

C. LYNNOCK.
ENGINE STARTER FOR AUTOMOBILES.
APPLICATION FILED FEB. 23, 1912.

1,059,679.

Patented Apr. 22, 1913.

3 SHEETS—SHEET 1.

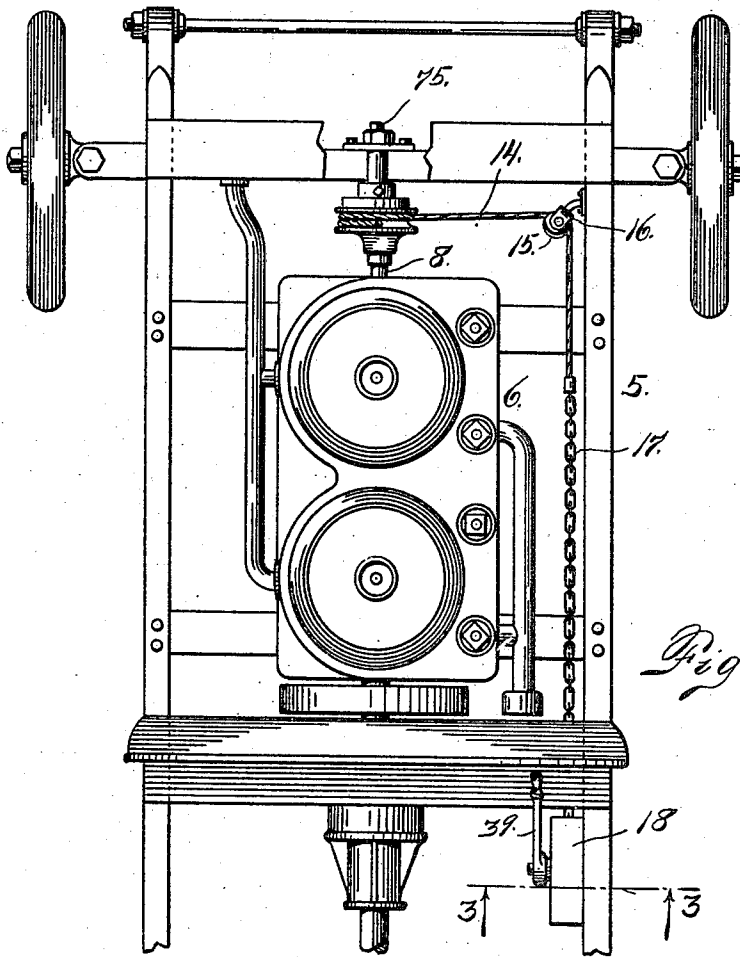


Fig. 1.

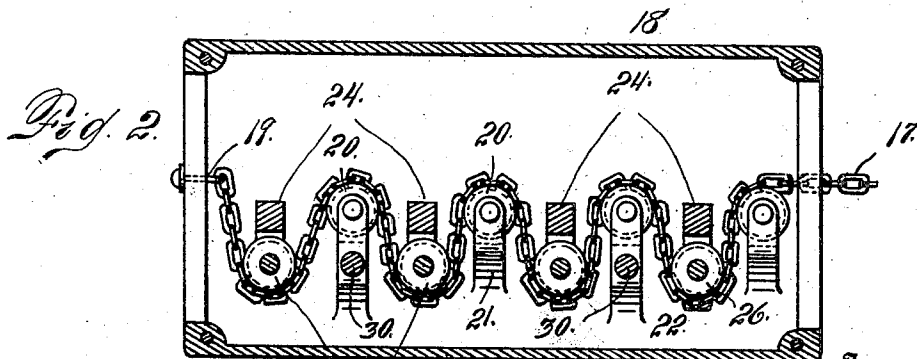


Fig. 2.

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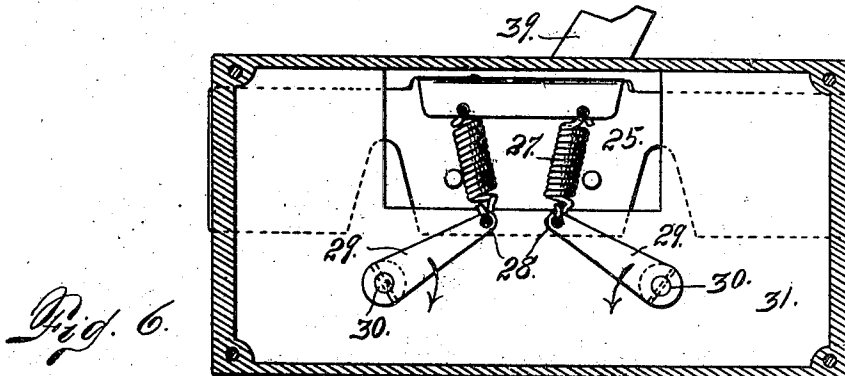
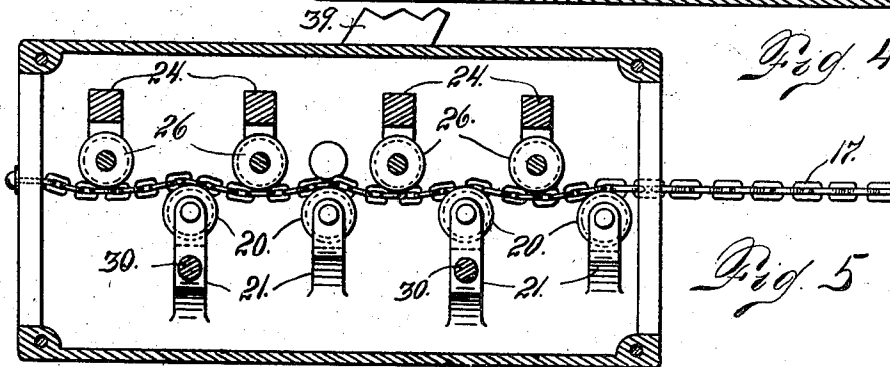
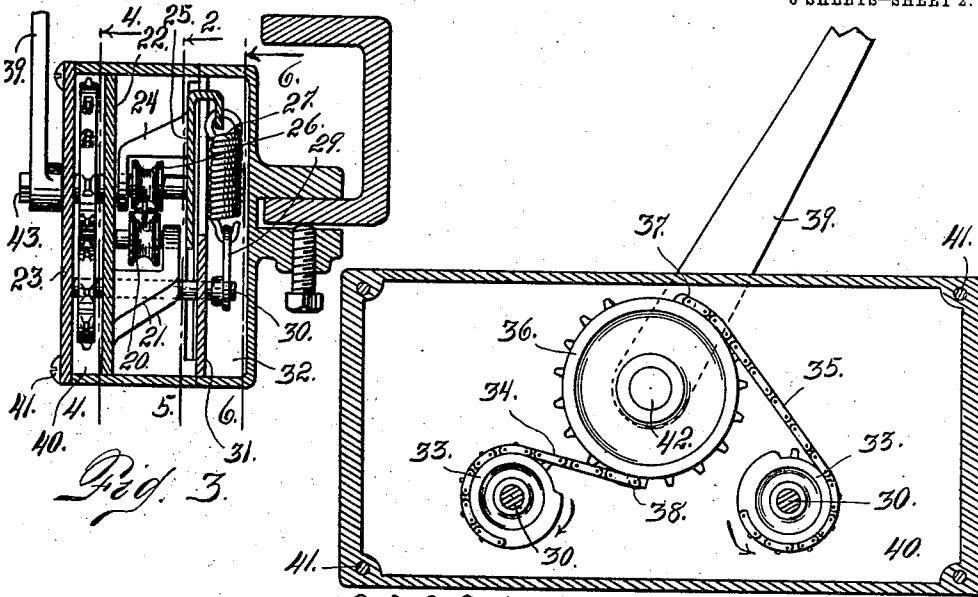
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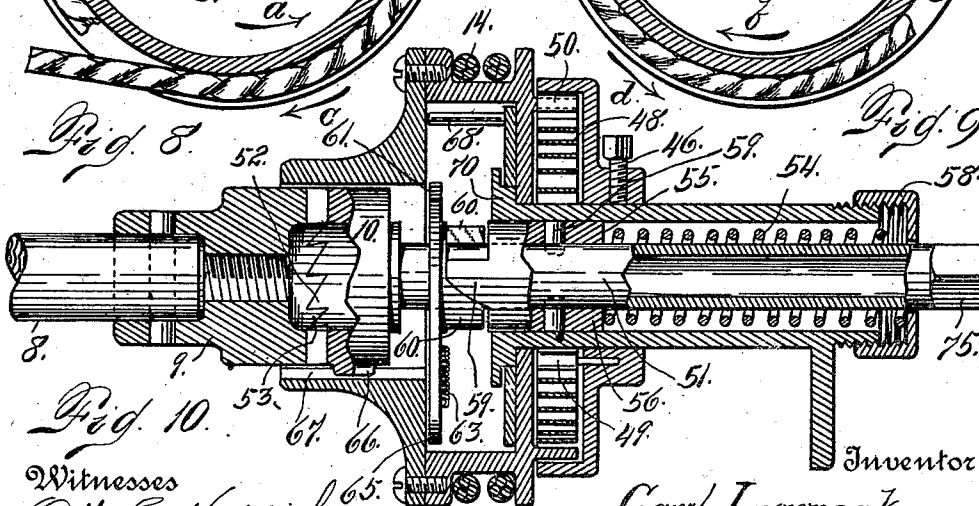
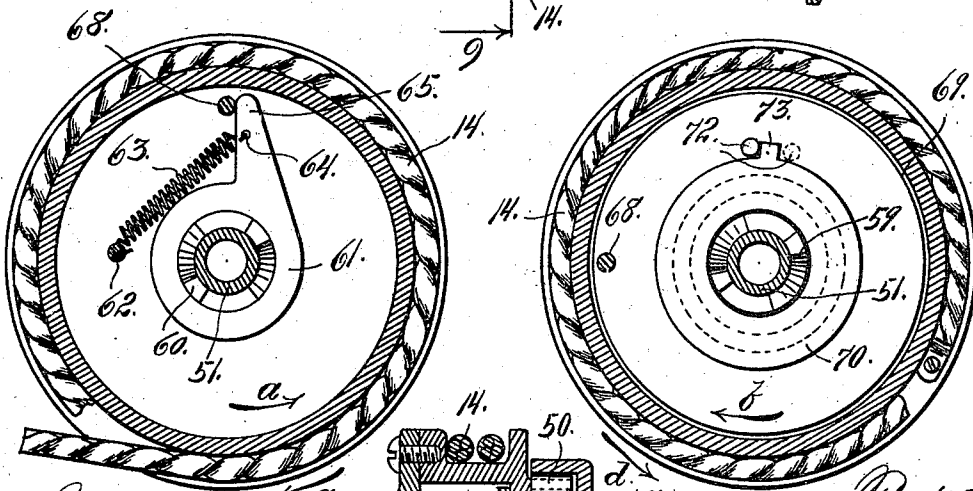
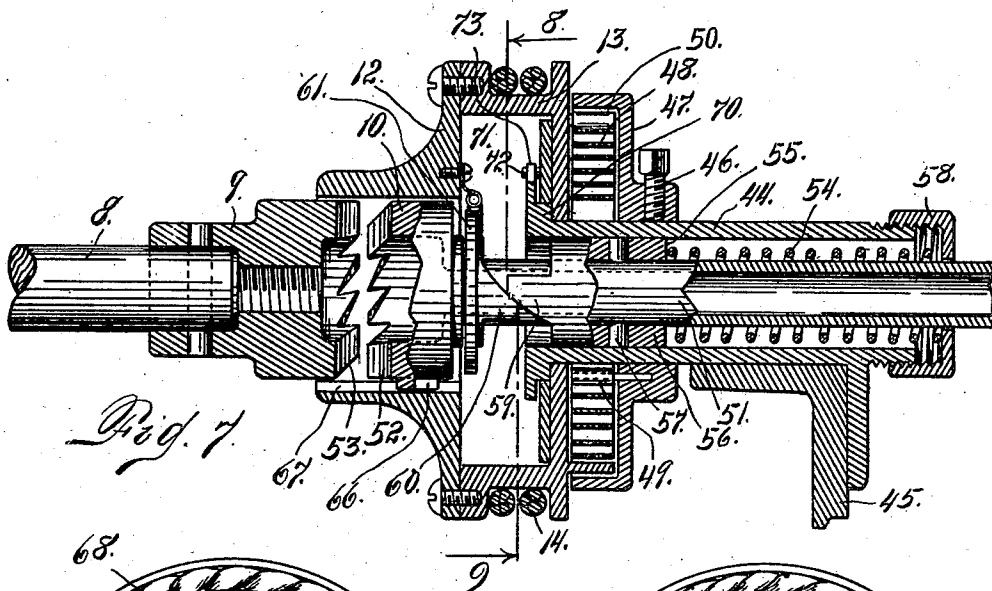


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3 SHEETS--SHEET 3.



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UNITED STATES PATENT OFFICE.

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ENGINE-STARTER FOR AUTOMOBILES.

1,059,679.

Specification of Letters Patent.

Patented Apr. 22, 1913.

Application filed February 23, 1912. Serial No. 679,225.

To all whom it may concern:

Be it known that I, CARL LYNNOCK, citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Engine-Starters for Automobiles; and I 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 characters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in starters for internal combustion engines, being more specially intended for use in connection with the engines of automobiles.

My object is to provide a construction of this class which shall be comparatively simple, economical in cost, and which may be confined within a relatively small space.

My further object is to impart a relatively long travel to the flexible device connected with the engine shaft by a relatively short travel of the actuating device. It is by reason of this fact that the starting mechanism may be confined within small compass. This result is obtained by means of rock arms which are connected in operative relation with a vertically movable wheel-carrying plate. This plate carries a plurality of wheels, which act upon the flexible device connected with the engine shaft, the movable wheels being arranged in staggered relation with reference to a corresponding number of wheels mounted in stationary bearings. As movement is imparted to the wheel-carrying plate, or carrier, the pulleys mounted thereon are actuated, whereby they are caused to move downwardly, for instance, between the pulleys mounted on the stationary bearings. This operation imparts travel to the flexible device, or chain, connected with the engine shaft, the said travel being equal to that of the vertical movement of the carrier, twice multiplied by the number of wheels. In other words, if the carrier is moved two inches, and has four pulleys mounted thereon, the chain connected with the engine shaft will be caused to travel sixteen inches, for engine starting purposes.

Having briefly outlined my improved construction, I will proceed to describe the same in detail, reference being made to the accom-

panying drawing, in which is illustrated an embodiment thereof.

In this drawing: Figure 1 is a top plan view of a vehicle, as an automobile, equipped with my improved starter, the parts being shown on a relatively small scale, and for the purpose of locating the various features and showing them in connected relation. Fig. 2 is a longitudinal section taken through the main feature of the starting mechanism. This is a section taken on the line 2-5, Fig. 3, looking toward the left. Fig. 3 is a cross section taken through the same device on the line 3-3, Fig. 1, the parts being shown on a larger scale. Fig. 4 is a section taken on the line 4-4, Fig. 3. Fig. 5 is a section taken on the line 2-5, Fig. 3, with the parts shown in different relative positions. Fig. 6 is a section taken on the line 6-6, Fig. 3, looking toward the left. Fig. 7 is a longitudinal section taken through the starter drum and its shaft, the same being in alignment with the engine shaft, the two shafts being equipped with cooperating clutch members. In this view the parts are shown on a much larger scale than in Fig. 1. Fig. 8 is a section taken on the line 8-9, Fig. 7, looking toward the left. Fig. 9 is a section taken on the same line, looking toward the right. Fig. 10 is a section similar to Fig. 7, but showing the clutch members of the two shafts in connected relation.

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

Let the numeral 5 designate the frame work of an automobile, 6 the engine, and 8 the shaft thereof, the said shaft being exposed at the forward extremity of the machine and equipped with a clutch member 9, arranged to cooperate with a clutch member 10, surrounded by the housing 12 of a drum 13. As the drum is actuated the two clutch faces are caused to interlock, whereby, the engine shaft is rotated for engine starting purposes, as hereinafter more fully explained. A flexible device, as a cable 14, is connected with the periphery of the said drum, and leads therefrom to a guide pulley 15 mounted on a swiveled bracket 16, from which the cable extends rearwardly and is connected with a chain, or other suitable flexible device, 17, which extends into and through a casing 18, the opposite extremity of the chain being connected with a stationary support 19. This chain within the

casing 18 normally occupies a position approximately straight and in contact with a series of pulleys 20, mounted on stationary supports 21, carried by a plate, or partition, 22, located within the casing and forming a stationary part thereof.

Mounted on brackets 24 carried by a vertically movable plate 25, is a number of pulleys, or wheels, 26, corresponding in number with the stationary pulleys 20, and arranged in staggered relation therewith.

Connected with the plate 25 which may be termed "a carrier," are two relatively stiff spiral springs 27, the opposite extremities of said springs being respectively connected, as shown at 28, with two rock arms 29, the said arms being secured at their opposite extremities to rock shafts, or spindles, 30, which are journaled in the stationary partition 22, and also in a partition 31 within the casing 18. The rock arms 29 are connected with the extremities of the spindles 30, which extend into a compartment 32 of the casing. To the opposite extremities of these spindles are secured sprocket wheels 33, which are respectively connected by means of chains 34 and 35 with a third sprocket 36 at opposite points, as shown at 37 and 38. The connection and arrangement of the three sprockets is such that when a lever arm 39, which is connected with the sprocket 36, is actuated, the sprockets 33 will be moved in reverse direction whereby the rock arms, (see Fig. 6), will both be moved downwardly, or in the direction indicated by the arrows adjacent said arms. This movement will depress the carrier plate 25, since the springs 27 are sufficiently stiff to make practically a non-elastic connection between the carrier plate and the rock arms. Hence, as the lever arm 39 is moved in the direction indicated by the arrow adjacent said arm (see Fig. 4), the plate 25 will be moved downwardly within the casing 18 sufficiently to cause the pulleys 26 carried thereby to occupy the positions shown in Fig. 2, whereby, the flexible device connected with the drum 13, will be caused to travel a sufficient distance to impart to the drum the necessary movement for engine starting purposes.

Attention is called to the fact that the sprocket wheels 33 and 36 are located in a compartment 40 of the casing 18, said compartment being located between the partition 22 and one of the outer walls 23 of the casing. As illustrated in the drawing, this wall 23 is removable, being secured to the body of the casing by fastening devices, as screws 41. The spindle 42 of the sprocket wheel 36, is journaled in the partition 22 and the outer wall 23 of the casing, the said spindle protruding, as shown at 43, sufficiently to connect the lever arm 39 therewith. This lever arm is suitably located for

handy manipulation by the chauffeur, or other person in charge of the machine.

Returning now to the means for forming the interlocking connection between the drum 13 and the engine shaft, let the numeral 44 designate a cylindrical housing secured to a stationary plate 45 of the machine. Secured to this housing by a set bolt 46, is a casing 47 inclosing a coil spring 48, one extremity of which is secured to the housing, as shown at 49, while its opposite extremity is secured to the drum 13, as shown at 50. Journaled within this housing, is a starter shaft, or spindle, 51, which passes through the axial center of the drum and extends into the housing member 12 of the latter. The extremity of this spindle within the housing 12 is enlarged and constitutes the clutch member 10, whose teeth 52 cooperate with the teeth 53 of the clutch member 9, secured to the engine shaft, as heretofore explained. Normally, or when the mechanism is not employed or directly engaged in the performance of the starting function, the two clutch faces are separated, as illustrated in Fig. 7. During this time, the clutch spindle 51 is held in position to separate its clutch face from that of the corresponding face of the engine shaft by means of the coil spring 48, which serves to reverse the engine starting movement of the drum, after the latter has been released from the power employed for such purpose. During the performance of the engine starting function, the starter spindle 51, together with the parts mounted thereon, and cooperating therewith, is in the position illustrated in Fig. 10.

A coil spring 54, located within the housing 44, acts on a shoulder 55 formed by enlarging the starter spindle 51 by the employment of a sleeve 56, the sleeve being secured to the starter spindle in any suitable manner, as by a pin 57. The extremity of the spring 54 remote from the shoulder 55, engages a tension cap 58, screwed upon the outer extremity of the housing 44. This cap regulates the tension of the spring, and determines the normal force with which the spring acts upon the shoulder 55, whereby, the spindle is given a tendency to move in the direction of the engine shaft. Normally, however, a cam 59, formed on the sleeve 51 of the spindle, engages a cooperating cam 60, formed on a disk 61 loose on the spindle and connected with the drum or the housing member 12 thereof, by means of a screw 62 with which one extremity of a spiral spring 63 is connected, the opposite extremity of the said spring being connected, as shown at 64, with an arm 65 of the said disk. The normal position of the cam 60 is such that the spindle 51 is prevented from endwise movement in the direction of the engine shaft; and by virtue of this condition, the

clutch faces are normally maintained in separated relation. By the tension of the spring 47 acting on the drum, and through the drum upon the spring 63, the disk 61 is held with such force in the position shown in Fig. 7, as to prevent the endwise thrust of the spring 54 from actuating the spindle in the endwise direction and toward the engine shaft. The faces of the two cams 59 and 60, are inclined. Now, when it is desired to start the engine, a pull of the lever 39 will actuate the drum in the direction indicated by the arrows C and D in Figs. 8 and 9. The movement of the drum in this direction, (see Fig. 8), will release the disk 61 from the tension under which it is normally held by the spring 48 which acts thereon through the drum and the spring 63. As soon as this tension is released, the endwise thrust of the spindle 51 acting through its cam 59 on the cam 60 of the disk 61, will actuate the cam 60, or push it out of the way, whereby it no longer forms a stop to the endwise thrust of the spindle. Hence, as soon as the drum begins its engine starting movement, the spindle will be moved endwise by its spring 54 sufficiently to bring the teeth 52 of the spindle clutch member into engagement with the teeth 53 of the engine shaft clutch member; and as the drum continues its rotary movement in the same direction, the spindle is rotated to turn the engine shaft for starting purposes by virtue of an interlocking connection between the drum and the spindle, which as illustrated in the drawing, is composed of a lug, or tongue 66, formed on the clutch member 10 and occupying a position in a relatively long groove 67, formed in the housing 12 of the drum. During the movement of the drum for engine starting purposes, the disk 61 is carried along therewith in the direction of the arrow (see Fig. 8), and after this disk has made a complete rotary movement, approximately, its arm 65 engages a pin 68, traveling in the direction of arrow C. This pin 68 is mounted on a disk 69, loose on an exterior collar 70 formed on the inner extremity of the housing 44, and located within the cavity 71 of the drum. This engagement of the arm 65 with the said pin 68, will actuate the disk 69 until a pin 72 formed on the disk 69 travels in the direction of arrow D, (see Fig. 9), approximately a complete revolution and reaches the dotted line position in Fig. 9, whereby it is brought into contact with a lug 73 formed on the stationary collar 70 of the housing 44. As soon as this occurs, the disk 69 is locked against further travel, and it also follows that the pin 68 is also locked against further travel and the drum can move no farther in the engine starting direction. This construction and arrangement, however, allows the drum two complete rev-

olutions for engine starting purposes, which will be ample under all circumstances. Now as soon as the force acting on the lever arm 39 for engine starting purposes ceases to act, the recoil action of the spring 48 which has been placed under tension by the engine starting movement of the drum serves to move the drum in the reverse direction, or in the direction of arrow A, Fig. 8, and arrow B, Fig. 9. During this movement of the drum the arm 65 of the disk 61 engages the pin 68 of the disk 69, and moves the said disk sufficiently to cause the pin 72 to travel from the dotted line position in Fig. 9 to the full line position in the same figure. As soon as this occurs, the reverse rotary movement of the drum will stop, except so far as it is allowed to travel by the yielding action of the spiral spring 63. The tension of the spring 48 will, however, be sufficient to place the spring 63 under strong tension after the disk 61 has ceased to move. Under these circumstances, the disk 61 will be held in its normal position by the tension of the spring 48, and the cam 60 will act on the cooperating cam 59 of the spindle 51, to move the starter spindle and disengage the clutch member 10 of the said spindle from the corresponding member 9 of the engine shaft, and this condition will obtain until occasion requires that the drum be again actuated for engine starting purposes. By virtue of the employment of springs 27, which are connected with the rock arms 29 for actuating the carrier plate 25, provision is made for preventing injury to the mechanism due to back firing in the engine cylinders, since the springs 27 will yield sufficiently for the aforesaid purpose.

Having thus described my invention, what I claim is:

1. The combination with an engine shaft, of a starter shaft, the two shafts being equipped to interlock for engine starting purposes, rotary means connected with the starter shaft for actuating the latter to cause the two shafts to interlock, a flexible device connected with the said rotary means to actuate the latter, means acting on the flexible device at right angles thereto for bending it out of its course in a number of places, whereby it is caused to travel to actuate the said rotary means, substantially as described.

2. The combination with an engine shaft, of a starter shaft, the two shafts being normally separated, but equipped to interlock for engine starting purposes, rotary means connected with the starter shaft for actuating the latter to bring the two shafts into interlocking relation, a flexible device connected with the said rotary means, and means acting on the flexible device between its extremities and at right angles thereto, to simultaneously bend the flexible device out

of its course in a number of places, whereby the flexible device is caused to travel and actuate the rotary means, for the purpose set forth.

3. The combination with an engine shaft, of a starter shaft, rotary means connected with the starter shaft to actuate the latter for engine starting purposes, a flexible device connected with the rotary means at one extremity and with a stationary support at its opposite extremity, and means acting on the flexible device intermediate its extremities for simultaneously bending the said device out of its course in a number of places, substantially as described.

4. The combination with an engine shaft, rotary mechanism arranged to interlock therewith for engine starting purposes, a flexible device connected with the said rotary mechanism at one extremity, a stationary support with which its opposite extremity is connected, a plurality of separated bearings on which the flexible device normally rests, a device movable at right angles to the direction of the flexible device, and carrying a number of bearings staggered with reference to the stationary bearings, and means for actuating the movable device to bend the flexible device out of its course, for the purpose set forth.

5. The combination with an engine shaft, of rotary starter mechanism mounted in suitable proximity thereto and adapted when rotated to interlock therewith, of a flexible device connected with the starter mechanism to rotate the same when the flexible device is actuated, the extremity of the device remote from the starter mechanism being secured to a stationary support, a number of anti-frictional bearings suitably mounted and normally engaged by the flexible device, a corresponding number of anti-frictional bearings arranged in staggered relation with reference to the first named set of bearings, and means for actuating one set of bearings in opposing relation with reference to the other set of bearings whereby the flexible device is bent out of its course for actuating the starter mechanism, substantially as described.

6. The combination with an engine shaft and starter mechanism connected in operative relation therewith, of means for actuating said starter mechanism, comprising a flexible device connected with the starter mechanism at one extremity and with a stationary support at its opposite extremity, stationary devices suitably separated, upon

which the flexible device rests intermediate its extremities, a plate movable at right angles to the normal direction of the flexible device and carrying bearings staggered with reference to the first named set of bearings, and means for actuating the said plate, whereby the bearings carried thereby, are caused to act upon the flexible device to bend the latter out of its course and actuate the starter mechanism, substantially as described.

7. The combination with engine starting mechanism, of a flexible device connected therewith at one extremity, and with a stationary support at its opposite extremity, a number of bearings located intermediate the extremities of the flexible support and upon which the latter normally rests, a plate carrying a number of bearings arranged in staggered relation with reference to the first named set of bearings, and engaging the flexible device in opposing relation thereto, means for actuating the said movable plate in a direction at right angles to the normal direction of the flexible device, said means comprising a lever arm, a main sprocket wheel connected in operative relation therewith, two auxiliary sprocket wheels connected with the main sprocket wheel, by means of chains attached to the main sprocket wheel on opposite sides thereof, to cause the latter to actuate the auxiliary sprockets in reverse directions, rock shafts, upon which the auxiliary sprocket wheels are fast, rock arms carried by the said rock shafts, and an operative connection between the rock arms and the said movable plate, substantially as described.

8. The combination with an engine shaft having a clutch surface on its exposed end of a longitudinally slidable starter shaft having a cooperating clutch surface on its end adjacent the engine shaft, a spring tending to force said starter shaft in a direction to cause the clutch surfaces to engage, means connected with the starter shaft for actuating the latter, and means normally acting against the starter shaft in opposition to the spring, said last named means being adapted to be withdrawn from operative position by movement of the starter shaft actuating means.

In testimony whereof I affix my signature in presence of two witnesses.

CARL LYNNOK.

Witnesses:

E. BOARDMAN,
E. BOWEN.