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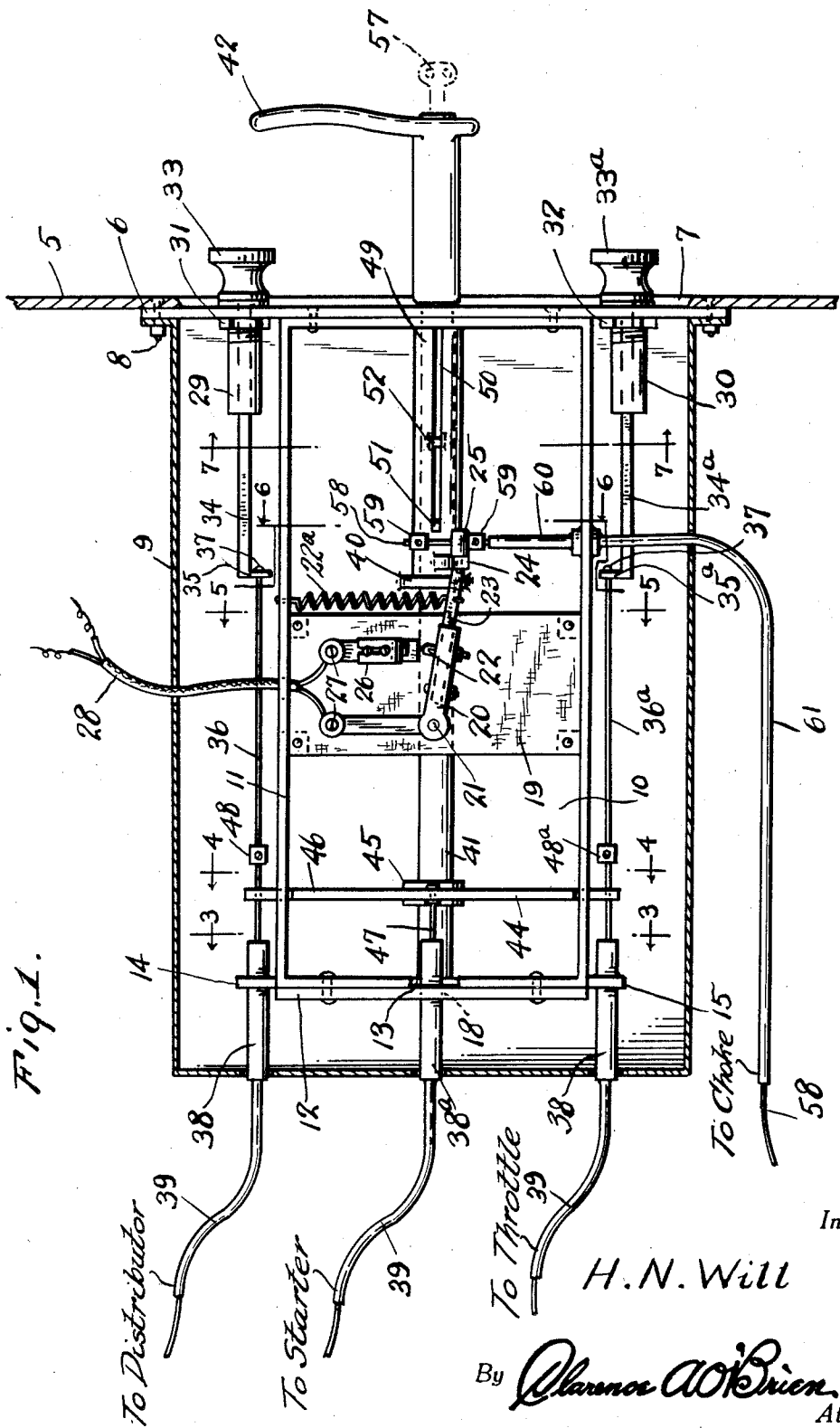
H. N. WILL

1,903,360

INTERNAL COMBUSTION ENGINE STARTER MECHANISM

Filed March 16, 1931

4 Sheets-Sheet 1



April 4, 1933.

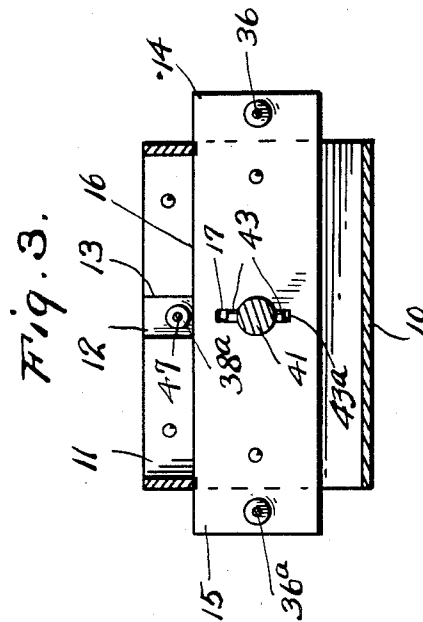
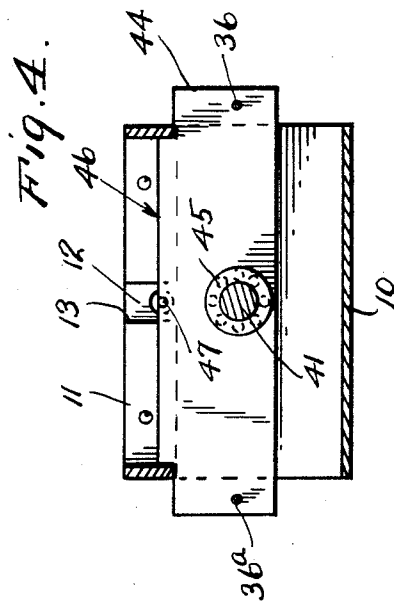
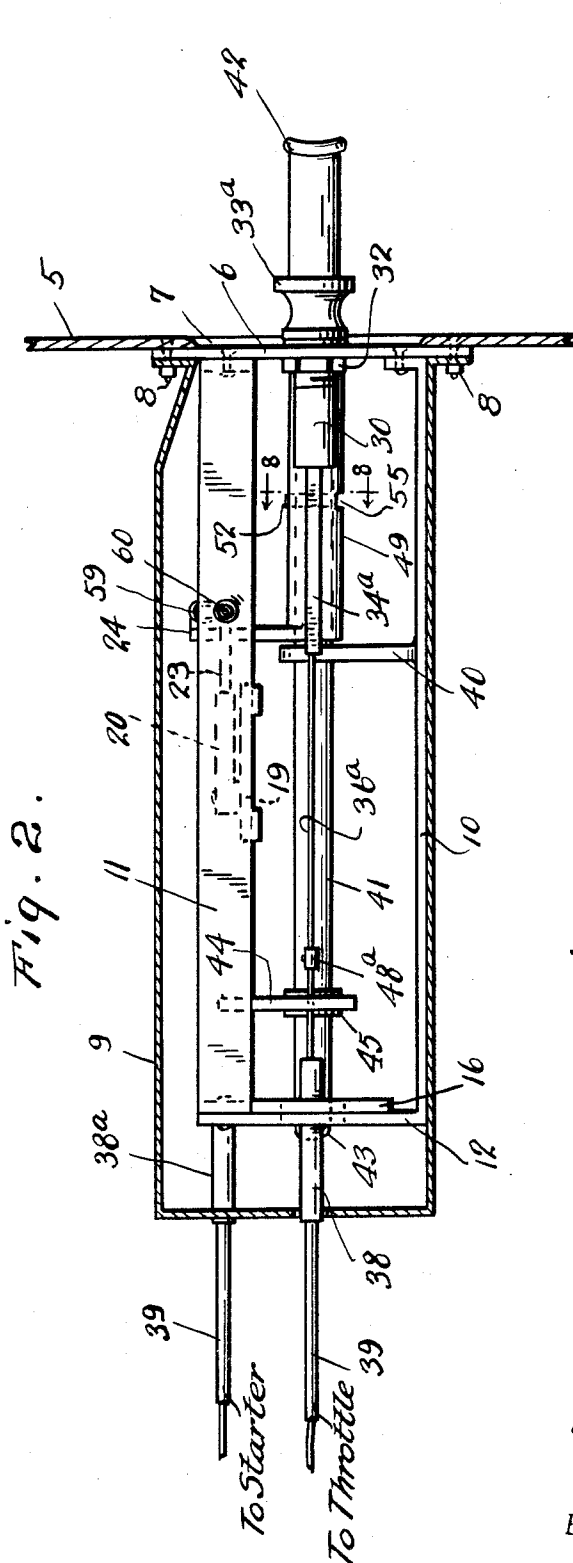
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INTERNAL COMBUSTION ENGINE STARTER MECHANISM

Filed March 16, 1931

4 Sheets-Sheet 2



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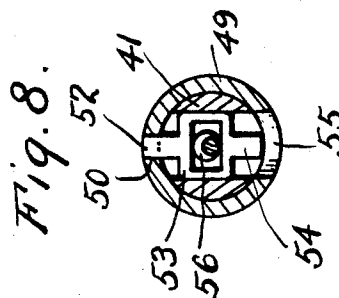
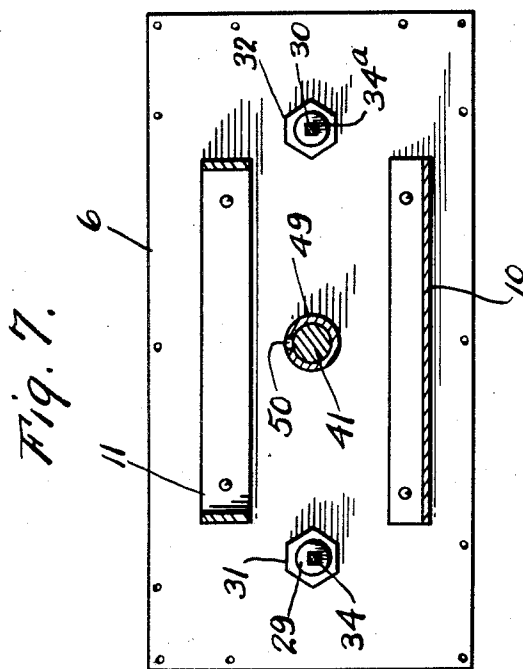
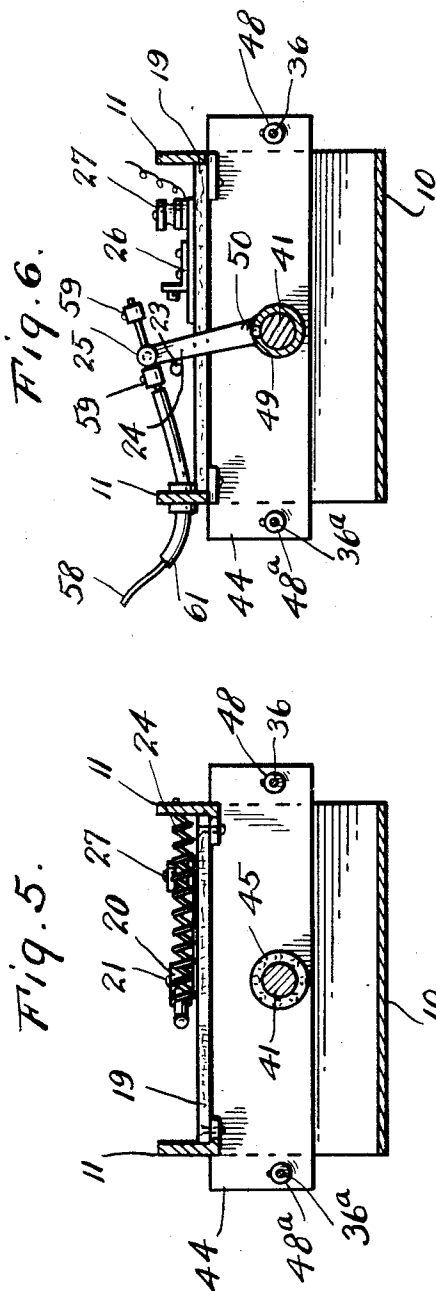
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**1,903,360**

## INTERNAL COMBUSTION ENGINE STARTER MECHANISM

Filed March 16, 1931

4 Sheets-Sheet 3



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1,903,360

INTERNAL COMBUSTION ENGINE STARTER MECHANISM

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4 Sheets-Sheet 4

Fig. 10.

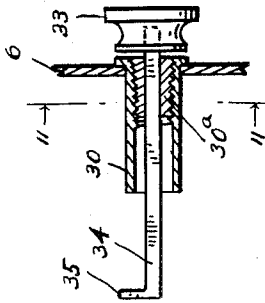


Fig. 11.

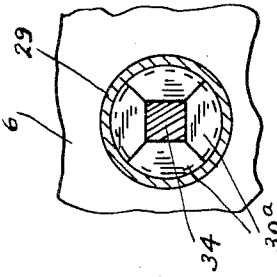
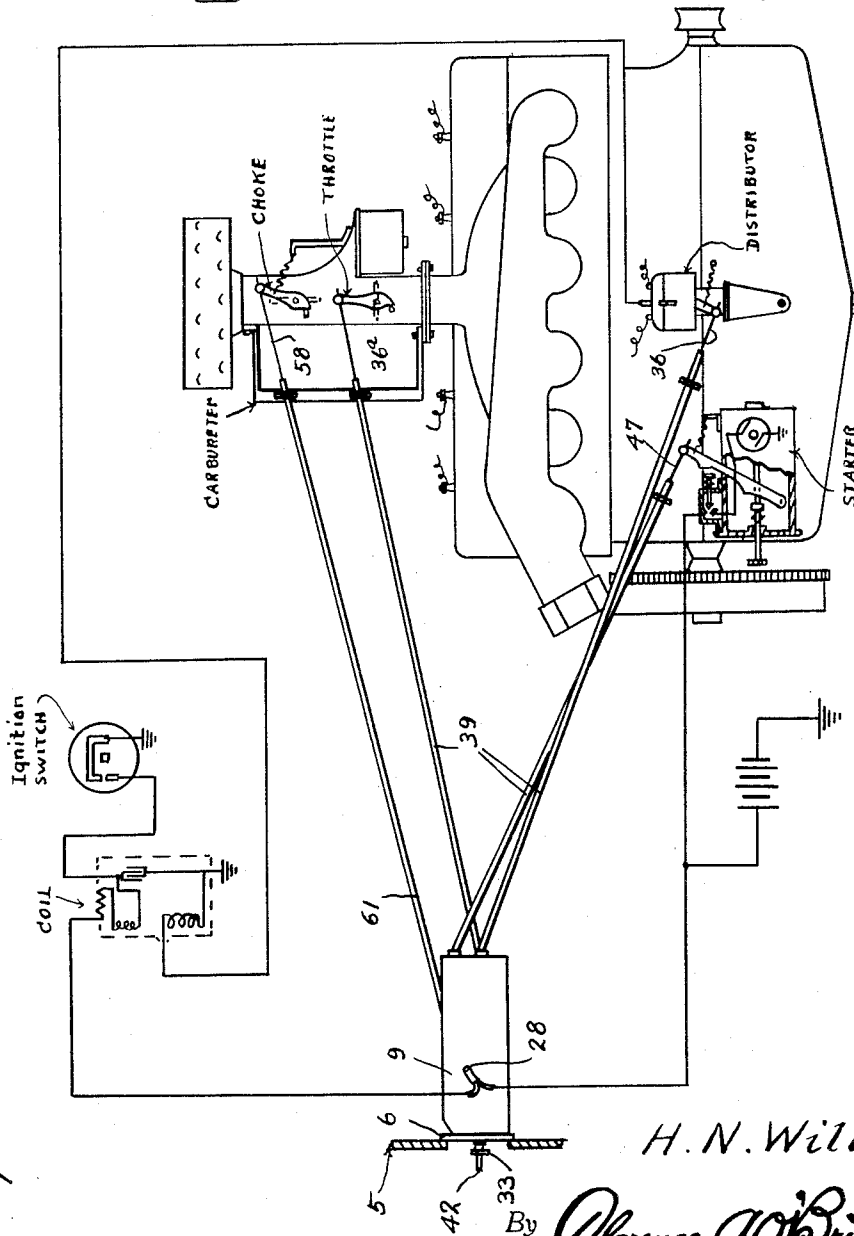


Fig. 9.



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## UNITED STATES PATENT OFFICE

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INTERNAL COMBUSTION ENGINE STARTER MECHANISM

Application filed March 16, 1931. Serial No. 523,086.

This invention relates generally to internal combustion engine starter mechanisms, and particularly to a single control means whereby the ignition switch, the throttle, the starter switch, the carbureter choke, and the advance or retard of the distributor may be properly actuated and controlled in a single manipulation of the control means for starting the engine, the mechanism being manually operated and provided with means whereby to lock the same against unauthorized manipulation.

It is an object of this invention to provide a coordination mechanism of the type described which will reduce the number of operations ordinarily necessary in starting an internal combustion engine, by coordinating all of the operations ordinarily necessary in starting the engine so that they are operated practically simultaneously by a single manipulation, thereby leaving free the feet of the operator of an automobile for operation of the brakes and other controls.

It is also an object of this invention to provide a coordination mechanism of the type described through the use of which gasoline as well as electric storage battery energy consumption will be reduced, and crank case dilution due to excessive use of the choke will be eliminated.

It is also an object of this invention to provide a mechanism of the type described which will materially reduce the time required in starting an internal combustion engine, by providing in a single control manipulable with one hand all of the elements necessary in starting an engine and reduce the number of starting controls which usually appear on the instrument panel and other parts of the driving compartment of an automobile.

It is also an object of this invention to provide a simple, practical as well as durable and efficient mechanism of the type described, which is readily adaptable to all conditions surrounding the use and operation of internal combustion engines, and which is particularly adapted to be installed in an automobile, and mounted on the instrument panel in a decorative and convenient manner, and

which is, in addition, cheap to manufacture and very easy to install and operate.

It is also an object of this invention to so construct the mechanism of the type described as to provide that it shall be proof against rewiring through the provision of a casing enclosing the moving parts thereof, and locked against unauthorized manipulation by locking means provided in the operating handle.

These and other objects of the invention, its nature and its composition and arrangement and combination of parts will be readily understood by any one acquainted with the art to which this invention relates upon consulting the following description of the drawings in which:

Figure 1 is a general top plan view of my improved starter mechanism.

Figure 2 is a longitudinal vertical section taken through the lower part of Figure 1.

Figure 3 is a transverse vertical cross sectional view taken on the line 3—3 of Figure 1 looking in the direction of the arrows.

Figures 4, 5 and 6 are transverse vertical cross sectional views taken through Figure 1 approximately on the lines 4—4, 5—5, and 6—6 of Figure 1 and looking in the direction of the arrows.

Figure 7 is a transverse vertical cross sectional view taken approximately on the line 7—7 of Figure 1, and looking in the direction of the arrows.

Figure 8 is a detailed enlarged cross sectional view transversely through the main operating mechanism and taken approximately on the line 8—8 of Figure 2 and looking in the direction of the arrows.

Figure 9 is a general view showing the application of the device of the invention to an internal combustion engine.

Figure 10 is a sectional view through one of the control rod structures showing the means for locking the rod in adjusted positions.

Figure 11 is a transverse sectional view through Figure 10 showing the slotted end of the locking sleeve.

Referring in detail to the drawings the numeral 5 designates generally the instru-

ment panel to the forward side of which is bolted in a suitable manner a mounting plate 6 which registers with a hole 7 made in the mounting plate 5. Secured to the instrument panel 5 by the same bolts or the like 8 which secure the mounting plate 6 to the instrument panel is a rectangular casing 9 extending horizontally and forwardly from the instrument panel and having a closed bottom. If desired the casing may be a closed box having only a rear end opening provided with a laterally projecting flange through which the attaching means 8 are projected.

Forwardly extending from the mounting plate 6 near the lower edge thereof is a horizontal base plate 10 secured in any suitable manner. Parallely spaced above the base plate 10 and likewise secured to the mounting plate 6 is a rectangular frame 11. A vertical portion 12 on the front end of the horizontal base plate 10 has attached thereto the front end of the rectangular frame 11. The rearward member of the frame 11 may be split as at 13 to accommodate a certain part to be described. On the inside of the portion 12 and projecting beyond the side edges thereof so as to form projections 14 and 15, is a plate 16 which is provided with a key hole formation 17 for a purpose to be described.

Registering with the key hole formation 17 is a hole 18 in the vertical portion 12. Suspended across and between the side members of the frame 11 intermediate the ends thereof is a dielectric plate 19 on which the ignition switch lever 20 is pivoted as indicated at 21. The switch lever 20 carries a suitable contact 22 for engagement with stationary contact 26, and is operated closed by a spring 22a and attached to a dielectric bar 23 extending from the end of the switch lever 20. For moving the contact 22 away from the stationary contact 26 the dielectric portion lever 23 of the lever 20 is engaged by a lever 24 to be described. The stationary contact member 26 is adjustable for varying the gap between the movable contact and the stationary contact, and both the switch arm 20 and the stationary contact structure 26 are connected to binding posts 27 to which the ignition wires 28 are led through the side member of the frame 11 and through a suitable opening in the side of the casing 9.

As seen in Figure 1, the sides of the mounting plate 6 extend beyond the sides of the frame 11 and therein locking tubes 29 and 30 are passed through suitable openings therein and secured by suitable means 31 and 32. A spark control knob 33 is secured to the rear end of a square or other shaped spark control rod 34. On the forward end of the spark rod 34 is a laterally directed foot 35 through which is slidably passed a spark control cable 36 which has a stop member 37 on its end. Obviously when the knob 33 is drawn outwardly, the cable 36 will be pulled, and

being connected with the distributor, as seen in Figure 9, will move the distributor mechanism to retard the spark.

The rearward end of the tube 29 and of the tube 30 is interiorly threaded and tapered as indicated in Figures 10 and 11. Received and threaded in the tapered threaded portions are threaded bushings 30a which are split at their rearward end to enable them to contract upon and lock the square rods 34 and 34a therein when the knobs 33 and 33a are rotated so as to screw in the bushings 30a. Of course, rotating the knobs in the opposite direction frees the rods for free manipulation thereof.

The throttle control knob 33a on throttle control rod 34a has the foot 35a connected to the throttle control cable 36a which, as seen in Figure 9 is connected to the throttle valve of the carburetor of the engine. It should be stated that in case the springs associated with the units which they control are not capable of returning the cables to initial position, any suitable means, such as springs, may be installed in my improved starter mechanism for returning the parts and associated cables to normal or initial position, such changes being necessary to incorporate this arrangement being within the skill of a mechanic.

The numerals 38 and 38a designate bearing tubes for the control cables 36 and 36a, and 47, respectively, the tubes 38 being supported by the lateral projections 14 and 15 of the plate 16, and the centrally placed tube 38a by the upper portion of the plate 12. The bearing tubes 38 and 38a closely receive the cables, and direct them into suitable flexible guides 39 which properly and conveniently conduct the cables to the parts of the engine to which they relate.

Rotatably supported in a horizontal position through the mounting plate 6, a bracket 40 rising from the horizontal plate 10, and the plate 12 is the operating shaft 41. The shaft 41 is also longitudinally and rearwardly slidable, and the rotation and the sliding movement is enabled and controlled by an operating handle 42 arranged on the rear end of the shaft outwardly of the plate 6. By manipulating the handle 42 in a manner to be subsequently described, the entire mechanism may be actuated. Near the forward end of the shaft 41 is a pair of diametrically opposite pins 43 for engaging the forward side of the portion 12 at the frame for locking the shaft against withdrawal when the handle is in full inward position and has been rotated to the position in which a latching mechanism provided in the handle, has been set. The opening 18 in the portion 12 through which the forward end of the shaft 41 works is provided with diametrically opposite extensions 43a which permit the pins 43 to pass the portion 12 when

the shaft 41 has been rotated out of the locking position.

At a point rearward of the pins 43, and so mounted on the shaft 41 as to permit rotation of the shaft therein, but not relative sliding movement, is a cable actuating plate 44. The plate 44 is mounted on the shaft 41 by means of a ball bearing assembly 45, the inner race of which is secured to the shaft, and the outer race to the cable actuating plate 44.

The form of the cable actuating plate 44 is best seen in Figure 4. It is provided to slide against the lower edges of the side members of the frame and has a projection 46 which provides shoulders for slidably engaging the inner faces of the side members of the frame 10 so that turning movement of the cable actuating plate 44 is prevented. Secured upon the upper edge of the shoulder portion 46 of the cable actuating plate 44 is a starter actuating cable 47 arranged to pass through the bearing sleeve tube 38a mounted in the upper portion of the plate 12, the tube 38a being disposed in the break 13 in the forward end of the frame 11.

The sides of the cable actuating plate 44 project similarly to the sides 14 and 15 of the plate 16, and through holes in the sides of the plate 44 which register with the bores of the tubes 38 in the ends 14 and 15 of the plate 16, the cables 36 and 36a freely pass so that they may be manually operated by manipulating the knobs 33 and 33a, independently of the coordinated operation thereof by the plate 44 by means to be described. Adjustable stop members 48 and 48a are arranged on cable 36 and cable 36a respectively, to be engaged by the plate 44 where it is rearwardly moved, whereby the cables 36 and 36a are also rearwardly moved.

Slidably but not rotatably mounted on the shaft 41 between the standard 40 and the mounting plate 6, is a tube 49 on the forward end of which rises the lever 24 hereinbefore mentioned. In one side of the tube or sleeve 49 there is provided a longitudinal slot 50 which extends through its rear end. Within the slot 50 there is slidably engaged a pin 51 projecting from the shaft 41, so as to connect the shaft 41 and the sleeve 49 for rotation when the handle 42 is rotated. For locking the shaft 41 with its pins 43 engaged in the extensions 43a of the opening 18 in the plate 16 against withdrawal which would permit the pins 43 to be disengaged upon rotation of the shaft 41, I provide a locking mechanism in the shaft 41 which is adapted to be operated by suitable means mounted in the handle 42.

Reference to Figure 8 will disclose in detail the nature of the locking structure in the shaft 41. It will be seen that a cam-operated member 53 has a lug 52 engageable with the slot 50 in the sleeve 49 when unlocked and a lug 54 opposite the lug 52 for engage-

ment with a transverse opening 55 in the sleeve 49 when locked, so that the shaft is locked with the sleeve 49 against longitudinal movement relative thereto. Since the sleeve 49 is confined against longitudinal movement, the described arrangement locks the shaft 41 with its pins 43 engaged in the extensions 43 of the opening 18. In this condition, the shaft 41 will be locked against rotation and against longitudinal movement, so that manipulation of the device of the invention by the handle 42 is rendered impossible.

A lock controlled cam 56, suitably connected to a tumbler mechanism or the like in the handle 42 is operable by a key or the like 57 for moving the frame 53 and lugs 52 and 54 into the positions shown in Figure 8 in which the locking mechanism is in unlocked position. When the lug 54 is positioned in the hole 55 in the sleeve 49, the handle 42 is locked against manipulation, since the shaft 41 and the sleeve 49 are locked against the relative longitudinal movement which is necessary to release the pins 43 which, until released, prevent rotation of the shaft 41.

Referring again to the lever 24 on the end of the sleeve 49, it will be seen that as the handle 42 is rotated to the left or counterclockwise, the ignition switch lever 24 will be carried into engagement with dielectric portion 23 of the switch arm 20 so as to move it out of contact with the stationary contact 26, and that this movement of the lever 24 also actuates a choke actuating cable 58. The lever 24 is operatively connected to the cable 58 by means of a cable connector 25 which slides on the cable between adjustable stop members 59. The cable 58 is mounted in a suitable bearing tube 60 mounted transversely in the side member of the frame 11. A suitable flexible tube 61 passed through the side of the casing 9 guides the cable 58 to the choke valve of the engine to which it is connected.

Once the key of the locking mechanism has been turned to operate the locking lug 54 out of the hole 55 in the sleeve 49 the handle 42 is free to be manipulated so as to rotate and slide the shaft 41. The handle 42 may then be pulled out sufficiently to bring the pins 43 out of the keyhole formation 17 and then rotated slightly to the right or clockwise, so as to move the lever 24 away from the ignition switch arm 20 and permit the spring 22a to draw the switch arm 20 into engagement with the stationary contact 26 for closing the ignition circuit. The next manipulation for starting the engine under ordinary circumstances is to pull out the handle 42 to the limit. This causes the cable actuating plate 44 to strike the stops 48 and 48a of the spark retarding cable 36 and of the throttle opening cable so as to pull these cables 36a and the starter actuating cable 47,

simultaneously, for simultaneously retarding the spark, opening the throttle of the carbureter, and operating the starter of the engine.

5 However, should the carbureter mixture be too lean or the motor cold, and choking required, the choke control cable 58 may be operated simply by turning the handle 42 to the limit to the right or clockwise. This  
10 will cause the choke cable 58 to be pulled by the lever 24, for operating the choke valve of the carbureter to which it is connected. Once the engine has started, the handle 42 is released, and returned to the position first described, namely, that in which the handle is  
15 unlocked and slightly but not fully withdrawn, with the pins 43 withdrawn from the keyhole formation 17.

In this position of the handle 42 the spring  
20 22a maintains the contacts of the ignition switch closed. It is only in the locked position of the handle that the contacts of the ignition switch are separated. To lock the ignition, the carbureter throttle and choke,  
25 and the starter switch, it is only necessary to turn the handle 42 slightly to the left or counter clock-wise, and then push it all the way in, to enter the pins 43 in the keyhole formation 17, and then to turn the key 57.  
30 In this way every element required for starting an internal combustion engine is protected against unauthorized use, except the manual throttle and manual spark controls 33, 33a which do not need to be locked to protect the car properly, as they are of no use for  
35 starting the engine unless the ignition can be brought into play. It will be observed that the choke cable cannot be manipulated except by manipulation of the handle 42.

40 It will be observed that all of the functions now commonly performed either singly or in groups, for starting an internal combustion engine, and in particular for starting an automobile engine, are performed in one  
45 continuous operation by a single agency in the form of the handle 42.

It is to be definitely understood that I do not desire to limit the application of this invention to the particular modification set  
50 out herein in order to illustrate the principles thereof, and any change or changes may be made in materials, or in the structure and arrangement and combination of parts, consistent with the spirit of the invention  
55 and the scope of the subjoined claims.

Having thus described my invention, what I claim as new is:

1. A structure of the type described comprising rotatable plunger means for actuating  
60 the starter, the ignition switch, the throttle and the spark distributor, simultaneously with a single axial movement of the means, said single operating means being also rotatable to actuate the carbureter  
65 choke, by a movement continuous with the

movement entailed in actuating said ignition switch, said starter switch, said throttle, and said spark distributor.

2. A structure of the type described comprising rotatable plunger means for actuating  
70 the starter, the ignition switch, the throttle and the spark distributor, simultaneously with single movement of said means, said means being also rotatable to actuate the carbureter choke, by a movement continuous  
75 with the movement entailed in actuating said ignition switch, said starter switch, said throttle, and said spark distributor, said means carrying with a lock actuatable by a key or the like for locking said ignition  
80 switch, said starter switch, and said choke against unauthorized operation.

3. A structure of the type described comprising rotatable plunger means for actuating  
85 the starter, the ignition switch, the throttle and the spark distributor, simultaneously with single movement of said means, said means being also rotatable to actuate the carbureter choke, by a movement continuous  
90 with the movement entailed in actuating said ignition switch, said starter switch, said throttle, and said spark distributor, said means carrying with a lock actuatable by a key or the like for locking the same against  
95 unauthorized operation, and independent manually operable means for separately operating the throttle and the spark distributor.

4. In a device of the character described, the combination of ignition switch throttle control, and choke control for an internal  
100 combustion engine simultaneously operable by a single rotatable plunger means, the throttle control being actuatable by axial movement of the plunger means and the choke control by a rotary movement of the  
105 plunger means.

5. In a device of the character described the combination of throttle control and a choke control operable by a single rotatable  
110 plunger means, said throttle control and choke control being actuatable by said means either simultaneously, successively or singly.

6. In a device of the character described, in combination, choke control, and a distributor control, simultaneously operable by  
115 a single rotatable plunger means, said choke control being actuatable by a rotary movement, and said distributor control by an axial movement, of said single means.

7. In a device of the character described, the combination of a choke control and a distributor control, operable by a single  
120 rotatable plunger means, arranged to actuate said controls, either successively, simultaneously or singly.

8. In a device of the character described, a choke control and starter control, operable  
125 by a single rotatable plunger means, said choke control being actuatable by a rotary movement of the said means, and said starter



control being disengageable by an inward axial movement and engageable by an outward axial movement, of said plunger means.

9. In a device of the character described, the combination of a hand operated, rotatable plunger means for closing the ignition switch, opening the throttle, and starting the starter, and a choke control, simultaneously operable by said plunger means.

10. The combination with a starter switch and an ignition switch, of rotatable plunger actuator means therefor, said means being arranged to actuate the ignition switch by a rotary movement, and the starter switch by an axial movement of said means, said single means also being arranged so as to be capable of actuating said starter switch and said ignition switch simultaneously, successively or singly.

11. The combination with an ignition switch, and a throttle control, of a single rotatable plunger actuator means therefor, said means being arranged to actuate said ignition switch by a rotary movement, and said throttle by an axial movement of the actuator means, said actuator means being also arranged to operate said ignition switch and throttle control simultaneously, successively, or singly.

12. The combination with an ignition switch, and a distributor control, of a single rotatable plunger actuator means, said means being arranged to actuate said ignition switch by a rotary movement, and said distributor control by an axial movement of the actuator, said single actuator means being also arranged so as to actuate said ignition switch and distributor control either simultaneously, successively, or singly.

13. The combination with a throttle control, distributor control, and starter switch, of single rotatable plunger means for actuating the same, together with an ignition switch and choke control actuatable by said single means, said throttle control, distributor control, and starter switch being actuatable by an axial movement, and said ignition switch and choke control by a rotary movement, of said single means.

14. The combination with a throttle control, distributor control, and starter switch, of single rotatable plunger means for actuating the same, together with an ignition switch and choke control actuatable by said single means, said throttle control, distributor control, and starter switch being actuatable by an axial movement, and said ignition switch and choke control by a rotary movement, of said single means, and locking means carried by said single means for locking the same against unauthorized use.

In testimony whereof I affix my signature.

HAROLD NEWTON WILL.