

No. 736,737.

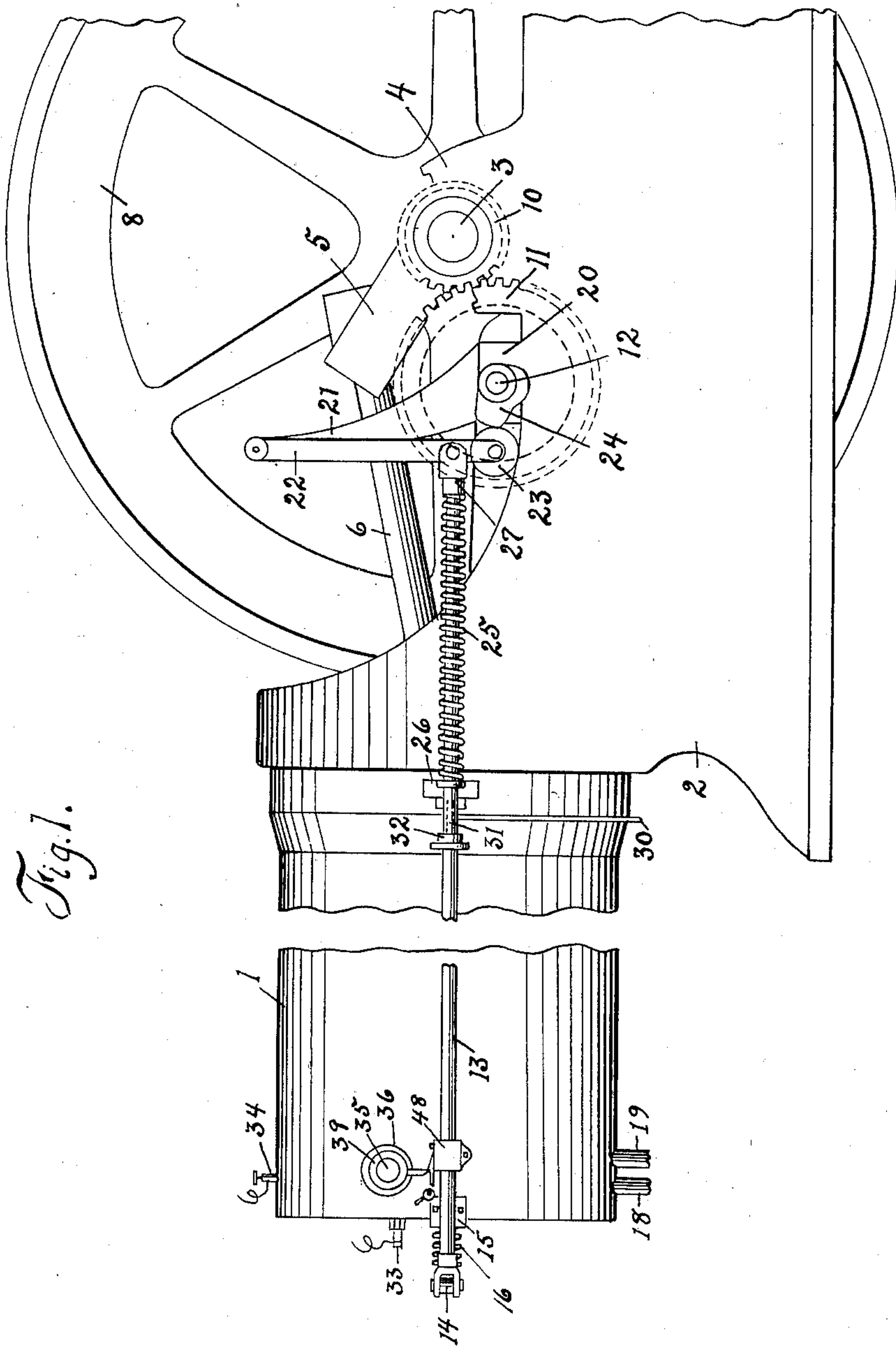
PATENTED AUG. 18, 1903.

A. A. & D. E. KARCHER.
SPARKING IGNITER FOR EXPLOSIVE ENGINES.

APPLICATION FILED FEB. 12, 1903.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES:

Laura Burger
Andrew Wright Crawford

INVENTORS

Douglass Eugene Karcher & Arthur Adelbert Karcher
BY
H. Bone & Schumacher
ATTORNEY.

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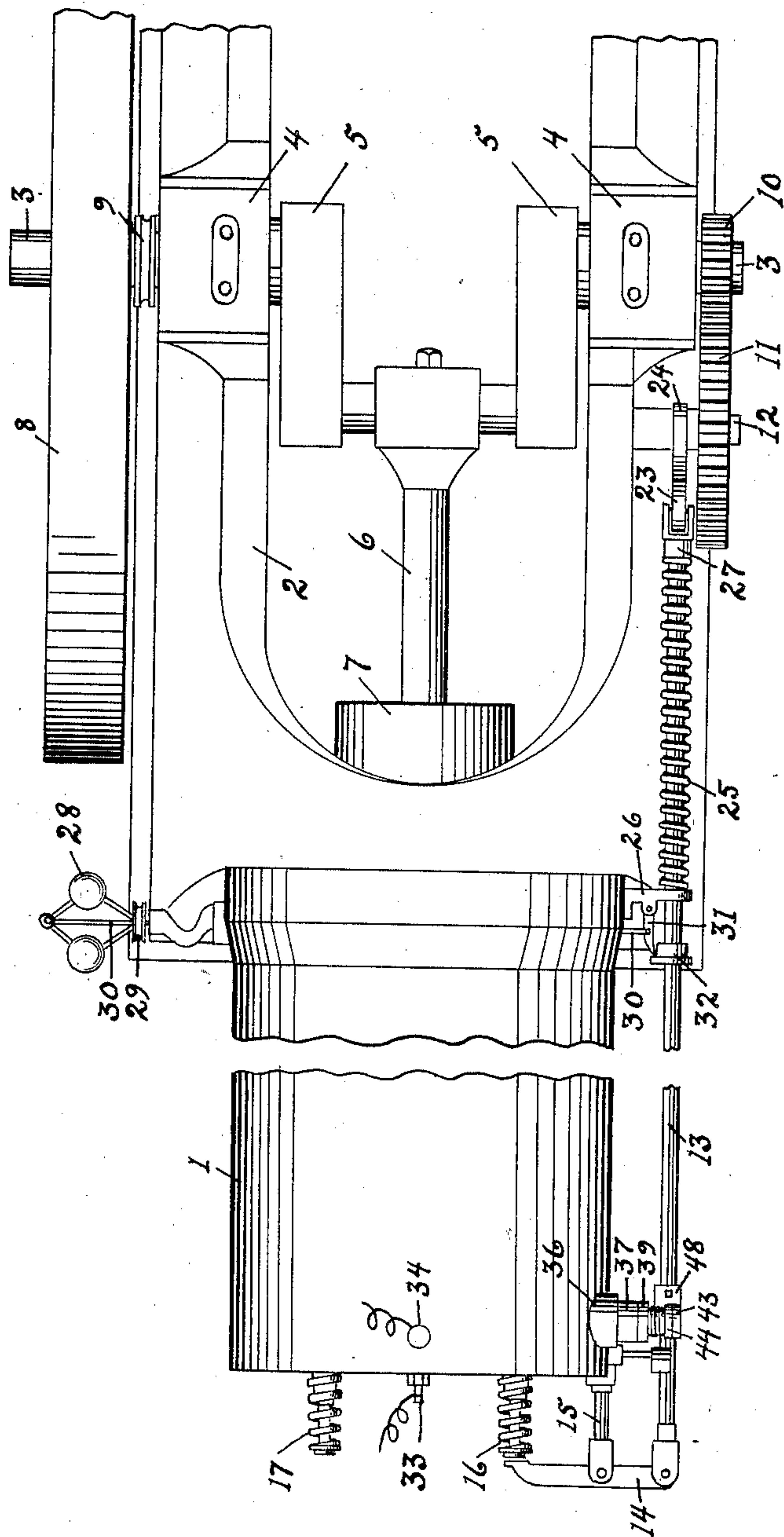
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Fig. 2.



WITNESSES:

Laura Berger
Andrew Wright Crawford

INVENTORS

Douglas Eugene Karcher & Arthur Adelbert Karcher

BY

H. B. McKenney

ATTORNEY.

No. 736,737.

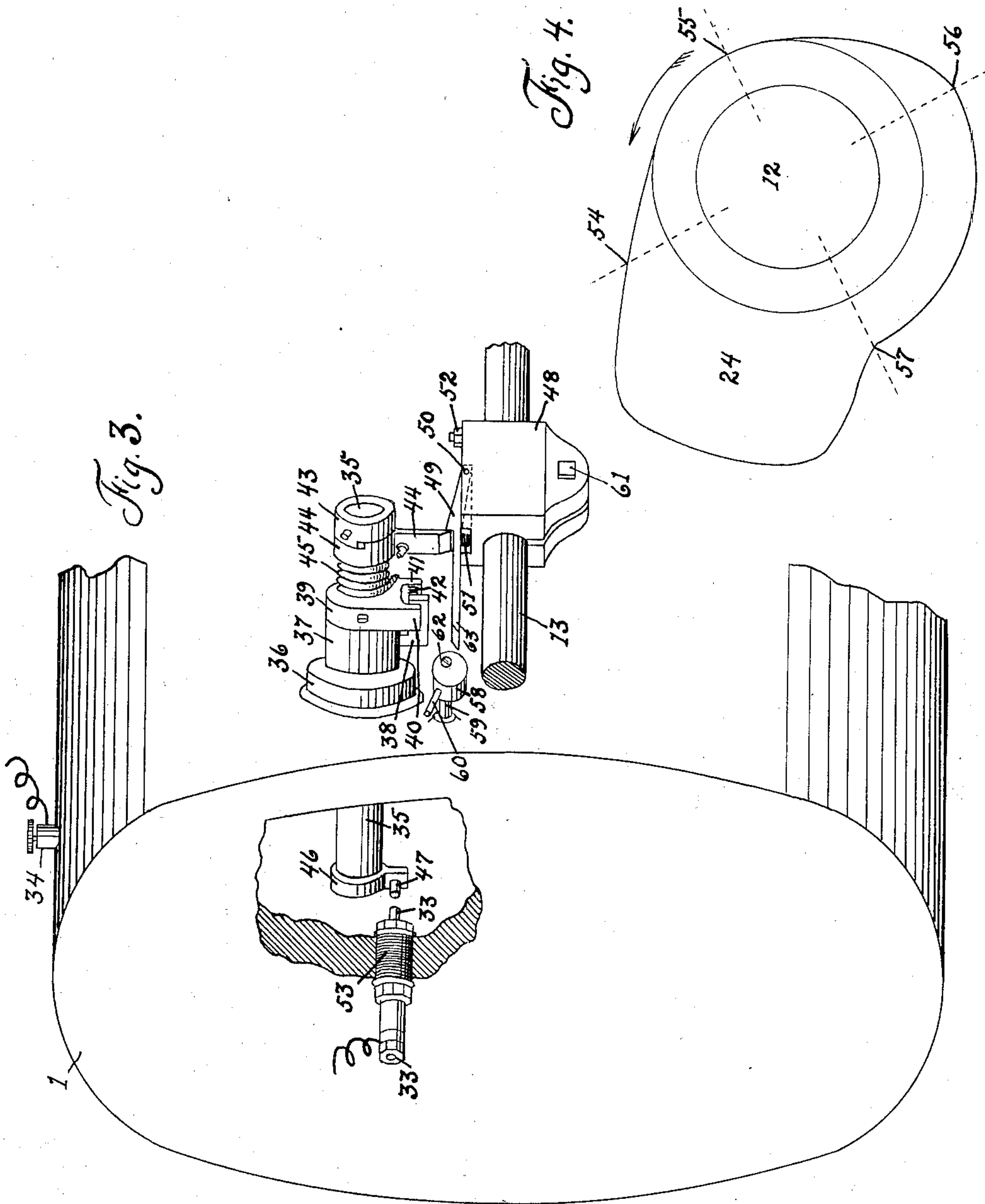
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WITNESSES:

Laura Berger

Andrew Wright Crawford

INVENTORS

Douglass Eugene Karcher & Arthur Adelbert Karcher

BY

H. B. Ockerman

ATTORNEY.

UNITED STATES PATENT OFFICE.

ARTHUR ADELBERT KARCHER AND DOUGLASS EUGENE KARCHER, OF
LYONS, MICHIGAN.

SPARKING IGNITER FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 736,737, dated August 18, 1903.

Application filed February 12, 1903. Serial No. 143,730. (No model.)

To all whom it may concern:

Be it known that we, ARTHUR ADELBERT KARCHER and DOUGLASS EUGENE KARCHER, citizens of the United States, residing at Lyons, in the county of Ionia and State of Michigan, have invented certain new and useful Improvements in Sparking Igniters for Explosive-Engines, of which the following is a specification.

Our invention relates to gas or gasolene engines of the single-acting four-cycle compression type; and our improvement therein consists in the means herein shown and described for actuating and controlling the exhaust and the explosion of gas or gasolene in the cylinder

In the accompanying drawings, Figures 1 and 2 are views in side elevation and in plan, respectively, of the entire engine. Fig. 3 is a detailed view in perspective, on a larger scale, of the means for causing and regulating the spark in the cylinder. Fig. 4 is a side view of the cam which actuates and controls the valve-rod.

In Figs. 1 and 2 the cylinder 1 is secured to the base 2. The main shaft 3, mounted in the bearings 4, is rotated by the cranks 5, piston-rod 6, and trunk-piston 7. Only one of the two fly-wheels 8 is shown. The gear-wheel 10, mounted upon and rotated by the main shaft 3, meshes into the gear-wheel 11, which rotates the secondary shaft 12, upon which is mounted the cam 24. The secondary shaft 12 rotates in the bearing 20 upon the base 2. The arm 21, integral with the base 2, carries the hanging arm 22, the upper end of which is pivoted freely to the arm 21 and in the lower end of which is mounted the wheel 23. The arm 21 and hanging arm 22 are omitted in Fig. 2 in order to show the relation of certain other parts more clearly therein. The valve-rod 13 is connected at one end to the hanging arm 22 and at the other to the rock-arm 14, which is pivoted upon the support 15. The free end of said rock-arm is adapted to engage the exhaust-valve 16 in the manner hereinafter set forth. 17 is an intake-valve, and 18 and 19 are the intake and exhaust pipes, respectively. The spring 25 is coiled about the valve-rod 13, being compressed be-

tween the collar formed on the bearing 26 and the collar 27, formed on the end of said valve-rod.

In Fig. 2 the governor 28 of the ordinary ball type is mounted upon the rod 30 and is actuated from the main shaft 3 by the pulleys 29 and 9. The rod 30 passes in a semicircular bend beneath the cylinder 1 and is connected to the catch 31, mounted upon the bearing 26. The catch 31 is adapted to engage the collar 32 upon the valve-rod 13 in the manner hereinafter described.

In Fig. 3 the igniter-stem 35 passes through the side of cylinder 1, being mounted in the bearing 36 and having a semirotary movement therein, as hereinafter more fully explained.

The collar 37 is integral with the bearing 36 and carries the L-shaped tongue 38. The collar 39 is mounted upon and rotates with the igniter-stem 35 and is furnished with the shoulders 40 and 41. The spring 42 is attached to and compressed between the shoulder 41 and the L-shaped tongue 38. The collar 43 is attached to and rotates with the igniter-stem 35. The igniter-catch 44 is mounted upon the igniter-stem 35, fitting into the collar 43 in such manner as to have a limited semirotation in connection therewith. The collar 39 and igniter-catch 44 are connected by the spring 45, coiled about the igniter-stem 35. One end of the spring 45 is attached to the collar 39 and the other to the igniter-catch 44, as shown in Fig. 3. The end of the igniter-stem 35 within the cylinder 1 is furnished with the collar 46, having the point 47. The igniter-block 48 is adjustably clamped to the valve-rod 13 by the screws 52 and 61 and is furnished with the catch 49, one end of which is pivoted in the igniter-block by the pin 50 and the other end of which is raised above the face of the igniter-block 48 by the spring 51. The catch 49 is formed with the projecting tongue 63, the end of which is beveled to engage the head 58. The head 58 is eccentrically mounted upon the support 59 by means of the set-screw 62 in such manner that said head can be semirotated by means of the handle 60 and fixed in any position relative to the beveled end of

tongue 63. The insulated point 33 passes through the head of the cylinder 1, its axis being at right angles to that of the igniter-stem 35. Said point is surrounded where it passes through the cylinder-head by the insulation 53. The fixed point 33 and the movable point 47 are thus directly opposite and close to one another. The cap 34, Fig. 3, forms the connection for completing the electric current.

Having described the various parts of our gas or gasoline engine, its mode of operation is as follows: The valve-rod 13 actuates both the exhaust-valve 16 and the igniter-stem 35 in the following manner: The expansion of the spring 25 on valve-rod 13 serves to keep the wheel 23, to which said valve-rod is connected by the arm 22, pressed against the cam 24. The latter being rotated by the gears 10 and 11 serves in conjunction with the spring 25 to impart a to-and-fro stroke to the valve-rod 13. Referring to Fig. 2, it will be seen that this stroke of valve-rod 13 actuates exhaust-valve 16 by means of rock-arm 14, exhaust-valve 16 being of the ordinary puppet type. The manner in which the stroke of valve-rod 13 actuates the igniter-stem 35 and causes a make-and-break contact between points 33 and 47 is apparent in Fig. 3. The expansive action of spring 42 causes a partial rotation of igniter-stem 35, drawing point 47 away from point 33. As the valve-rod 13 moves toward the cylinder-head the catch 49 in igniter-block 48 engages the end of igniter-catch 44. As the latter is thus rotated it engages the collar 43, which being integral with the igniter-stem 35 causes a semirotation of the igniter-stem, bringing point 47 into contact with point 33. This establishes a current through said points. As catch 49 continues to move toward the cylinder-head the beveled tip 63 encounters the head 58, under which it slides, thus depressing catch 49 and releasing igniter-catch 44. Thereupon the expansive action of spring 42 operates to semirotate the igniter-stem 35 in the opposite direction. This causes point 47 to recede from point 33, thus breaking the current and causing the spark that ignites the gas or gasoline in the cylinder. The function of spring 45 is to take up in part the suddenness of contact between catch 49 and igniter-catch 44, so that the semirotation of igniter-stem 35 shall not be too rapid, bringing points 33 and 47 gently and firmly into contact. By adjusting the position of eccentric head 58 upon its support 59 the tongue 63 of catch 49 may be released earlier or later in the stroke of valve-rod 13. Thus the instant of sparking the cylinder may be timed as desired in the cycle of the engine's operation. Furthermore, this adjustment may be effected while the engine is running. The governor 28 should be so adjusted as to disengage catch 31 from collar 32 when the engine is running at the desired speed.

Should this speed be exceeded, the governor moves over the rod 30 and catch 31 until the latter engages the collar 32 at the end of valve-rod's (13) stroke toward the cylinder head. This holds open the exhaust-port 16 and checks the action of the firing mechanism until the speed has been reduced to normal, when the action of the governor automatically disengages catch 31. The action of valve-rod 13 in actuating both exhaust-valve and igniter-stem is due to the form of cam 24. In Fig. 4 the contour of said cam has been divided into four sections, each section representing a different successive movement or position of the valve-rod. The cam rotates in the direction indicated by the arrow in Fig. 4. At point 54 the exhaust-valve closes and from 54 to 55 vapor is being drawn into the cylinder, the valve-rod meanwhile moving toward the main shaft. From 55 to 56 the valve-rod moves toward the cylinder-head, and at 56 the igniter-stem is actuated, igniting the vapor. From 56 to 57 the valve-rod remains motionless during expansion. From 57 to 54 the valve-rod is moved still farther on toward the cylinder-head, actuating the exhaust-valve through the rock-arm 14, Fig. 2. Thus each of the four sections of cam 24 corresponds in succession to one of the four cycles of the engine. For an engine of the single-acting four-cycle compression type the gears 10 and 11 should be so proportioned as to secure one revolution of gear 11 and cam 24 to two revolutions of gear 10.

In Fig. 2 the exhaust-valve 16 is provided with a strong spring and the intake-valve 17 with a weaker one, so that the forward charging stroke of the piston actuates only the intake-valve 17. Both valves are of the puppet type, and the arrangement of the exhaust and intake valve ports within the cylinder may be of any well-known form.

What we claim as our invention, and desire to secure by Letters Patent, is—

In combination in a gas-engine, the valve-rod 13 and means for actuating and controlling the stroke of said valve-rod, said means consisting of the cam 24 rotated by the gears 10 and 11, the arm 21, the hanging arm 22, the wheel 23 and spring 25, the fixed point 33, the igniter-stem 35 and means whereby the stroke of said valve-rod semirotates said igniter-stem into a make-and-break contact with the fixed point 33, said means consisting of the igniter-block 48 adjustably mounted upon said valve-rod, the catch 49 pivotally mounted upon said igniter-block and furnished with the spring 51 and beveled tongue 63, the adjustable head or wheel 58 eccentrically mounted upon its base 59 and adapted to engage and depress the beveled tongue 63, the U-shaped collar 39 integral with said igniter-stem 35 and furnished with the shoulders 40 and 41, the tongue 38 integral with the bearing wherein said igniter-stem is mounted, and the spring 52, said col-

lar 39, tongue 38 and spring 42 constituting
the means whereby said igniter-stem is semi-
rotated out of contact with the fixed point 33,
the catch 44, spring 45 and shouldered col-
5 lar 43, adapted to maintain said catch 44 in
contact with the catch 49 during part of the
stroke of said valve-rod, substantially as and
for the purposes set forth.

In testimony whereof we affix our signa-
tures in presence of two witnesses.

ARTHUR ADELBERT KARCHER.
DOUGLASS EUGENE KARCHER.

Witnesses:

LEON D. SHERWOOD,
VICTOR F. UPTON.