W. GADKE.

TIMER.

APPLICATION FILED MAY 1, 1915. RENEWED JUNE 26, 1917.

1,257,694.

Patented Feb. 26, 1918.

2 SHEETS—SHEET 1.

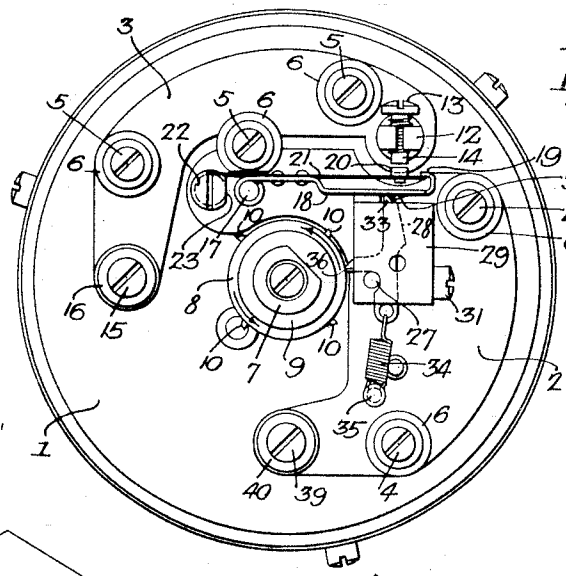


Fig. 1.

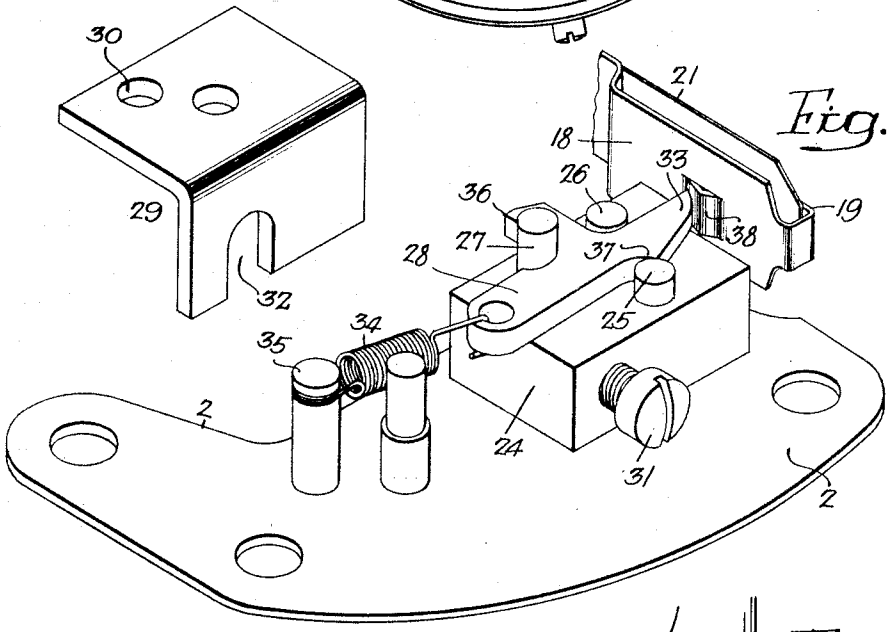


Fig. 2.

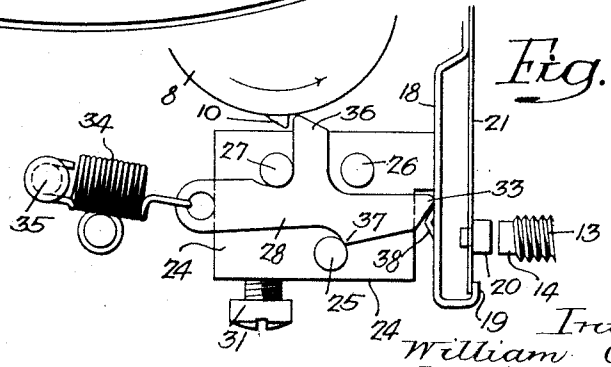


Fig. 4.

Witnesses—
J. F. Wessner
Ella A. Burnsa

Inventor—
William Gadke.
by his Attorneys—
Howson & Howson

W. GADKE.

TIMER.

APPLICATION FILED MAY 1, 1915. RENEWED JUNE 26, 1917.

1,257,694.

Patented Feb. 26, 1918.

2 SHEETS—SHEET 2.

Fig. 9.

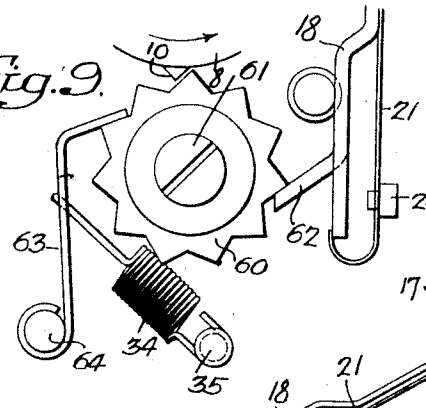


Fig. 5.

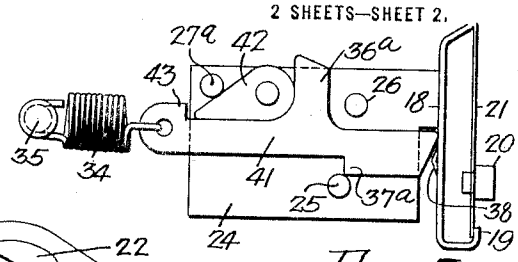


Fig. 3.

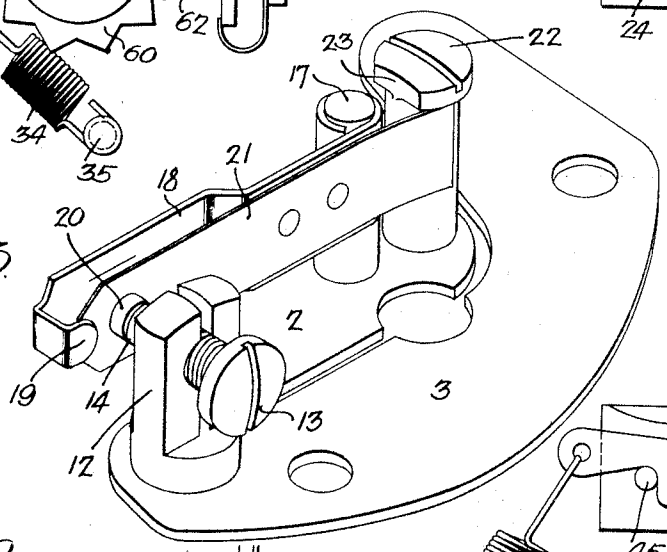


Fig. 6.

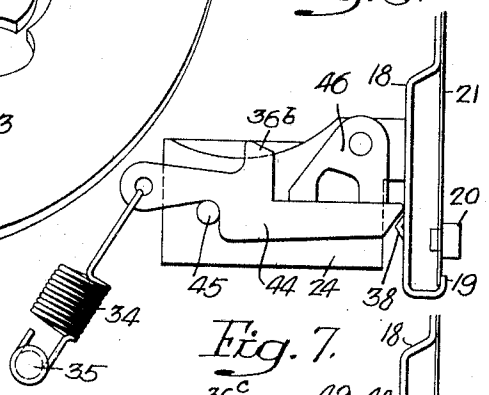


Fig. 10.

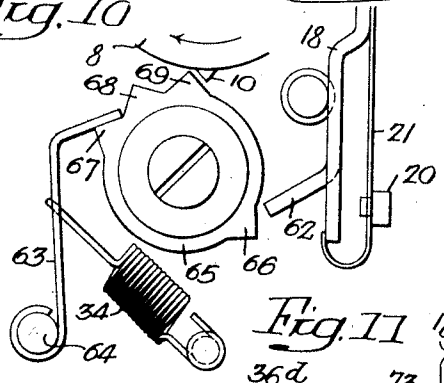


Fig. 7.

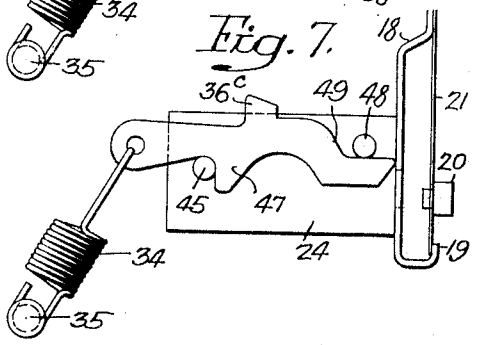


Fig. 11.

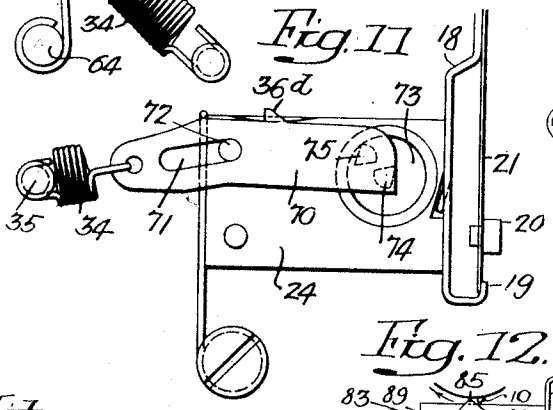


Fig. 8.

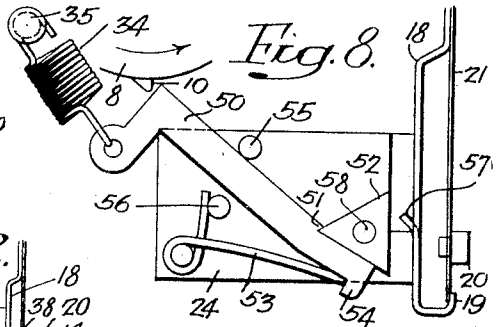
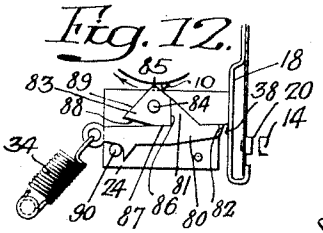


Fig. 12.



Witnesses.—
J. F. Wessner
Hilbert Burrows

Inventor—
William Gadke.
by his Attorneys—
Howson & Howson

UNITED STATES PATENT OFFICE.

WILLIAM GADKE, OF PHILADELPHIA, PENNSYLVANIA.

TIMER.

1,257,694. Specification of Letters Patent. **Patented Feb. 26, 1918.**

Application filed May 1, 1915, Serial No. 25,147. Renewed June 26, 1917. Serial No. 177,150.

To all whom it may concern:

Be it known that I, WILLIAM GADKE, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Timers, of which the following is a specification.

One object of my invention is to provide a novel form of contact making device particularly designed for use as part of a timer such as is required in ignition systems, which in addition to being efficient, reliable, substantial and relatively inexpensive, shall have its parts so proportioned and arranged that it shall properly perform its functions regardless of the speed, between the working limits of the timer, at which it is operated.

I further desire to provide a device of the character noted which shall take a greater current and therefore provide a fatter and hotter spark when operated at low speeds than when driven at higher speeds, the arrangement of parts being such that the slide cannot materially affect the operation of the contacts because of its momentum when the device is run at high speed.

The invention also contemplates novel supporting structures for the contacts of the timer, together with a novel device for removably holding one of said structures in place.

These objects and other advantageous ends I secure as hereinafter set forth, reference being had to the accompanying drawings, in which,

Figure 1 is a plan of the body of a timer illustrating my invention as applied thereto;

Figs. 2 and 3 are perspective views on an enlarged scale illustrating the detail construction of the parts constituting my invention, the cover plate for the slide being shown as detached in Fig. 2.

Fig. 4 is a plan on an enlarged scale of the slide and its associated parts; and

Figs. 5 to 12 inclusive are plans illustrating modified forms of the slide and the parts with which it is immediately associated.

In the above drawings 1 represents a portion of the supporting frame of the timer, which in the present case has the form of a circular block or disk of metal, and on this are rigidly mounted two metallic plates 2 and 3 so supported as to be electrically insulated from each other and from said frame. For holding the plate 2 in place I provide screws 4, which while threaded into the frame 1, are insulated from said plate by fiber bushings 6, and similarly the plate 3 is held in position by screws 5 likewise threaded into the frame 1 but insulated from said plate by fiber bushings 6^a. Any suitable means such as fiber sheets (not shown) may be mounted between the plates 2 and 3 and the upper face of the block 1, it being noted that one of the screws 5 is so mounted that the head of its insulated bushing engages both the plates 2 and 3.

Centrally mounted in and extending through the frame 1 is a timer shaft 7 on which a metallic ring 8 is fixed in such manner as to be electrically insulated from it by suitable means such as the bushing 9. This ring has projecting radially from it four or any desired number of radial pins 10, depending upon the number of cylinders of the engine with which the timer is associated, and these pins are preferably in the form of short projections whose extremities on one side are flat and on the other are convexly curved.

One of the contact members of the device includes a split post 12 projecting perpendicularly from the plate 3 and having threaded through its upper end a screw 13 which at its extremity carries the contact proper 14. The supporting plate at any suitable point has a binding post in the form of a screw 15 provided with a retaining washer 16 whereby an electric conductor may be conveniently connected.

The second contact member includes a cylindrical post 17 also projecting from the plate 2 and having removably mounted on it the rolled up cylindrical end of a metal strip 18 which is offset at its middle point as shown and has its second extremity 19 returned upon itself in a V-shaped form. The second contact proper of the device, indicated at 20, is fixed to the extremity of a spring strip 21 which is riveted to the stiff strip 18 adjacent its rolled up end, and projects beyond said contact so as to normally engage the inside surface of the returned end 19. The opposite end of the spring 21 projects beyond the post 17 and rests against a second post having the form of a screw 22 whose head has a flat portion whose plane is tangent to its cylindrical body. This screw when tightly set up is so positioned

that this flat portion 23 extends in a line practically at right angles to the spring strip 21, although it may occupy any position not immediately over the same. When it is desired to remove the part 18 with the contact 20 it is only necessary to turn the screw of the post 22 through an angle sufficient to bring this flat part of its head into the plane including the adjacent end of the spring strip, whereupon this latter with the strip 18 may be moved upward on the post 17 and removed.

Mounted on and fixed rigidly to the plate 2 adjacent the contact carrying end of the strip 18 is an upwardly projecting block 24 of rectangular outline having projecting from its top face three pins 25, 26 and 27, of which the latter is longer than the other two. Slidably mounted on the top face of this block 24 is a flat three armed slide 28 operative between the pins and normally held from raising by a cover plate 29 of L-shaped section provided with a hole 30 for the reception of the pin 27, the pins 25 and 26 merely projecting to a height equal to or slightly less than the thickness of the slide 28. This angle plate 29 not only extends over and parallel with the top surface of the block 24 but projects down one side thereof where it is engaged by a screw 31 so placed as to enter a slot 32 in its side.

The slide 28 has approximately the form of a flat bar one of whose extremities is plane on one edge and has a blunt wedge shape as indicated at 33, while its opposite end is provided with an opening for the reception of one end of a coil spring 34 whose opposite end is connected to a post 35 on the plate 2. At about the middle of the slide is an integral arm 36 extending approximately at right angles and likewise having its extremity of a blunt wedge shape, its position being such that it extends into the path of movement of the pins 10 on the ring 8 carried by the timer shaft. That edge of the slide opposite the arm 36 has a shoulder 37 immediately adjacent the pin 25 and the slide is normally drawn away from the contact strip 18 by the spring 34 so that the pin 27 lies in the angle between the arm 36 and the rear end of the slide body, the pin 26 normally lying immediately adjacent but spaced away both from the front end of the slide body and from the arm 36. The contact supporting strip 18 immediately adjacent the end 33 of the slide is preferably formed with a lug or pressed-out portion 38 for engagement with said end, the two contacts 20 and 14 being normally separated by reason of the action of the spring 21 upon the post 22. The plate 2 is provided with a second binding post in the form of a contact screw 39 having a retaining washer 40.

Under conditions of operation the contacts 14 and 20 are connected in the primary circuit of an ignition system whose conductors are respectively attached to the plates 2 and 3 by the binding screws 15 and 39. The shaft 7 is so connected as to make half as many revolutions per minute as the engine shaft, turning in the direction indicated by the arrows in Figs. 1 and 4. As a consequence of this movement, each of the pins 10 on the ring 8 engages the arm 36 of the slide 28 once every second revolution of the engine shaft, causing two engagements of the contacts 14 and 20. Each time a pin 10 strikes the arm 36, the slide while moved longitudinally toward the contact carrying strip 18 also has its forward end 33 moved laterally of said strip into engagement with the projection 38 thereon, this movement being to some extent guided by the coaction of the shoulder 37 on the slide with the pin 25. As a result of this forward movement of the slide, said strip 18, the spring strip 21 and the contact 20 are moved toward the fixed contact 14 until said first contact electrically engages the latter, whereupon the spring strip 21 yields to permit the continued forward movement of the strip 18.

Since the longitudinal and swinging movement of the slide 28 results in the extremity of its arm 36 moving away from the pin 10 on the timer shaft, said pin shortly passes beyond the comparatively sharp edge of said arm, whereupon the spring 34 acts to instantly return the slide to its normal position as determined by the pins 25 and 27. The contact carrying strip 18 is thereupon free to move to its normal position in which it engages the adjacent end of the block 24 and the contact 20 is moved away from the contact 14 under the action of the spring 21, the parts remaining in this position until the arm 36 is engaged by another one of the shaft-carried pins 10.

The forward stroke of the slide is limited by the pin 26 so that its cycle of movements and the times required therefor, are practically constant regardless of the speed of the shaft 7, although it is noted that by the peculiar arrangement and proportioning of the parts shown in the drawings the time of the electrical engagement of the contacts appears to be longer continued when the shaft is moving at its lower speed than when it turns at higher working speeds. This feature constitutes one of the advantages of the device, since it is obviously advisable to provide a hot spark of large volume at times when the engine is running at a low speed with a comparatively poor fuel mixture. On the other hand, when the engine is operating at high speeds, the mixture is usually rich and the engine comparatively warm, so that it is not necessary that the spark be of such large volume as when the engine has just started and is comparatively cold. In other words the apparatus automatically

regulates the volume of current delivered and the characteristics of the sparks so as to best suit the needs of the engine, as well as to economize current.

While that particular form of slide and its associated parts shown in Figs. 1 to 4 inclusive has been found by practical experiment to give the best results under operating conditions. those forms and arrangements shown in Figs. 5 to 11 inclusive which also involve certain of the characteristics of the invention, have likewise been found to give results superior to what can be obtained with other ignition apparatus.

In the case of Fig. 5 for example, the slide 41 as before is given a wedge shaped end adjacent the contact carrying structure 18 and at its rear end is drawn rearwardly by the spring 34. In place of the pin 27 however, I provide a pivoted finger 42 in the angle between its rear half and the arm 36^a, and as before a stroke limiting pin 26, said finger being held in place by a pin 27^a. The opposite side of the slide is provided with an angular shoulder 37^a adjacent whose sharp edge is mounted the pin 25.

In this case when the arm 36^a is engaged by a pin 10 on the ring 8 of the shaft, the slide 41 is first moved longitudinally and is thereafter caused to swing toward the post 25 because of the engagement of a shoulder 43 at its rear end with the end of the pivot finger. As the latter swings the slide outwardly, its forward end therefore not only moves toward the contact carrying strip 18 but moves longitudinally thereof for a distance limited by the space between the pin 25 and the adjacent side of the slide, after which the pin 10 passes out of engagement with the end of the arm 36^a, allowing the spring 34 to return the slide and the finger 42 to the normal position shown in Fig. 5.

In this case as in that illustrated in Figs. 1 to 4 inclusive, the movement of the shaft 7 with its pin 10 in the direction opposite to that indicated by the arrow in Figs. 1 and 4, merely causes the rear end of the slide to move away from the pin 27 or from the finger 42 as the case may be, without causing its forward end to affect the contact carrying member 18.

The slide 44 in that form of my invention shown in Fig. 6 may be described as consisting of a forward part and an arm 36^b substantially at right angles to each other, with a rear end projecting from the middle of said arm substantially parallel with the forward end. In this case there is provided a limit pin 45 in the angle between the front and rear ends of the pin and in addition there is a double pivot finger 46 so placed as to engage the flat side of said front end in advance of the arm 36^b. In this case the spring 34 is so mounted as to draw the rear end of the slide into engagement with a pin 45 while retaining its forward end in engagement with the ends of the fork provided by the pivot finger 46. When the arm 36^b is engaged by the pin 10, the slide as before moves forwardly toward the contact carrying member 18, until said arm engages the adjacent branch of the pivot finger 46. Thereafter the forward end of the slide is swung on the pin 45 as a fulcrum so that its forward end has the same sliding engagement with the member 18 as before described until the pin 10 disengages the arm 36^b and the parts return to their normal position.

The rear part of the slide 47 in Fig. 7 with the spring 34 is practically identical with that of the construction shown in Fig. 6, but in this case the forward end of said slide is held in engagement with a pin 48 immediately in front of a curved or cam-like portion 49 on its edge immediately in advance of the arm 36^c. After the slide has been moved toward and with the contact carrying member 18 for a predetermined distance so as to close the contacts because of the pressing of the pointed end of the slide against said member, this pin acts on the curved edge 49 to swing the forward end of the slide and hence the arm 36^c away from the pin 10, thus causing said end of the slide to pass through an opening in the member 18 which allows the contacts to separate. The pin 10 shortly thereafter releases the slide and permits the parts to return to their normal positions.

In Fig. 8 I have shown a somewhat different type of slide which however acts in a manner somewhat similar to that of the other slides shown. In this construction however, the slide 50 consists of a straight elongated bar having a notch and a shoulder 51 adjacent its forward end designed for the reception of any of the angular edges of a triangular piece 52 rotatably mounted on the supporting block. The forward end of said slide is at all times pressed toward this piece by a spring 53 whose end engages a shoulder 54 to limit its rearward movement under the action of the spring 34 which is connected to the end of a laterally extending arm at the rear extremity of the slide. This latter spring retains the slide in engagement with a pin 55 which engages that edge adjacent the pin 10.

In this case also the contact carrying member 18 is provided with a projecting tongue 57 placed to be engaged by any one of the angular ends of the piece 52 as it turns on its pivot pin. When the slide 50 is moved toward the member 18 under the action of one of the pins 10 engaging its rear end or striking an extension such as those shown in the other figures, it causes a partial rotation of the triangular piece 52 at the same time that its forward end is swung outwardly by reason of such rotation. As soon

however, as that edge of the piece 52 engaging the shoulder 51 passes beyond a line drawn through the center of its supporting pin 58 at right angles to the general line of the slide 50, the pressure on the spring 53 causes said piece to rapidly continue its movement independently of the slide until it has turned in all through 120°, when it comes to rest with one of its sides resting against the slide 50 which is still moving forward under the action of the pin 10. In making this movement, however, one of its angles engages the projection 57 of the member 18, thereby forcing the latter with the contact on its spring member 21 into engagement with the fixed contact. Obviously as soon as the slide 50 has been disengaged from the pin 10, the various parts return to their normal positions under the action of the two springs 34 and 53.

That form of my invention shown in Fig. 9, includes a rotary ratchet wheel 60 mounted to intermittently turn on a screw or pin 61 under the action of the pins 10 on the shaft collar 8. The contact carrying strip 18 in this case includes a projecting tongue 62 which normally rests on the side of one of the teeth and the wheel is acted on by a pawl 63 in the form of a strip mounted to oscillate on a post 64. This pawl is at all times drawn toward the ratchet wheel 60 by a spring 34 and the arrangement is such that as said wheel is turned by engagement of one of its teeth with a pin 10, the tongue 62 and its supporting strip 18 is forced outwardly away from the wheel, bringing the movable contact 20 into engagement with the fixed contact 14 to complete the primary circuit. As soon as the tongue 62 passes the apex of the ratchet tooth, the spring 21 at once so moves the strip 18 as to separate the contacts although said tongue has practically no action in turning the wheel, which under the continued action of the pin 10 shortly thereafter causes the apex of a second tooth to be moved toward the end of the pawl 63. Immediately thereafter the spring 34 so acts on the pawl as to cause it to incidentally rotate the ratchet wheel ahead of the pin 10 until said pawl rests upon the flat side of the second tooth, with the tongue and the other parts of the device in the positions shown in Fig. 9.

While in this case the ratchet wheel 60 is intermittently turned always in the same direction, in that form of my invention shown in Fig. 10 said wheel instead of rotating, merely oscillates under the action of the pins 10. Said wheel 65 therefore is merely provided with a tooth 66 designed to coöperate with the tongue 62 on the member 18 and opposite this has three projecting teeth 67, 68 and 69, on one face of the first of which rests the flat end of the pawl 63 under the action of the spring 34. The shaft in this form of my invention rotates in a clockwise direction so that when one of its projections engages the tooth 69, the ratchet wheel is turned through a small angle, causing the flat face of the tooth 66 to engage the adjacent end of the tongue 62 to force the latter and with it the contact 20 toward the fixed contact 14. The full angular movement of the wheel 65 under the action of one of the pins 10, while sufficient to cause the two contacts 20 and 14 to engage each other, merely causes the extremity of the pawl 63 to slide up on one of the flat faces of the tooth 68, without passing the apex thereof, with the result that as soon as said wheel is released from the pin 10, it is at once restored to its original position by the spring 34.

In Fig. 11 I have shown another arrangement of parts whereby the slide is actuated by the shaft projection, the arrangement being such that the flat strip 70 constituting said slide has a slot 71 for the reception of a pin 72 projecting from the upper face of the block 24. In the case illustrated said slide is normally held by a spring 34 with the rear of the pin 72 in the forward end of its slot and on one side it is provided with a tooth or extension 36^a designed to coöperate with the pin 10. The forward end of the block however has formed in it a circular hole 73 in which is a substantially axial pin 74 projecting upwardly from its bottom practically to the level of the block and designed to coöperate with a second pin 75 projecting into the hole 73 from the under surface of the forward end of the slide 70. When therefore the arm 36^a of the slide is engaged by one of the shaft pins 10, the slide 70 is moved longitudinally forward and then is caused to fulcrum on the pin 72 as its pin 75 slides on the cylindrical surface of the hole 73. While the forward end of the slide is thus advancing and at the same time swinging outwardly, it engages the contact carrying member 18, causing engagement of the fixed and movable contacts 14 and 20 and thereafter permitting of their separation when the pin 10 finally clears the arm 36^a. At such time the spring 34 at once causes the slide to return to its normal position, in doing which the pin 75 passes completely around the pin 74.

In that arrangement of parts shown in Fig. 12, I employ an elongated slide 80 having an angular head portion 81 terminating in a wedge shaped extremity 82 designed to engage a pressed-out tongue 38 on the contact carrying strip 18. This tongue, as in the case shown in Fig. 7, while extending out from the surface of the strip at an acute angle, terminates abruptly.

This form of the invention also includes a cam 85 in the shape of a five sided flat plate rotatable on a spindle or pivot pin 84 projecting from the face of the block 24 nor-

mally lying with one of its sides in engagement with the inner edge of the angular slide head 81 and another side projecting practically at right angles thereto in engagement with the adjacent flat edge of the body of the slide. When the toe 85 of this cam is engaged by the projection 10 carried by the timer shaft and moving in the direction indicated by the arrow, its resultant partial rotation first forces the slide forward so that its extremity 82 engages or lies immediately adjacent the beginning of the inclined portion of the tongue 38, this forward motion of the slide being due to the pressure of that corner between the cam faces 86 and 87 upon the adjacent edge of the slide head 81. The continued and comparatively slight rotation of the cam 83 then brings its side 88 into engagement with the adjacent edge of the slide body and thereafter causes a corner between this side and the side 89 to strike said edge.

Owing to the fact that the cam is so proportioned that this corner is at a considerably greater distance from the pivot 84 than the corner between the sides 86 and 87, the extremity of the slide 80 is swung at a relatively high speed around a pivot pin 90 as a center, acting on the tongue 38 of the strip 18 so that the latter with its contact 20 is moved, causing said contact to engage the fixed contact 14. As soon as the extremity 82 passes off the end of the tongue 38, the strip 18 is released to permit the contacts to separate, while the extremity of the slide is still being swung under the action of the cam. When the projection 10 passes beyond the toe 85 of said cam, the latter with the slide are returned to their normal positions under the action of the retracting spring 34.

When the timer shaft turns in a direction opposite to that indicated, the engagement of its pins 10 with the cam 83 merely causes the slide to pivot on the pin 90 without being moved forwardly into engagement with the tongue 38, and it is returned to its normal position after disengagement with said pin, by the action of the spring 34.

In all of the cases above described it is to be noted that the fixed and movable contacts are brought into engagement as a result of the movement toward them of a slide or other member directly acted on by the pins on the timer shaft, said contacts being allowed to separate either before the completion of this forward movement or immediately after the release of the slide or other member by the shaft projection. In every case also, a reversal of the direction of rotation of the timer shaft merely causes a movement of the slide or other pin actuated member without affecting the contacts.

Further, in those forms of my invention employing slides it is noted that the latter under the action of the shaft carried pins move longitudinally and thereafter have their forward ends swung out so that the contacts are not only brought into engagement but are shortly thereafter released and permitted to separate partly by reason of the lateral movement of the forward end of the slide carrying it beyond the tongue or projection of the contact carrying member and partly because of the return of the slide to its normal position after its release from the shaft pin. In every instance the forward movement of the slide is absolutely limited so that even when the timer is operated at the highest speeds the effect of the momentum of the slide and its associated parts is so small as to be practically negligible.

Moreover by long continued tests I have found that by the proportioning and arrangement of parts illustrated in the drawings, more current is permitted to flow in the circuit when the timer is turned at relatively low speeds than when it operates at higher speeds, so that as previously pointed out, hot sparks of large volume are produced in the engine cylinders at the time when this is most advantageous, while a smaller current flow and sparks of less intensity are produced at the higher speeds.

This is apparently due to the quicker release of the member 18 by the slide 28 when the shaft is driven at the higher speeds, on account of the effect of centrifugal force on the forward end of said slide. Regardless of just what part of the apparatus is responsible for this desirable result, I have found by many experiments that it is certainly obtainable to slightly varying extents by the constructions illustrated. As will be understood by those skilled in the art, the actual form and arrangement of the timer shaft pins or projections 10 is immaterial since any suitable form of shaft or shaft carried structure may obviously be employed to actuate the various forms of slides shown.

It is particularly to be noted that all of the constructions illustrated possess the important and valuable characteristic of having their contacts separated at a speed which is constant regardless of the speed at which the timer shaft is driven.

I claim:—

1. A timer including two normally separated contacts; a member carrying one of said contacts; a timer shaft having projections; a member slidably guided in a plane parallel to the plane of rotation of said projections, each of the projections being placed to positively move said member into direct engagement with said contact carrying member to close the contacts.

2. A timer including two normally separated contacts; a member carrying one of said contacts and provided with an abut-

ment; a timer shaft having projections; a member slidable in a plane parallel to the plane of rotation of said projections under the action of the same; and means for guiding said member into positive engagement with said abutment while it is being moved by each projection and thereafter causing it to disengage the abutment when it is disengaged from a timer shaft projection.

3. A timer including two normally separated contacts; a member carrying one of said contacts; a timer shaft having projections; and a slide in the form of an elongated longitudinally movable body of metal having an arm projecting substantially at right angles to its center line into position to be successively engaged by the projections, one end of said slide being directly operative upon the contact carrying member; with a retracting spring engaging the opposite end of the slide.

4. A timer including two normally separated contacts; a member carrying one of said contacts; a timer shaft having projections; a spring; with a slide having one end engaged by the spring and its opposite end in position to engage said member, the projections of the timer shaft engaging the slide intermediate its ends in position to move its member-engaging end forwardly and laterally when the shaft is rotated in one direction; and to move its spring-engaging end without moving said member-engaging end when said shaft is turned in the opposite direction.

5. A timer including two normally separated contacts; a timer shaft having projections; with a substantially T-shaped freely slidable member having one arm in position to be engaged by the projections and a second arm in position to actuate the contacts; with a spring operative upon the third arm.

6. A timer including two normally separated contacts; a timer shaft having projections; a substantially T-shaped slide having one arm in position to be engaged by the projections and a second arm in position to actuate the contacts; a spring operative upon the third arm; with movement limiting abutments on opposite sides of the contact engaging arm.

7. A timer including two normally separated contacts; a substantially T-shaped slide mounted with one of its arms in position to actuate the contacts; a timer shaft having projections operative upon another one of the slide arms; and a spring connected to the third slide arm, the slide having a shoulder; with a guide pin placed to cooperate with said shoulder.

8. A timer including two normally separated contacts; a timer shaft having projections; a slidable member having a shoulder moved by the projections and formed to cause engagement of the contacts while it is being so moved; a guide pin abutment adjacent said shoulder; and a spring opposing movement of the member and forcing its part adjacent said shoulder toward the abutment.

9. A timer including two normally separated contacts; a timer shaft; a block mounted adjacent said shaft; a cover plate extending over the block but spaced away from the same; with a slide mounted between and guided by the block and the cover plate in position to be actuated by the shaft and operative to cause closure of the contacts.

10. A timer including two contacts; a member carrying one of said contacts; a block adjacent the member; a cover plate spaced away from said block; pins projecting from the block toward said plate; a slide mounted between the block and the plate and guided by said pins; with a timer shaft mounted to actuate the slide to close the contacts.

11. A timer including a supporting structure; a post projecting therefrom; a spring strip removably mounted on the post and projecting in opposite directions therefrom; a second post on the supporting structure; a rotatable head for said second post normally retaining the spring on the first post but having a flat portion movable into position to permit passage of said strip; a contact carried by the strip; a second contact; and means for periodically causing engagement of the contacts.

12. A timer including a supporting structure; a post thereon; a metal piece pivoted on said post; a spring strip carried by said piece and projecting in opposite directions therefrom; a second post engaged by said spring strip; a screw rotatably mounted in the second post and having a flat edge placed to permit movement of the metal piece off the first post longitudinally thereof; means for periodically swinging the metal piece on its pivot; and contacts placed to be brought into electrical contact by such swinging.

13. A timer including a supporting structure having a slide movable thereon; an angle plate having a slot in one side and normally retaining the slide in position; a screw mounted in the supporting structure and passing through the slot of the angle piece in position to clamp it to said structure; means for periodically actuating the slide; and contacts placed to be brought into electrical engagement when the slide is actuated.

14. A timer including a slide; a timer shaft having projections placed to periodically engage said slide to move it in one direction; a spring acting on the slide to move it in opposition to the projections; two contacts mounted to be brought into electri-

cal engagement by movement of the slide; and a pivoted finger coöperating with the slide to give a part of it a lateral movement when it is actuated by the shaft projections.

15. A timer including a slide; a timer shaft having projections placed to periodically engage said slide to move it in one direction; a spring acting on the slide in opposition to the projections; two contacts mounted to be brought into electrical engagement by movement of the slide; and a pivoted finger mounted to be moved by the slide to give a part of the same a lateral movement when said slide is actuated by the shaft projections.

16. A timer including two contacts; a timer shaft; with a device intermittently actuated by said shaft for causing electrical engagement of said contacts and including a slide placed to positively move one of the contacts toward the other when so actuated, said device including means for causing longer engagement of the contacts when the shaft is rotated at low speeds than when it is turned at higher speeds.

WILLIAM GADKE.