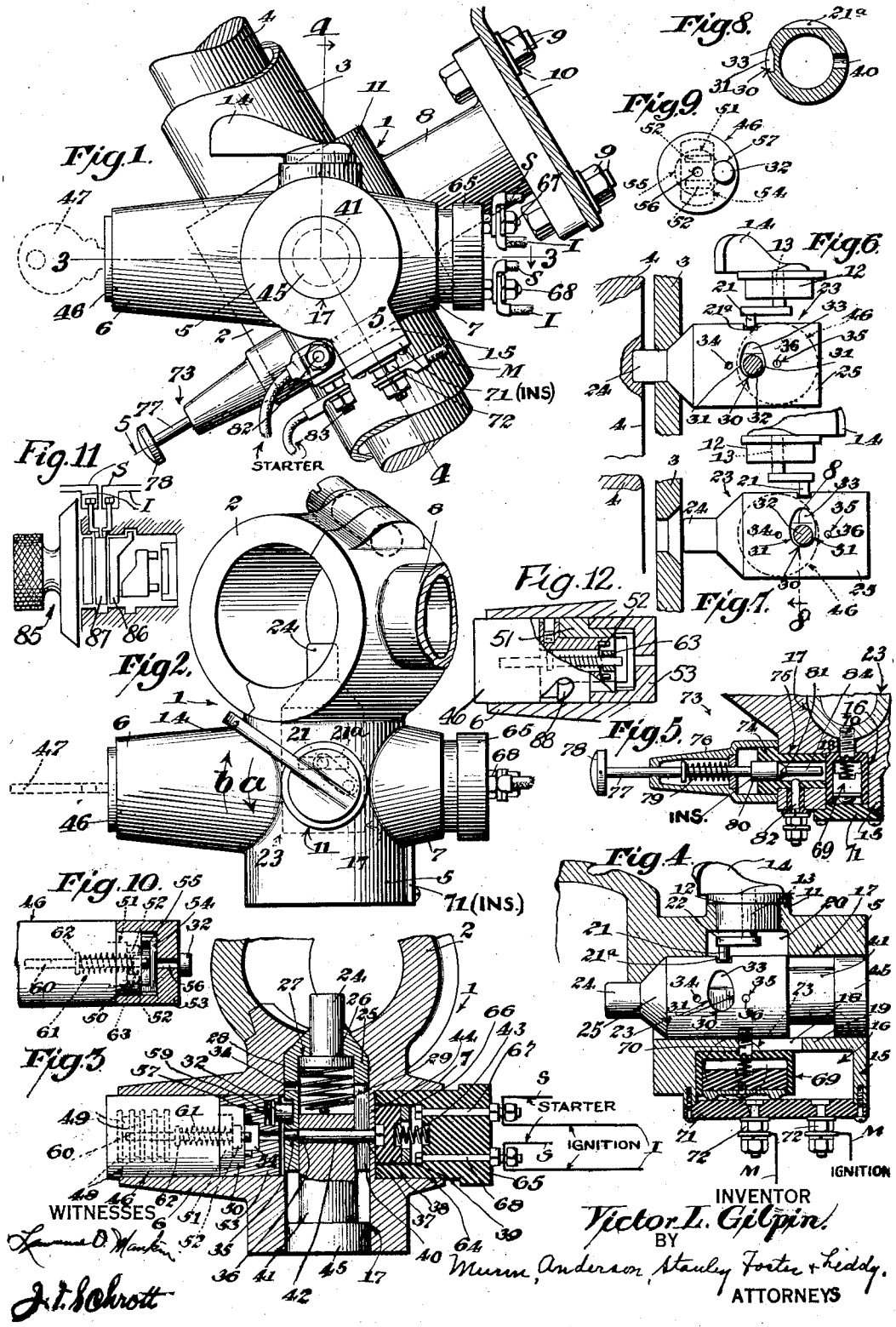
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AUTOMOBILE LOCK

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AUTOMOBILE LOCK

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This invention relates to improvements in locks, for example of the type used on motor vehicles, although its principles are adaptable to locks for other purposes, and its objects are as follow:—

First, to provide an automobile lock in which the lock bolt is movable into locking and unlocking positions solely by a manually operable locking lever.

Second, to combine with a lock of the above description, a key-operated plug with a pin (off-centered in this case) for the purpose of securing said bolt in the locking and unlocking positions after said bolt has been moved into said positions by the locking lever.

Third, to provide the foregoing key-operated plug with off-center and center pins respectively for the purpose of securing the lock bolt in its locking and unlocking positions and of dogging the lock bolt against premature movement to the locking position by the locking lever.

Fourth, to supplement the key passage of any known lock plug with a pin, or its equivalent, for the purpose of so obstructing the passage in the absence of the key as to make picking difficult and under ordinary circumstances virtually impossible.

Fifth, to supplement a known key plug with a pin which is normally spring pressed inwardly of the plug and projected out of the plug only upon the insertion of the key, said pin having at least two main purposes first to cause closure of a starter or other circuit upon its projection from the plug by the insertion of the key, second, to so obstruct the key passage upon withdrawal and absence of the key as to render picking more difficult as aforesaid.

Sixth, to devote the foregoing pin, which is herein known as the center pin but which is not necessarily a center pin, to another important purpose, namely to compel the removal of the key from the lock before the ignition circuit can be broken.

Seventh, to utilize the foregoing pin as a dog, so to speak, on the lock bolt, holding said bolt in the unlocked position awaiting the removal of the key so that the ignition circuit can be broken simultaneously with locking the steering post as fully brought out below.

Eighth, to provide the plug of any known cylinder lock with an adapter which serves in the capacity of a mount mainly for the foregoing off-center pin, said adapter having a hole through which the center pin is projectable upon longitudinal manipulation of the key.

In the drawing:—

Figure 1 is a partial sectional and elevational view of the improved lock.

Figure 2 is a plan view of the lock.

Figure 3 is a horizontal section taken on the line 3—3 of Figure 1, parts being in elevation.

Figure 4 is a vertical section taken on the line 4—4 of Figure 1.

Figure 5 is a detail section of the so-called stall or traffic switch, taken on the line 5—5 of Figure 1.

Figure 6 is a diagram showing the locking bolt in the locked position.

Figure 7 is a diagram showing the locking bolt in the unlocked position.

Figure 8 is a detail cross section of the locking bolt shell alone as though taken on the line 8—8 of Figure 7.

Figure 9 is an elevation of the adapter on the inner end of the turnable key plug.

Figure 10 is a detail sectional view especially of the adapter, taken on the line 10—10 of Figure 9.

Figure 11 is a diagram illustrating the use of a combination lock in lieu of a key-operated lock.

Figure 12 is a detail sectional view of the lock cylinder, particularly illustrating the formation in its plug for projecting (and retracting) its contained extension.

In carrying out the invention provision is made of a lock casing, generally denoted 1, which comprises a hub 2 to receive the tubing 3 of the steering post 4, a bolt cylinder 5, a lock cylinder 6, a coaxial switch cylinder 7, and a bracket 8. This bracket is securable by any desired means, for example by bolts and nuts 9 to a relatively fixed support 10 such as the instrument board of a motor vehicle.

The casing further includes a hollow boss 11, upstanding from the bolt cylinder 5, said boss fixedly containing a plug 12 (Fig. 4) in which the shaft 13 of a locking lever 14 is turnable. The sole purpose of this lever is to enable manual movement of the lock bolt, later described, into locking (Fig. 6) and unlocking (Fig. 7) positions with respect to the steering post 4. As far as the functions of the foregoing lever and bolt are concerned they could be made to serve just as well to lock and unlock a member other than a turnable steering post.

Additional appendages to the lock casing 1 comprise a non-circular boss 15 (Figs. 4 and 5) which is made hollow to provide a main ignition switch contactor chamber 16 (Fig. 4). This

chamber communicates with the bore 17 of the bolt cylinder 5 by means of a slot 18 (Fig. 4) which goes through the intervening wall 19. A recess 20 also communicates with the bore 17 (Fig. 4) so that the pin 21 (which may be a roller pin) on a crank 22 carried by the shaft 13 may have access to the locking bolt 23 in the bore 17. It is the crank pin 21 which actually moves the locking bolt back and forth to its locking and unlocking positions by the manual operation of the locking lever 14 as already stated.

This locking bolt is what might be called a double affair. The numeral 23 is its general designation. It actually comprises a center plug 24 (Fig. 3) and a shell 25 in which the plug has slight movement if necessary. A flange 26 on the inner end of the plug 24 is ordinarily pressed against a shoulder 27, formed at the inner end of the shell bore, by a spring 28 which, at its ends, bears against the flange 26 and against a cross pin 29. In practice the steering post 4 has one or more openings (Fig. 6) for the center plug 24 to enter.

Should the locking bolt 23 be projected at a time when one of these openings is out of registration with the center plug the latter, striking a solid part of the steering post, would simply recede into the shell 25 until the steering post is turned enough one way or the other to let the center plug into the nearest opening under tension of the spring 28.

The shell 25 of the locking bolt 23 has a recess 30 on the outside nearest the lock cylinder 6. In cross section this recess appears as shown in Figure 8. The opposite walls 31 of this recess, reading in the axial direction, comprise abutments which are engageable by detent means consisting of an off-center pin 32 which is for the purpose of securing the locking bolt 23 in either of its two positions (Figs. 6 and 7). The recess 30 has a generally tapering shape in the upward direction (Figs. 6 and 8), due to its merging with the circular cross section of the shell 25. The resulting diminishing part 33 of the recess provides a track on which the off-center pin rides during part of its turning movement to its two possible positions. The recess 30 and off-center pin 32 are two independent parts which collectively comprise detent means, although the pin 32 is herein distinguished by the latter term.

On the opposite sides of the recess 30, adjacently to the walls 31 and going through the shell 25 are holes 34, 35 flanking the recess 30. The hole 34 is blank. The hole 35 contains a tumbler 36 which is instrumental in closing at least one circuit. In this instance two circuits are closed to wit, starter and primary ignition circuits. This tumbler is loose in the hole. It is not any longer than the shell 25 is thick. Its inner end loosely contacts a stud 37 which is made integral with the insulating base 38 of the contactor ring 39 of a switch, in this case a combined starter motor and primary ignition switch.

This stud goes through a slot 40 in the wall of the shell 25 diametrically opposite to the two holes 34, 35. The tumbler 36 is prevented from dropping out of the hole 35 because of the confinement afforded by a plug 41 which occupies the shell 25 approximately up to the point of the cross pin 29. This plug also has a hole 42, necessarily registering with the hole 35 and the slot 40 for the purposes of the tumbler and stud.

The purpose of the slot 40 is to accommodate the movement of the locking bolt with respect to the stud 37. This movement is caused by the arcuate motion of the crank pin 21 (Fig. 4) in a cross slot 21a in the shell 25 upon turning of the locking lever 14. The stud 37 is not capable of moving with the locking bolt. It moves only in its axial direction when pushed through the medium of the tumbler 36 or when returned by a spring 43. The plug 41 remains stationary, being held so by the stud 37. This stud projects from an opening in a wall 44. The outer end of the plug 41 abuts a closure 45 in the exposed end of the bore 17.

The lock cylinder 6 houses some known type of cylinder lock mechanism, the turnable plug of which is generally designated 46 (Fig. 3). The position of this plug is designated by dotted lines in Figures 6 and 7 by the corresponding numeral 46. The plug is adapted to be turned within its cylinder 6 by a key 47 of any desired description. Most of the details of the turnable plug are herein omitted, but such as are more or less directly concerned with an understanding of the invention are briefly described as follows:—

The plug contains a series of leaf tumblers 48 (Fig. 3). They are separated by spacers 49 which, in practice, include small shoulders between which and corresponding parts on the leaf tumblers small springs press to keep said tumblers in a normally alined and projected position. Upon insertion of the key 47 the key formation retracts said tumblers from their recessed position so that the plug can be turned in one direction or the other.

The plug 46 includes a reduction 50 which is an integral part of the plug. Inside of this reduction is an extension 51, only fragmentarily designated in Figures 3 and 10. The extension has a pair of diametrically alined prongs 52 which remain hidden in the reduction 50 as long as the key 47 is out of the cylinder lock. Insertion of the key causes the key formation to retract the leaf tumblers 48 in readiness for turning the plug 46. When the latter is turned a certain amount, 45° for example, a certain formation in the plug 46 (with which the invention is not concerned) projects the extension 51 so that its right end comes substantially flush with the right end of the reduction 50, and its prongs 52 out of the reduction 50 couple with the adapter presently described. Said formation may consist of cam slots 88 (Fig. 12) which actuate the extension when the key plug is turned. The insertion of the key has an important bearing on the invention, and those parts of the invention affected by the insertion of the key are described as follows:—

An adapter 53 (Fig. 3) is added to the plug 46. It is fitted on the reduction 50 which thus become a mount for the adapter. The adapter is loose on the reduction 50, and it is not until the prongs 52 are projected, as stated above, that the adapter will turn with the plug. For that purpose the adapter has a keyway 54 (Figs. 3, 9, 10). When the key is given its first fractional turn (45° approximately) the prongs are projected into the keyway whereupon the adapter turns with the plug for the ensuing 180°. The main purpose of this adapter is to provide a mount for the off-center pin 32.

When this projection of the prongs occurs the extension 51 may go a little beyond the reduction 50. To take care of that the adapter is counterbored at 55 to make room. The adapter has a center hole 56 and an off-center hole 57 (Fig. 9). The hole 56 goes all the way through into the

interior of the adapter, but the hole 57 is closed at its inner end.

The off-center pin 32 occupies the hole 57, but it is projected from the hole because of the outward tension of a spring 59 behind it. It is this spring which causes automatic engagement of the foregoing detent means. The adjacent parts of the hole 57 and pin are shouldered so that the spring cannot drive the pin out of the hole. The pin 32 is herein known as the off-center pin because of its being carried by the off-center hole.

A much longer pin 60 (Fig. 3) occupies the axial center of the plug 46 and extends through the reduction 50 in registration with the center hole 56. This pin is herein known as the center pin. A spring 61 tends to keep the center pin retracted, and for that purpose said spring bears against a shoulder 62 (or its equivalent) on the center pin, and a bushing 63 (Fig. 10) in the reduction 50 in which the exposed end of the center pin is guided.

The normal tendency of the spring 59 (Fig. 3) is to project the off-center pin 32. The normal tendency of the spring 61 is to retract the center pin 60. Upon the foregoing insertion of the key 47 the inner end of the center pin 60 is engaged so that the pin is forced out of the center hole 56 either into the hole 34 or hole 35 in the shell 25, depending on the position of the locking bolt 23. One or the other of these holes 34, 35 is always in registration with the center hole 56 so that the center pin 60 can be projected as just stated.

Now as regards the switch cylinder 7:—This has a bore 64 (Fig. 3) in which an insulating plug 65 is tightly fitted, and in practice pinned so that it will not fall out. The previously mentioned wall 44 comprises the bottom of the bore 64. The plug 65 is inserted until it strikes said wall. The plug is chambered at 66 to slidably receive the base 38. The spring 43 is stationed between this base and the plug 65, and when the base is shifted to the right its tumbler ring 39 engages a pair of contacts 67, 68 which comprise the starter motor and primary ignition circuit terminals. Wires S of the starter circuit and I of the primary ignition circuit are connected in common to these terminals so that the two circuits will be closed simultaneously. When the center pin 60 is projected out of the center hole 56 into the hole 35 the tumbler 36 is pressed to the right (Fig. 3), shifting the stud 37 and its base 38 to the right, thereby closing the starter motor and primary ignition circuits.

Back and forth movements of the locking bolt 23 control the main ignition circuit in this way:—A contactor 69 (Fig. 4) is carried by the shell 25 by means of a suitable connection 70 which passes through the slot 18 from the shell to the contactor. The contactor travels on an insulating plate 71 (Fig. 4) which carries the ignition terminals 72 to which the main ignition circuit wires M are connected, and at the same time provides a bottom closure for the chamber 16 by which the contactor 69 is contained.

A stall or traffic switch, generally designated 73, is intended to be used for closing the starter motor circuit in the event of the engine stalling. In this respect it supplements the foregoing function of the center pin 60 in originally closing the starter motor circuit. The stall switch also has an additional safety function in that it prevents turning of the locking lever 14 for the purpose of moving the locking bolt 23 to the locking position from the unlocked position (Fig. 7) while the stall switch is closed for the purpose of starting the starter motor. The stall switch is so arranged that it cannot be operated to close the starter motor circuit while the car is locked.

All this will be clear from the following description:— An insulating sleeve 74 (Fig. 5) is tightly driven into a bore 75 which communicates with one side of the contactor chamber 16. Enough of the sleeve projects from the boss 15 with a sufficiently large head to provide a mounting for a thimble 76. This thimble provides a guide for a stem 77, the outer end of it having a button 78 which is adapted to be pressed upon so as to move the stem inwardly against the tension of a spring 79.

An insulating shoulder 80 on the stem rides the bore of the sleeve 74 and provides additional guidance for the stem. At one side of this shoulder there is a contact point 81 which is adapted to engage a pair of auxiliary starter motor circuit terminals 82, 83 (Fig. 1). The stem 77 projects beyond the contact point 81 as at 84. The position of the stall switch 73 with respect to the contactor 69 is indicated in Figure 4 by a dotted circle which is correspondingly designated 73.

As long as the bolt 23 is in the locking position (Figs. 4 and 6) the contactor 69 will be in the path of the projection 84 thus preventing pressing in on the button 78 and closing the starter motor circuit at this point while the vehicle is locked. Should the engine stall after having been set in operation subsequently to unlocking the vehicle, the stem 77 can be moved inwardly by pressing on the button 78 because then the contactor 79 will be in the ignition circuit-closing position, agreeing with the unlocked position of the bolt 23. An attempt to then turn the locking lever 14 so as to throw the bolt 23 into the locking position will be prevented because the projection 84 (Fig. 5) will have entered the chamber 16 (Fig. 4) in advance of the contactor 69.

The operation is readily understood:—Before describing this in detail it is desired to state that in specifying a key-operated cylinder lock of which the turnable plug 46 is a part, it is not intended to limit the improved apparatus to such use. It is contemplated that a combination lock 85 (Fig. 11) can be used in lieu of it, and when such a lock is used it will be the arrival of one of the tumblers 86 at a given position that will couple the adapter 53 on, and also the arrival of some other tumbler 37, or possibly some other part at a given position that will close the starter and primary ignition circuits S and I. Reading this on the reverse order, the parts mentioned in the combination lock will have to be restored to the original or starting position before the locking lever 14 can be turned to move the locking bolt 23 to the locking position and the main ignition switch to the open position.

With such a lock mechanism in mind, and with the instant cylinder lock mechanism in mind, assume the vehicle to be locked. The locking bolt 23 is in the projected or locking position (Figs. 3 and 6). The center plug 24 is in engagement with the steering post 4 or some other part to be locked. The off-center pin 32 occupies the recess 30. The walls 31 of the recess and the sides of the off-center pin are so abrupt that movement of the locking bolt is not possible through the turning of the locking lever 14. Specifically, as long as the pin 32 remains in the recess 30 while the bolt 23 is in the locking position (Fig. 6) the locking lever 14 cannot be turned counter-clockwise

(looking down on it) for the purpose of moving the bolt from said position.

Still considering the same position, the center hole 56 of the adapter 53 (Fig. 3) is in registration with the hole 35 of the locking bolt shell 25. These holes together with the tumbler 36 and stud 37 are all in line, but the center pin 60 is in the retracted position. The spring 61 presses it into that position as long as the key 47 is out of the plug 46. The key is not supposed to be in the plug 46 while the vehicle is locked, and in fact the spring 61 is intended to serve as an ejector, throwing the key out in the locked position.

Upon desiring to unlock the procedure is thus:— Insert the key 47 in the key passage of the plug 46. This key passage is not specifically illustrated in the drawing, but the reader will understand that there is a key passage longitudinally of the plug as is common in cylinder locks. The displacement of the leaf tumblers 48 (Fig. 3) by the key formation is also incidental to the known lock, and it is by this displacement that it becomes possible to presently turn the plug 46, assuming that the proper key has been inserted.

While pushing in the key the point of the latter will strike the left end of the center pin 60 (Fig. 3), and as the inward movement of the key continues the center pin will be forced to the right against the tension of the spring 61, until the right end of the center pin goes through the center hole 56 and sufficiently far out at the right of the adapter 53 to project into the hole 35 deeply enough to strike the tumbler 36 and push both the tumbler, the stud 37 and the insulating base 38 far enough to cause the contactor ring 39 to engage the contacts 67, 68 and simultaneously close the starter motor and primary ignition circuits. Therefore, the first act of the key, namely its simple insertion in the plug 46 (before any turning is done at all), is to displace the center pin 60, tumbler 36, stud 37 and switch member 38, 39 in the axial direction to close the starter motor and primary ignition circuits.

It is necessary to push the key in all the way so that this circuit closure is accomplished. Now turn the key 47 clockwise 45°, this direction being read as though looking at the key from the left (Fig. 1) which is from the driver's position. Said clockwise turn causes the extension 51 (Figs. 3, 10 and 12) to move to the right within the reduction 50 until its prongs 52 enter the keyway 54 of the adapter 53.

Before this the adapter was free, and had it been possible to get inside of the lock cylinder 6 the adapter could have been turned on the reduction 50. But after the key has been turned as just stated, the prongs 52 couple the plug 46 to the adapter 53 so that subsequent turning of the plug by means of the key causes turning of the adapter also. The turn of the key is supposed to follow its complete insertion. The insertion of the key and the ensuing turn are virtually one operation.

The 45° turn is only preliminary. Continue turning the key 180° clockwise. The starting motor and primary ignition circuits remain closed during this turn of the key, the closure having begun when the key arrived at the in position. These circuits remain closed after the 180° turn as long as the key 47 is held pressed in. The operator should now be in readiness to turn the locking lever counter-clockwise to close the main ignition circuit, and as soon as he lets up pressure on the key the locking lever can be turned, thereby reclosing the ignition circuit by means of the contactor 69 (Fig. 4), it being noted that the primary ignition circuit is momentarily opened, (together with the starter circuit) at the switch 39, 67, 68.

Understand that the key is held in at the end of the 180° turn until the engine has started. Before going on, consider what happened during the 180° turn of the key and consequently of the plug 46 and adapter 53. The off-center pin 32 was moved from the position in Figure 6 to the position in Figure 7. This pin does not have anything to do with moving the locking bolt 23 from the position in Figure 6 to the position in Figure 7 and vice versa. Its sole purpose is to secure the locking bolt in either of the two positions. When the off-center pin 32 was moved to the position in Figure 7, the locking bolt 23 as yet had not been shifted from its locking position (Fig. 6).

In displacing the pin 32 from the recess 30 at the beginning of the 180° turn, said pin simply rubbed against the track 33 on the way out. The pin had no impediment to its motion in traversing the zenith of the curve because there the shell 25 slopes away from under it due to the circular cross section of the shell. But in the last part of the 180° turn the pin again encountered the shell, and as it traveled down over the high part to the final position on the horizontal axial plane it was pressed into its off-center hole 57 against the tension of the spring 59, until the point of the pin became substantially flush with the inner end of the adapter 53.

Now resume the operation: Release pressure on the key. The spring 61 pushes the key part way out, but not all the way because the key formation is so combined and interlocked with the leaf tumblers 48 as to prevent that. The same action of the spring removes the point of the center pin 60 from the hole 35, and the spring 43 momentarily opens the starter and primary ignition circuits. The locking lever should immediately be turned counter-clockwise (arrow *a*, Fig. 2).

That shifts the locking bolt 23 from the locking position in Figure 6 to the unlocking position in Figure 7. The recess 30 is caused to catch up, so to speak with the off-center pin 32. This pin snaps into the recess by the pressure of the spring 59 behind it, in which position it is shown in Figure 7, interlocking with the bolt and securing it in the unlocked position as brought out before.

Should the operator not be quick enough in closing the main ignition circuit at 69, 72 (Fig. 4) he will use the stall switch 73 (Fig. 5). The contactor 69 (Fig. 4) will be out of the way of the projection 84 (Fig. 5), making it possible to close the auxiliary starter circuit between the terminals 82, 83 (Fig. 1) by the contact point 81. The motor is supposed to be running and the steering post 4, or equivalent part, is in the unlocked position.

Go back to the counter-clockwise turn of the locking lever 14 (arrow *a*, Fig. 2). When the locking bolt 23 (Fig. 6) was moved to the unlocking position (Fig. 7) by the action of the crank pin 21 on one wall of the cross slot 21^a, the hole 34 in the shell 25 was moved up to the axial center of the plug 46. The hole 35 with its tumbler 36 was moved out of registration and beyond range. The tumbler is displaceable with the shell 25 because its axial length is not any greater than the thickness of the shell, and since the left end of the stud 37 is made to

come flush with the left end of the hole **42** in the stationary plug **41** it follows that there is not any chance of obstruction by the right end of the tumbler entering the hole **42**.

Consider what happens when desiring to lock up. An operation on the reverse order is carried out. Remember that the key **47** is still in the plug **46** of the lock mechanism but that it is part way out. Push the key in. This moves the center pin **60** (Fig. 3) to the right but this time into the hole **34**. The spring **61** is put under tension. The main purpose of the hole **34** is to provide a place for the point of the pin to go into at this particular time. But as long as the pin is in the hole the locking bolt **23** cannot be moved. It, therefore, augments the off-center pin **32** in holding the locking bolt **23** against premature movement to the locking position. But later on the center pin becomes the means which compels the removal of the key before the locking lever **14** can be turned to throw the bolt **23** into the locking position and at the same time open the main ignition circuit.

Turn the key **47** in the counter-clockwise direction 180°. During all the foregoing time the adapter **53** was not uncoupled from the plug **46**, consequently the adapter will turn counter-clockwise with the plug **46** as it originally turned clockwise with the plug. The off-center pin **32** is restored to the position in Figure 6, but the center pin **60** is still in the hole **34**, now serving its chief purpose in holding the locking bolt irrespective of the off-center pin **32**. The off-center pin is now at a blank place against the rounded wall of the shell **25**, awaiting the arrival of the recess **30**, but the center pin is performing its dogging function in holding the locking bolt in the unlocked position. Turn the key the remaining 45° in the counter-clockwise direction. This act uncouples the adapter from the plug by reason of drawing the prongs **52** back into the plug. Upon letting up pressure on the key the spring **61** causes its ejection from the plug should the operator happen to leave the key in the lock. The same act of the spring retracts the center pin **60** from the hole **34**, freeing the locking bolt **23**.

Now turn the locking lever **14** clockwise (arrow *b*, Fig. 2). The action of the crank pin against the other wall of the cross slot **21a** moves the locking bolt **23** to the locking position and at the same time opens the main ignition circuit so that the engine stops. The recess **30** catches up with the off-center pin **32** whereupon the spring **59** snaps the pin into the recess and secures the bolt in its locking position.

Going back to the clockwise turn of the locking lever **14**, the resulting movement of the lock bolt **23** moved the contactor **69** (Fig. 4) to the main ignition circuit opening position. As long as the contactor **69** is in the ignition circuit-closing position, namely at the right end of the chamber **16**, there is room for the projection **84** of the stall or traffic switch **73** to enter the chamber upon pressing on the button **78**. After the contactor **69** has been moved to the circuit-opening position, the contactor blocks the path of the projection and the stall switch **73** cannot be worked.

The following is a convenient résumé:—The locking bolt **23** is to be considered as a whole. The recess **30** is a part of it since it is formed in the shell **25**. As far as the interengaging function of **30** and **32** is concerned, the pin **32** might be recessed in some way and the shell be provided with a projection in lieu of the recess **30**. The means for operating the lock bolt is the manual locking lever **24**. The means for moving or displacing the off-center pin **32** into either of its two positions comprises the key **47**, the plug **46** and the adapter **53** together with internal parts.

The detent means, as concerns the locking bolt **23**, broadly speaking comprises two parts one on the bolt and the other separate from the bolt. In this instance the part on the bolt is the recess **30** and the part separate from the bolt is the off-center pin **32**. The spring **59** makes these parts engage automatically when registered.

The center pin **60** is the immediate means for compelling removal of the key **47** before the locking bolt or main ignition switch can be moved to the locking and circuit-opening positions respectively. In this sense the center pin also comprises a detent, but the term is not used in connection with the center pin for fear of confusion of the function of the off-center pin **32**. Notice that the key-actuated means, mainly comprising the center pin **60**, prongs **52** and adapter **53**, are subject to a sequential operation in that said means first closes the switch (the starter and primary ignition switch) and then disconnects the detent means **30**, **32** preparatory to closing the main ignition switch.

I claim:—

1. A lock comprising a lock bolt, manual operating means for moving said bolt either into locking or unlocking position, and means preceding each movement of said bolt into a waiting position to detain said bolt when the respective movement is completed, and means independent of said manual operating means to then cause the previous means to interlock with the bolt to secure it in position against an immediate return movement by said manual operating means when said bolt reaches either of said positions.

2. A lock comprising a lock bolt, manual operating means so arranged that when it is manually shifted back and forth it will move said bolt back and forth either into locking or unlocking position, detent means to secure said bolt in each of said positions, means to work the detent means before each shift of the manual means so as to place the detent means in a waiting position to secure said bolt when caught up with by said bolt and means independent of said manual operating means to then displace the detent means from its waiting position into securing engagement with the bolt.

3. A lock comprising a lock bolt which includes a recess, operating means adapted to move said bolt either into locking or unlocking position, and detent means to occupy the recess in each of said positions to detain said bolt against movement by the operating means as long as the detent means remains in the recess.

4. A lock comprising a lock bolt which includes a recess, operating means adapted to move said bolt either into locking or unlocking position, detent means to occupy the recess of each of the positions of said bolt, and means to displace the detent means from the recess into a waiting position preparatory to moving the bolt by said operating means at the end of which movement the recess is caught up with the detent means to receive it again.

5. A lock comprising a lock bolt which includes a recess, operating means adapted to move said bolt either into locking or unlocking position,

detent means including a pin and a spring to press the pin toward said bolt, said pin occupying the recess in each of the positions of said bolt, and means to displace the detent means from the recess into either of two positions along the bolt preparatory to a movement of said bolt by the operating means, the pin then bearing against the outer surface of said bolt and holding the spring pressed in a waiting position for the recess.

6. A lock comprising a lock bolt, operating means adapted to move said bolt either into locking or unlocking position, detent means interconnecting with said bolt to hold it both before and after its movement by said operating means, and means for shifting the detent means between alternate positions in the interval between operations of the operating means.

7. A lock comprising a lock bolt, a locking lever and means both part of the lever and part of the bolt to move the bolt into locking or unlocking position as said lever is operated back and forth, detent means which consists of one part on the bolt and a second part separate from the bolt but engaging automatically to secure the bolt in either the locking or unlocking position, and key-actuated means for placing said separate second part into either of two positions to agree with the two positions of said bolt.

8. A lock comprising a spring pressed pin, a key-operated turnable plug by which the pin is carried off-center making it an off-center pin, said pin being swung through the arc of a circle into either of two positions upon turning the plug, a locking bolt, and means to move the locking bolt into either of two positions, said bolt having a recess into which the pin snaps when the respective positions match, opposite walls of the recess forming abutments against which the pin is detained, said recess having a diminishing part providing a track which enables swinging the pin out of the recess.

9. A lock comprising a key-operated turnable lock plug, a locking bolt and means by which to move it into locking or unlocking position, detent means to secure said bolt in each of said positions, said means consisting of at least two parts, one on the bolt and one separate from the bolt, and an adapter by which one of said parts is mounted on the plug so that the turning of the plug can be utilized for placing said part in either of two positions to be caught up with by the other part on the bolt when the latter is moved.

10. In a lock including a turnable plug and at least one prong which is projectable from the plug during part of its turn, an off-center pin swingable between alternate positions by the turning of said plug, and an adapter carrying the pin, said adapter being loosely carried by the plug and having a keyway to receive the prong to transfer turning motion from the plug to the adapter.

11. A lock comprising a lock bolt having a recess on the outside, means to move the bolt into locking or unlocking position and so dispose the recess in either of two positions, a pin with a spring behind it to press it into the recess in either of its positions, a key-operated turnable lock plug for doing the turning said turning being utilized to swing the pin into either of two positions to match those of the recess, and an adapter carrying the pin and spring and being loosely carried by said plug but adapted to be coupled with said plug.

12. A lock comprising a lock bolt, interconnected detent means to secure the bolt in a locking position, a locking lever and means by which the bolt can be moved out of said position by operation of the lever, turnable means which is required to be worked first to disconnect the detent means before said lever can be operated, a primary circuit and means for closing it during the working of said turnable means, and a main circuit and means for closing it by the movement of the lock bolt following said operation of the locking lever.

13. A lock comprising a lock bolt having a recess and a hole, a lock mechanism including a key-operated lock plug and a center pin in said plug in registration with the hole when the bolt is in the unlocked position, an off-center pin carried by the plug occupying the recess and so detaining the bolt in said position, said pin being displaced from the recess by a push of the key imparted to the center pin thereby to move said pin into the hole and so dog the bolt.

14. A lock comprising a lock bolt having a recess and a hole, a lock plug and a center pin which is axially movable during the manipulation of a key in said plug, said hole being in registration with the pin while the bolt is in the unlocked position and being occupied by an end of the pin when the key is pushed all the way in the plug, an off-center pin occupying the recess to prevent movement of the bolt but being displaceable from the recess upon turning of the key while in its pushed in position, said pin being displaceable from the hole to free the bolt upon subsequent manipulation of the key, and a locking lever having means for then moving the bolt to the locking position thereby advancing the recess to the displaced position of the off-center pin.

15. A lock comprising a lock bolt and a member which is attached to said bolt to move with the bolt, a stud which has its axis crosswise of the axis of the bolt, a lock plug having a center pin which is pushed by the insertion of a key in said plug thereby to cause displacement of said stud, and a lever having means to move the lock bolt upon movement of the lever thereby to simultaneously move its attached member.

16. A lock comprising a key-operated turnable locking plug, combined locking bolt and ignition switch means, means manually operable independently of said plug to simultaneously move the bolt and switch means respectively to locking and circuit-opening positions, and means situated in the plug in the path of the key, being held by the key in a dogging position against the plug and therefore compelling the removal of the key from the plug before said last means can be operated.

17. A lock comprising a lock mechanism adapted to be worked from an original locked position to an unlocked position and vice versa, a locking bolt and an attached switch contactor, a locking lever and means between it and the bolt to move the bolt and its contactor to locking and circuit-opening positions, and means incorporated in the lock mechanism requiring restoration of that mechanism to the original locked position before the locking lever can be operated.

18. A lock comprising a turnable plug into which a key is insertable for turning the plug, a locking bolt and means to move the locking bolt to a locking position, and means displaced by the key into interconnection with the locking bolt by said insertion of the key to prevent movement of said bolt as long as the key is in the turnable plug.

19. A lock comprising a turnable plug into which a key is insertable for turning the plug, a locking bolt and means to move the locking bolt to a locking position, means displaced by the key into interconnection with the locking bolt by said insertion of the key to prevent movement of said bolt as long as the key is in the turnable plug, and means for simultaneously severing the interconnection of said means with the locking bolt and ejecting the key from the turnable plug thereby enabling movement of the locking bolt to the locking position.

20. A lock comprising a locking bolt and an attached main ignition circuit contactor, a combined starter and primary ignition circuit switch, detent means holding the bolt in the locked position and its contactor in the circuit-opening position, key-actuated means for sequentially closing said switch, disconnecting the detent means so as to free the bolt and then again opening said switch, and means for moving the bolt to the unlocked position and its attached contactor to the main ignition circuit-closing position.

21. A lock comprising a locking bolt and an ignition switch combined therewith, an ignition circuit which is closed by said switch to keep an associated motor running while said bolt is in an unlocked position with respect to a steering post, means under control of a key to secure the bolt in said unlocked position, said means being subject to operation by the key to release the bolt whereupon the key is removable from its working position, and a locking lever by which the locking bolt and the switch are coincidentally shifted to a locking position and to a circuit-breaking position respectively thereby stopping the motor simultaneously with locking the steering post.

22. A lock comprising a locking bolt and an ignition switch combined therewith, an ignition circuit which is closed by said switch to keep an associated motor running while said bolt is in an unlocked position with respect to a steering post, means under control of a key to secure the bolt in said unlocked position, said means being subject to operation by the key to release the bolt whereupon the key is removable from its working position, a locking lever by which the locking bolt and the switch are coincidentally shifted to a locking position and to a circuit-breaking position respectively thereby stopping the motor simultaneously with locking the steering post, and means tending to eject the key from said working position so that the key will not stay in said working position unless held, as long as the locking lever and bolt are in the locking position.

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