

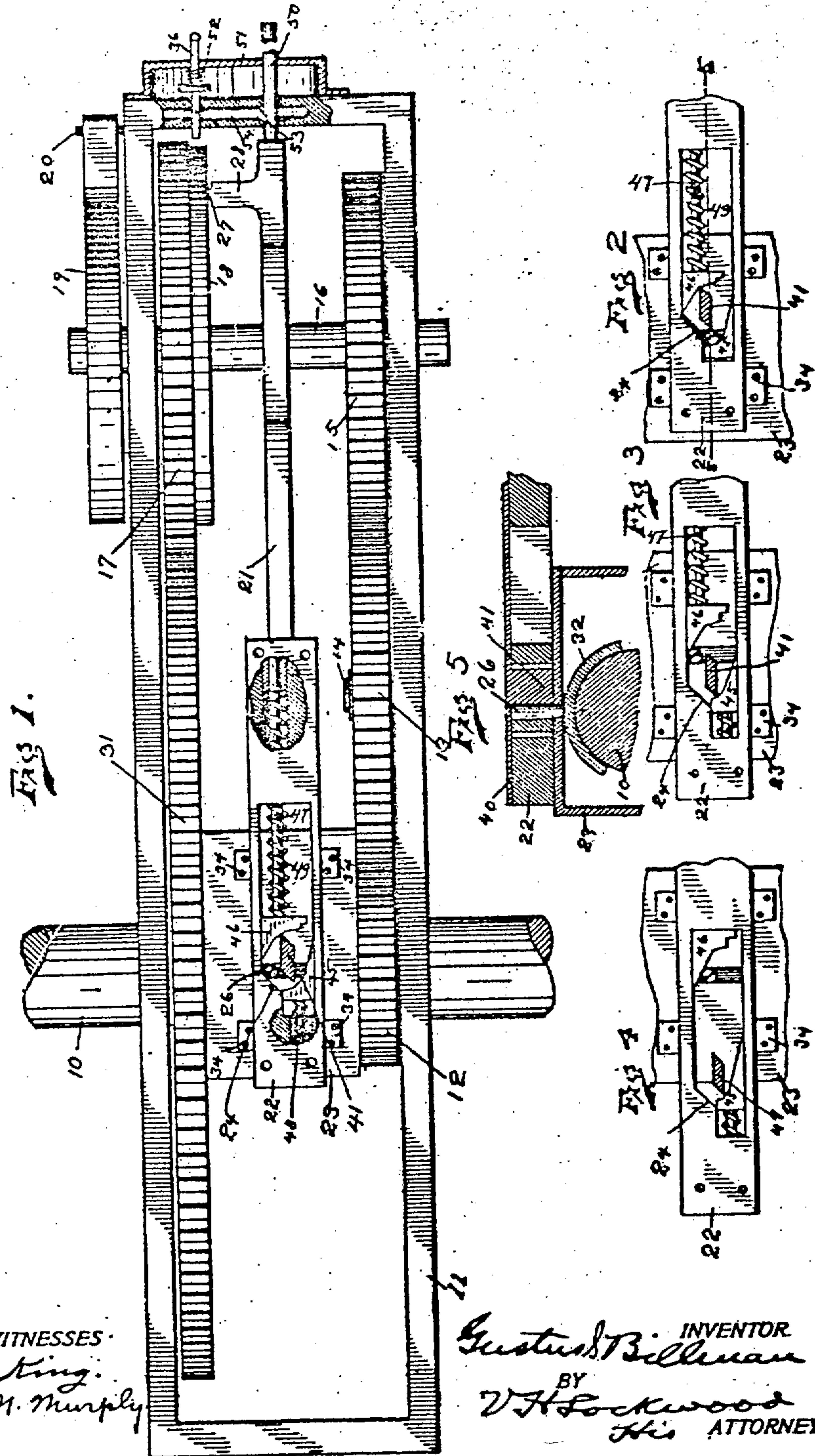
No. 768,506.

PATENTED AUG. 23, 1904.

G. S. BILLMAN.
GAS ENGINE STARTER.
APPLICATION FILED AUG. 24, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



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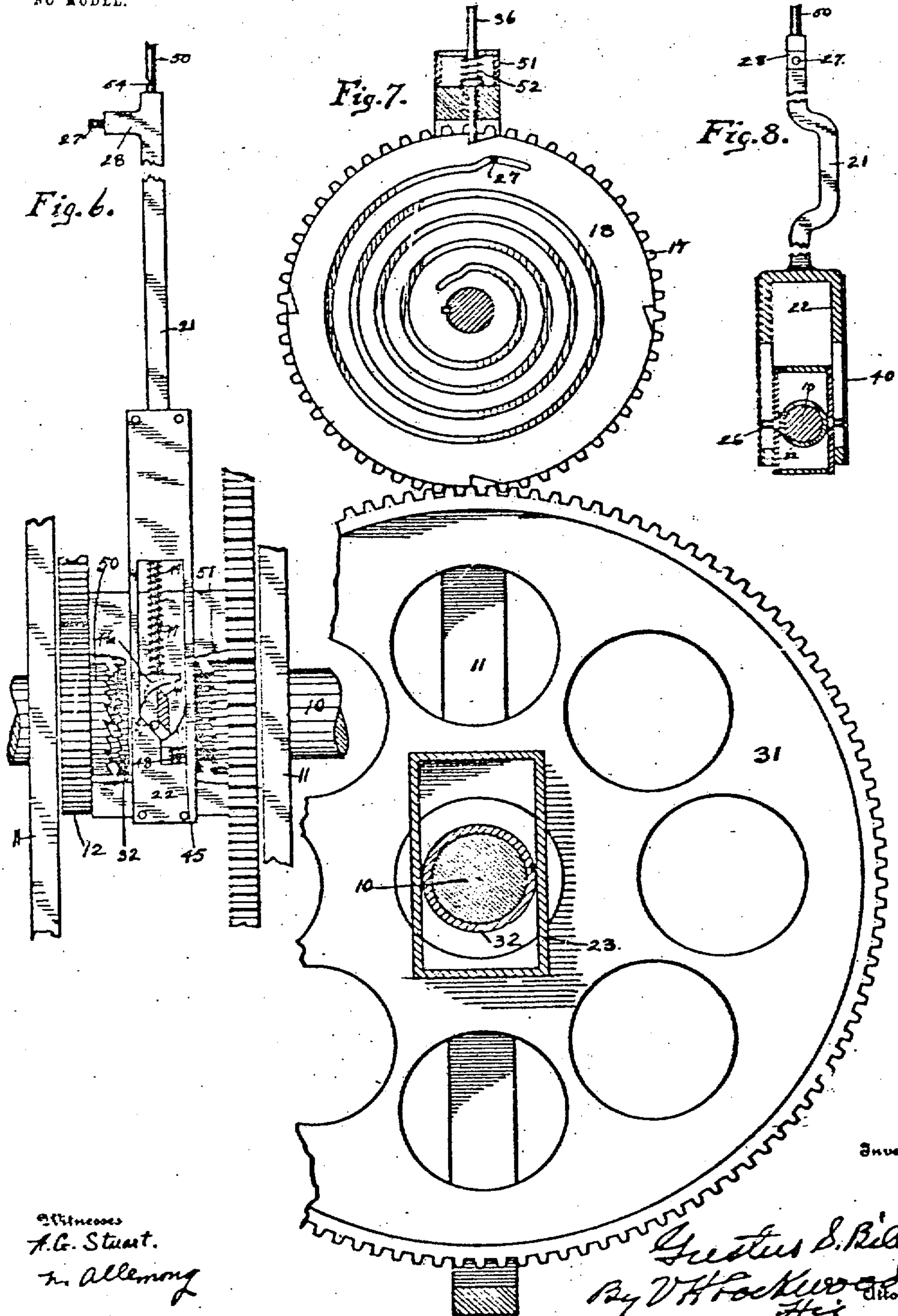
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3 SHEETS-SHEET 2.



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UNITED STATES PATENT OFFICE.

GUSTUS S. BILLMAN, OF INDIANAPOLIS, INDIANA.

GAS-ENGINE STARTER.

SPECIFICATION forming part of Letters Patent No. 768,506, dated August 23, 1904.

Application filed August 24, 1903. Serial No. 170,589. (No model.)

To all whom it may concern:

Be it known that I, GUSTUS S. BILLMAN, of Indianapolis, county of Marion, and State of Indiana, have invented a certain new and useful Gas-Engine Starter; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like numerals refer to like parts.

The object of this invention is to provide certain improvements in automatic starting mechanism for explosive-engines of a gasoline or other type over what is set forth in my former applications for Letters Patent, Serial No. 121,406, filed August 28, 1902, and Serial No. 157,963, filed May 20, 1903.

The device shown and described herein further simplifies the construction, as will appear from the accompanying drawings and the following description and claims.

In the drawings, Figure 1 is a plan view of my improved starting mechanism in place with the lid off and the main driving-shaft broken away, parts being broken away and parts in section. Figs. 2, 3, and 4 are plan views, on an enlarged scale, of a portion of the clutch mechanism, showing the parts in different positions during the operation. Fig. 5 is a central vertical section on the line 5-5 of Fig. 2, showing also a part of the main shaft and clutch-box. Fig. 6 is a plan view of a portion of the device with parts broken away to disclose the clutch mechanism. Fig. 7 is a vertical section of the device as shown in Fig. 1 on a line just inside the large spur-gear and grooved disk, parts being broken away. Fig. 8 is a detail view showing the master-bar in side elevation and other parts in cross-section, parts being broken away.

This device is adapted to be attached to an automobile or similar machine which may be driven by an explosive-engine.

10 is the main shaft, driven by the gas-engine and may be one of the axles of the automobile. The frame 11 is connected in any desired way with the engine or machine, it being rigid with relation to the shaft 10. Therefore this device will operate the gas-engine by operating the shaft 10, as heretofore explained in my said former applications, and

also the gas-engine winds or places the automatic starting mechanism in position for operation through said shaft 10. A pinion 12 is loosely mounted on the shaft 10 to mesh with the gear 13, that is loosely mounted on the spindle 14, which is rigidly secured to the frame 11. The gear 13 meshes with another gear, 15, that is rigidly mounted on a counter-shaft 16, whereby said shaft is driven from the main shaft 10. The shaft 16 carries a spring 19 on one end of it, which said shaft winds. The spring is helical, being fastened centrally to said shaft and at its outer end to the pin 20 in the frame. With the foregoing construction the ordinary operation of a gas-engine will drive the gears and shaft specified and wind the spring 19, as shown in Fig. 1.

The winding of the spring is automatically stopped by the following construction: A master-bar 21 extends longitudinally of the device and over the shaft 16. The rear end of the bar is yoked to carry parallel arms or places 22, which fit astride the clutch-box 23, that surrounds the main shaft 10, one arm 22 being above the clutch-box, as shown, and the other arm being below, as appears in my last application above mentioned. Each of said arms is cut out, as shown in Figs. 1 to 4, to form an opening or slot extending longitudinally of the arm. At the rear end of said opening there is an inclined shoulder 24, that is slightly to one side of a central line drawn longitudinally through said arms. The master-bar 21 is reciprocated by reason of the pin 27 extending inward from the arm 23 on said bar and fitting in a helical groove in the disk 18. When the disk 18 revolves in one direction, therefore, the master-bar 21 will be moved rearwardly, and as said disk revolves in the opposite direction said master-bar will be moved forwardly. The grooved disk 18 is placed on one side or rather forms one side of the gear 17, which is secured to the shaft 16. Said gear 17 meshes with the large gear 31, that is loosely mounted on the main shaft 10. The inner faces of the pinion 12 and the gear-wheel 31 are reversely toothed to form clutch members 30 and 31 and the sliding clutch member or sleeve 32, mounted so as to be slidable on the shaft 10, as set forth in said ap-

plication, and so that it will rotate with said shaft and be laterally movable into engagement with either the wheel 12 or the wheel 31. That sleeve or clutch member 32 has pins 26 extending radially from opposite sides thereof, as shown in Fig. 8. Said pins 26 extend through transverse slots in the clutch-box 23, so as to be movable longitudinally of the shaft 10 and independently of said clutch-box. Said clutch member 32 is moved into engagement with one or the other of the wheels 12 and 31 by the reciprocatory movement of the master-bar 21. Said bar 21 is guided in its movement on the clutch-box 23 by the guide-lugs 34, which extend upward from said box. Upon both the arms 22 of the master-bar a plate 40 is secured, which covers the openings in said arms, and from said plate 40 a tongue 41 extends inward into the opening in the arm 22, as appears in Fig. 5. This tongue appears in cross-section in all the other figures, being cut just below the plate 40 in order to disclose the mechanism below. The tongue 41 is placed on a middle line extending longitudinally of the arms 22 from the master-bar and is beveled at each end, as shown. The bevel at the rear end is parallel with the inclination of the shoulder 24 in the arm 22 of the master-bar and far enough away from said shoulder to permit the pin 26 from the sliding clutch member 32 to pass. In the opening in the arms 22 of the master-bar both at the top and at the bottom there are mounted two inclined clutch-throwing blocks 45 and 46, they being of the same thickness as the arm 22 and are mounted respectively on the shanks 47 and 48, that loosely fit in holes bored in the arm 22, as appears in Fig. 1, so as to be longitudinally movable and are pushed outward by the spiral springs 49, as shown. The clutch-throwing blocks 45 and 46 are therefore always normally forced toward each other and against the tongue 41, excepting when the clutch-pin 26 may push one or the other away. At the other end of the master-bar there is a guide-rod 50, extending through the frame and also the cap 51. There is also a locking-pin 36, that is slidable and held in engagement with the periphery of the disk 18 by the spring 52. It is adapted to engage a notch in the periphery of the disk 18, which notch is not shown here, but appears in my last application. Said locking-pin 36 is parallel with the guide-rod 50, and both said pin and said rod are provided with oppositely-located notches 53, adapted to be engaged by a loosely-mounted and slidable lock-bolt 54, mounted in the framework, as shown in Fig. 1. The position of the parts just described is such that said bolt 54 will lock only one at a time. The bolt 54 is for the purpose of holding the locking-pin 36 in its disengaging position during the movement of the master-bar.

65— The operation of the device with my pres-

ent improvement is as follows: As shown in Fig. 1, the device has just been set in operation for starting the engine. The pin 36 has just been drawn, releasing the spring, which is unwinding, and the master-bar has just started to the rear, the notch 53 in the rod 50 having moved somewhat away from the end of the locking-rod 54. The slight rearward movement of the master-bar that has just taken place has moved the tongue 41 likewise rearward, and its rear oblique face has pushed the pin 26 from the position shown in Fig. 2 to the position shown in Fig. 1, and therefore moved the clutch member 32 from the midway inoperative position toward and in engagement with the teeth on the wheel 31. As the spring further unwinds the gears 17 and 31 will actuate the main shaft 10 and start the engine. As the master-bar moves rearward the arm 22 assumes the position with relation to the pin 26 that is shown in Figs. 3 and 4 successively. Said pin engages the block 46 and pushes it back against the action of its spring from the position shown in Fig. 3 to that shown in Fig. 4, the latter position being reached about the time the mainspring 19 is unwound. The tension of the spring 49 has by this time become so great as to the inclined surface of the block 46 to throw the pin 26 and bring the clutch member 32 out of engagement with the gear-wheel 31. At the same time it throws said clutch member and pin over into engagement with the pinion 12, and the further operation of the main shaft 10 by the engine causes the mechanism to wind up the spring 19. As said spring 19 is wound the disk 18, with the groove in it, will cause the master-bar to be moved forward or to the right. Therefore the arm 22 will move longitudinally from the position shown in Fig. 4 to that shown in Fig. 2. As the master-bar almost reaches its limit of movement the inclined face of the block 45 engages the pin 26 and throws it and the clutch member 32 away from the pinion 12 to the middle inoperative position. (Shown in Fig. 2.) The winding of the spring then ceases. By that time the notch 53 in the master-bar rod 50 has come opposite the bolt 54, so that said locking-bolt can enter the notch in the rod 50. The spring 52 on the pin 36 will then force said pin into engagement with the disk 18 and hold it in a locked position. The mechanism is now inoperative and will remain so until it is desired to start the engine again, when the locking-pin 36 is released and the same operation is repeated as has been described.

It may be added that the block 46 will throw the pin 26 and clutch member 32 over toward the pinion 12 from the position shown in Fig. 3 as soon as the engine fires, and therefore the strain is taken off the gear 31, for then the clutch member 22 readily disengages from said wheel 31. If the engine be slow in firing, the block 46 may be forced back as far as in

Fig. 4, when the increased tension of the spring 49 will throw the clutch, whether the engine is fired or not.

What I claim as my invention, and desire to secure by Letters Patent, is the following:

1. An automatic starter for explosive-engines including a driving-shaft, a counter-shaft, two parallel sets of gears connecting said shafts, one for actuating the counter-shaft from the driving-shaft and the other for actuating the driving-shaft from the counter-shaft, a spring on said counter-shaft for driving it, a sliding clutch on said driving-shaft between said two sets of gears for operatively connecting either one of them with the driving-shaft, a pin extending from said clutch, a bar between said two sets of gears, means actuated by said counter-shaft for reciprocating said bar, and a tongue connected with said bar and extending in the path of the pin from the clutch, the ends of said tongue being beveled to throw the pin and clutch alternately in opposite directions.

2. An automatic starter for explosive-engines including a driving-shaft, a counter-shaft, two parallel sets of gears connecting said shafts, one for actuating the counter-shaft from the driving-shaft and the other for actuating the driving-shaft from the counter-shaft, a spring on said counter-shaft for driving it, a sliding clutch on said driving-shaft between said two sets of gears for operatively connecting either one of them with the driving-shaft, a pin extending from said clutch, a bar between said two sets of gears, means actuated by said counter-shaft for reciprocating said bar, a tongue connected with said bar and extending in the path of the pin from the clutch, the ends of said tongue being beveled to throw the pin and clutch alternately in opposite directions, and means cooperating with said tongue at each end thereof for throwing said clutch-pin alternately in opposite directions.

3. An automatic starter for explosive-engines including a driving-shaft, a counter-shaft, two parallel sets of gears connecting said shafts, one for actuating the counter-shaft from the driving-shaft and the other for actuating the driving-shaft from the counter-shaft, a spring on said counter-shaft for driving it, a sliding clutch on said driving-shaft between said two sets of gears operatively connecting either one of them with the driving-shaft, a pin extending from said clutch, a bar between said two sets of gears, means actuated by said counter-shaft for reciprocating said bar, a tongue connected with said bar and extending in the path of the pin from the clutch, the ends of said tongue being beveled to throw the pin and clutch alternately in opposite directions, a pair of blocks, one at each end of said tongue and movable toward and away from said tongue and each having a face inclined reversely to the inclination of the

approximate end of the tongue, and springs tending to force said blocks toward said tongue.

4. An automatic starter for explosive-engines including a driving-shaft, a counter-shaft, two parallel sets of gears connecting said shafts, one for actuating the counter-shaft from the driving-shaft and the other for actuating the driving-shaft from the counter-shaft, a spring on said counter-shaft for driving it, a sliding clutch on said driving-shaft between said two sets of gears for operatively connecting either one of them with the driving-shaft, a pin extending from said clutch, a bar between said two sets of gears, means actuated by said counter-shaft for reciprocating said bar, a tongue connected with said bar and extending in the path of the pin from the clutch, the ends of said tongue being beveled to throw the pin and clutch alternately in opposite directions, a clutch-box between the two sets of gears and surrounding said clutch with a transverse slot in it through which the clutch-pin may extend and move, an arm connected with said reciprocating bar movable longitudinally on said clutch-box and provided with a longitudinal opening in it over the transverse slot in the clutch-box and having an inclined shoulder at the rear and corner next to the gear which drives said driving-shaft, a plate on said arm covering said opening with a tongue extending therefrom into the opening in said arm with its two ends reversely beveled, the rear end being beveled parallel with said inclined shoulder, a pair of blocks fitting in the opening in said arm so as to be independently movable, one being near each end of said tongue and beveled reversely to the inclination of the adjacent end of the tongue, rods or shanks for said blocks mounted so as to be movable longitudinally on said arms, and springs tending to press said blocks toward the tongue.

5. An automatic starter for explosive-engines including a driving-shaft, a counter-shaft, two parallel sets of gears connecting said shafts, one for actuating the counter-shaft from the driving-shaft and the other for actuating the driving-shaft from the counter-shaft, a spring on said counter-shaft for driving it, a sliding clutch on said driving-shaft between said two sets of gears for operatively connecting either one of them with the driving-shaft, a pin extending from said clutch, a bar between said two sets of gears, means actuated by said counter-shaft for reciprocating said bar, a tongue connected with said bar and extending in the path of the pin from the clutch, the ends of said tongue being beveled to throw the pin and clutch alternately in opposite directions, a spring-actuated longitudinally-movable locking-pin adapted to hold said spring in its wound condition, a rod extending from said clutch-actuating bar parallel with said locking-pin, said

rod and said locking-pin having opposite arranged notches in them, and a sliding locking-bolt mounted between said rod and locking-pin with beveled ends for engaging said notches, said bolt being of such length that when it engages the notch on one of said notched members it will disengage the other of said members.

In witness whereof I have hereunto affixed my signature in the presence of the witnesses herein named.

GUSTUS S. BILLMAN.

Witnesses:

R. P. KING,

V. H. LOCKWOOD.