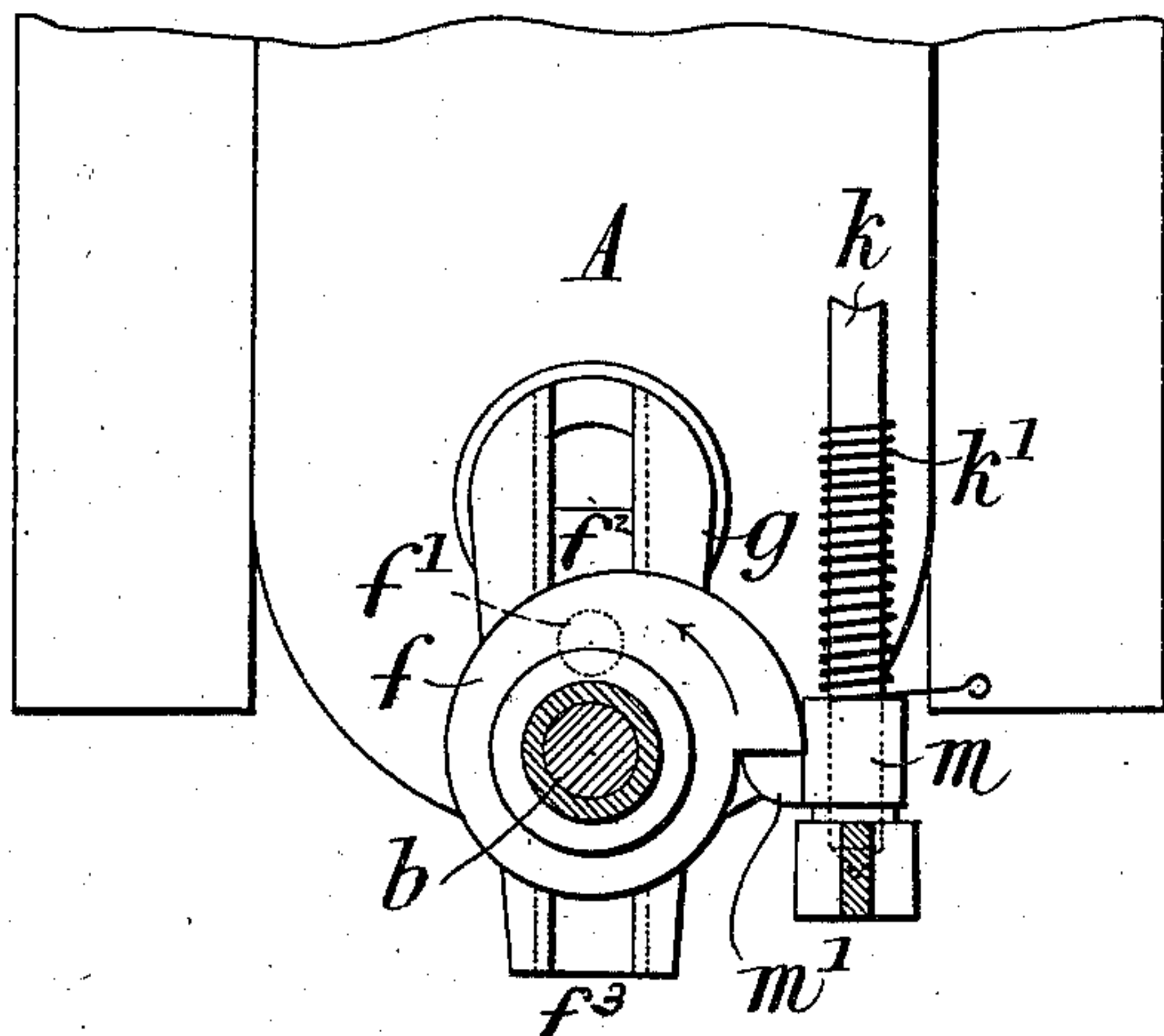


Fig. 3.

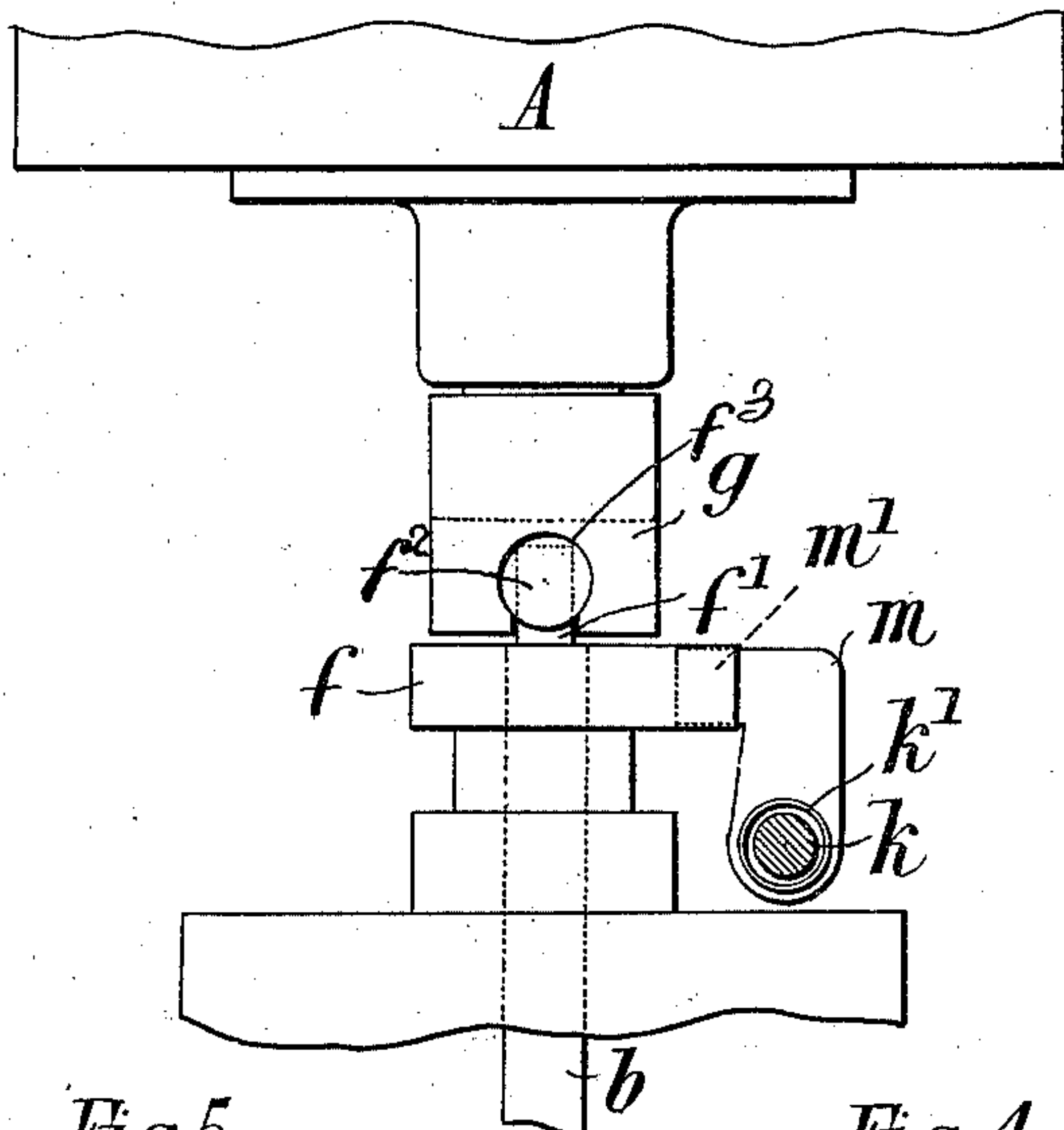


Fig. 5.

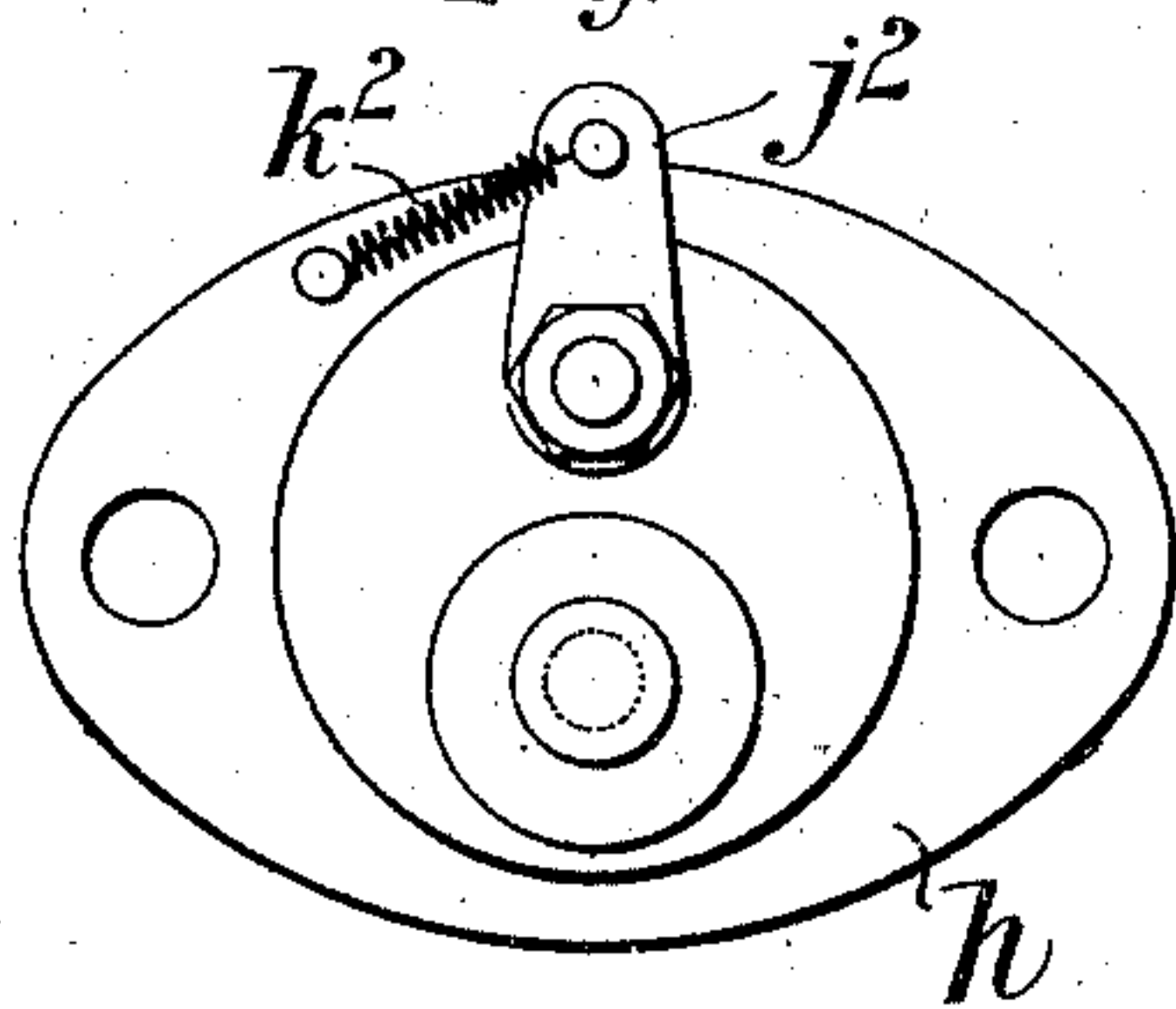
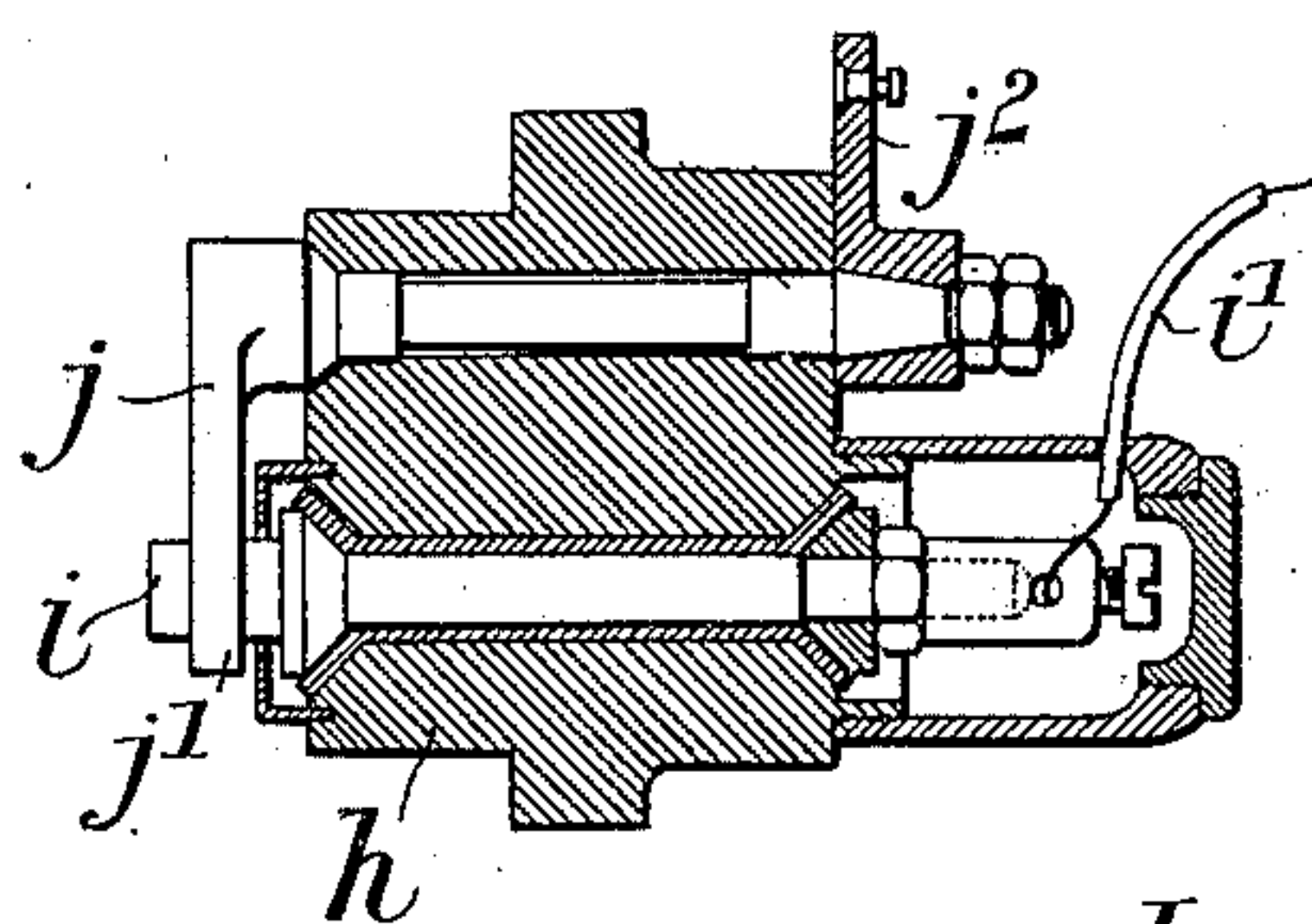


Fig. 4.



Witnesses.

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UNITED STATES PATENT OFFICE.

FREDERICK RICHARD SIMMS, OF LONDON, ENGLAND, AND ROBERT BOSCH,
OF STUTTGART, GERMANY.

SPARKING IGNITER FOR EXPLOSION-ENGINES.

SPECIFICATION forming part of Letters Patent No. 663,643, dated December 11, 1900.

Application filed September 12, 1898. Serial No. 690,764. (No model.)

To all whom it may concern:

Be it known that we, FREDERICK RICHARD SIMMS, a subject of the Queen of Great Britain, residing at London, England, and ROBERT BOSCH, a subject of the Emperor of Germany, residing at Stuttgart, Germany, have invented new and useful Improvements in or Connected with Ignition-Gear for Explosion-Engines, (for which we have applied for patents in Great Britain, No. 7,195, dated March 24, 1898, and in France, No. 267,252, dated July 4, 1898,) of which the following is a specification.

This invention relates to improvements in or connected with electric ignition-gear for explosion-engines, and has for its object to provide means whereby the time at which ignition of the explosive charge takes place, and thereby the speed of the engines can be regulated, as desired, while the engines are running.

According to the invention we make use of magneto-electric ignition apparatus preferably of the kind described in Bosch's British Patent No. 15,411 of 1897—that is to say, of a magneto-electric machine having a stationary armature and stationary magnets and a rocking envelop or the like arranged between the armature and the magnet-poles. The envelop is oscillated by a crank-pin or eccentric upon a half-speed or counter shaft rotated from the crank-shaft of the motor through the medium of suitable toothed gearing, and sparking is effected by a device comprising a hollow plug adapted to be fixed to the ignition-chamber of the motor and carrying a pin insulated from it and electrically connected to one terminal of the magneto-electric machine, the other terminal of which is connected with any convenient portion of the engine which forms a good conductor. A lever is pivoted to the plug and normally rests upon the pin held in the said plug, or if not normally retained in this position is allowed to make contact with the insulated pin momentarily previous to sparking. This contact-lever is operated by a rod from a cam upon the said half-speed or counter shaft, the said cam turning the rod and then suddenly releasing it, so that it is sharply returned and caused to strike the pivoted contact-lever,

which is thus made to momentarily break contact and produce a spark, both rod and contact-lever being returned to their normal positions by springs.

The counter-shaft is, as above stated, rotated from the crank-shaft of the motor by spur-gearing, the spur-wheel on the half-speed shaft being made in one with or rigidly connected to a bevel-wheel which gears with a second bevel-wheel mounted loosely upon a shaft or spindle fixed vertically to the said half-speed shaft and gearing with a third bevel-wheel, also mounted loosely upon the said half-speed shaft and rigidly connected with the above-described cam for operating the rod of the ignition device. The cam also carries upon its face the pin or eccentric which reciprocates or rocks the intermediate envelop of the magneto-electric machine.

To vary the time of ignition—that is to say, the point in the cycle of the motor at which the charge is exploded—we provide for moving the second or intermediate bevel-wheel around the shaft upon which the first and third wheels are mounted. By so doing it will be obvious that the third bevel-wheel and the cam are partially rotated, as the counter-shaft is held against rotation by the crank-shaft, so that the relative positions of the cam and crank-shaft are altered, as desired, thus varying the time at which ignition takes place.

To enable the invention to be fully understood, we will describe it by reference to the accompanying drawings, in which—

Figure 1 is a sectional elevation of electric ignition-gear made according to our invention. Fig. 2 is a section on the line 2 2, Fig. 1. Fig. 3 is a sectional plan view showing the arrangement for actuating the magneto-electric machine and the rod of the ignition device from the counter-shaft. Figs. 4 and 5 are a section and a plan, respectively, of the sparking or contact device shown in elevation in Fig. 1; and Fig. 6 is a section on line 6 6 of Fig. 1, part being broken away.

A is the magneto-electric ignition apparatus, which said apparatus is preferably, as above mentioned, of the kind described in Bosch's British patent, No. 15,411 of 1897.

a is the crank-shaft of the engine or motor,

and b is the half-speed or counter shaft, the said half-speed or counter shaft b being driven from the crank-shaft a by the spur-wheels a' and b' , mounted on the two shafts a and b , respectively.

c is the bevel-wheel, which is made in one with or rigidly connected to the spur-wheel b' .

d is the bevel-wheel, which is mounted loosely upon the spindle d' , fixed vertically to a sleeve d^2 , which is loosely mounted upon the counter-shaft b , the said bevel-wheel d gearing with the bevel-wheel c and with the third bevel-wheel e , which is also mounted loosely upon the shaft b . The spindle d' passes upward through a slot o in the casing and through a close-fitting aperture in a ring p , extending around the casing, which is formed circular in cross-section. The ring p closes the slot o and is capable of moving around the casing when the spindle d' is moved. The ring p fits the casing sufficiently close, so that its frictional contact with the casing will hold the spindle in any position to which it is moved.

f is the cam, which operates the rod of the sparking device, as hereinafter described, and is rigidly connected to the boss of the wheel e , so as to rotate therewith, and f' is the pin, with which the face of the cam f is provided, the said pin f' engaging with a slide f^2 , working in a slot f^3 in a crank g , so as to reciprocate or rock the intermediate envelop of the magneto-electric machine.

Referring now to the sparking device, h is the hollow plug or cap, the said hollow plug or cap being adapted to be screwed to the ignition-chamber of the engine or motor or to be otherwise fixed in position by means of nuts, studs, &c. i is the pin, which is insulated from it and is electrically connected to one terminal of the magneto-electric machine by means of the insulated wire i' , the other terminal of which is connected to any convenient portion of the engine which forms a good conductor.

j is the lever, which is pivotally mounted in the plug and one end j' of which normally rests upon the pin i , (or if not normally held upon the pin it is allowed to make contact with the insulated pin momentarily previous to sparking,) while the other end j^2 is outside the said plug.

k is the controlling-rod, which is provided with a torsion-spring k' to return it to its normal position. The upper end of the said rod is provided with a tappet l , while the lower end is furnished with an arm m , having a toe m' , which rests upon the cam f . This cam is of such a construction that when rotating in the direction of the arrow shown in Fig. 2 it gradually turns the rod k , and therefore the tappet l , and then suddenly releases it, so that the said tappet l is suddenly brought against the arm j^2 by the spring k' and momentarily lifts the arm j' from the contact i , thereby causing a spark to be produced in the ignition-chamber of the motor.

k^2 is a spring connected to the arm j^2 , so as to maintain a good contact between the parts j' and i .

As above explained, to vary the time of ignition—that is to say, the point in the cycle of the motor at which the charge is exploded—the bevel-wheel d is adjusted around the shaft b by means of the spindle d' . By so doing the bevel-wheel e and the cam f are partially rotated, as the counter-shaft is prevented from rotating by the crank-shaft a , so that the relative positions of the cam f and of the crank-shaft a can be altered to the desired extent, thus varying the time at which ignition takes place, and consequently the speed of the motor.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is—

1. In an explosive-engine, the combination with a current-generating machine, driving mechanism for operating the same intermittently from the engine proper, means for adjusting the relation of said driving mechanism to the engine and a sparking device electrically connected to said generator, substantially as described.

2. In an explosive-engine, the combination with a current-generating machine, mechanism for operating the same intermittently, a sparking device provided with a movable part, mechanism for operating said movable part, connection between the driving-shaft of the engine and said operating mechanisms for the sparking device and the current-generator, electric connection between the electric generator and the sparking device and mechanism for adjusting the relative positions of the operating mechanisms for the sparking device and said generator with respect to the engine-shaft, substantially as described.

3. In an explosive-engine, the combination with the engine-shaft, of a second-motion shaft operatively connected therewith and provided with a bevel-gear, of mechanism for producing an electric spark, a bevel-gear loosely mounted on said second-motion shaft and operatively connected with said spark-producing mechanism and intermediate bevel-gear connecting the two before-mentioned bevel-gears and means for adjusting said intermediate gear around the shaft to vary the relation between the engine-shaft and the spark-producing mechanism, substantially as described.

4. In an explosive-engine, the combination with a shaft operatively connected with and driven by the engine, a bevel-gear fixed on said shaft, a bevel loosely mounted on said shaft, spark-producing mechanism operatively connected with said loosely-mounted gear, a sleeve loosely mounted on the shaft between said bevel-gears and provided with a radial arm, and an intermediate gear mounted upon said arm and meshing with said bevel-

gears whereby by moving said arm in a direction around the shaft the relation of the spark-producing apparatus to said shaft may be adjusted, substantially as described.

5 5. In an explosive-engine, the combination with a current-generating machine and a sparking device electrically connected therewith and provided with a movable part, of a shaft operated by the engine, a bevel-gear
10 fixed on said shaft, a bevel-gear loose on said shaft, operative connections between said loose gear and the current-generating device, and the movable part of said sparking device, a sleeve loosely mounted on said shaft be-
15 tween said bevel-wheel and provided with a radial arm and a bevel-wheel loosely mounted

on said arm and meshing with the before-mentioned fixed and loose bevel-wheels whereby by moving said arm, the relation between the engine and said current-generating and 20 sparking devices can be adjusted, substantially as described.

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