

Oct. 26, 1937.

E. G. BEIDERMAN

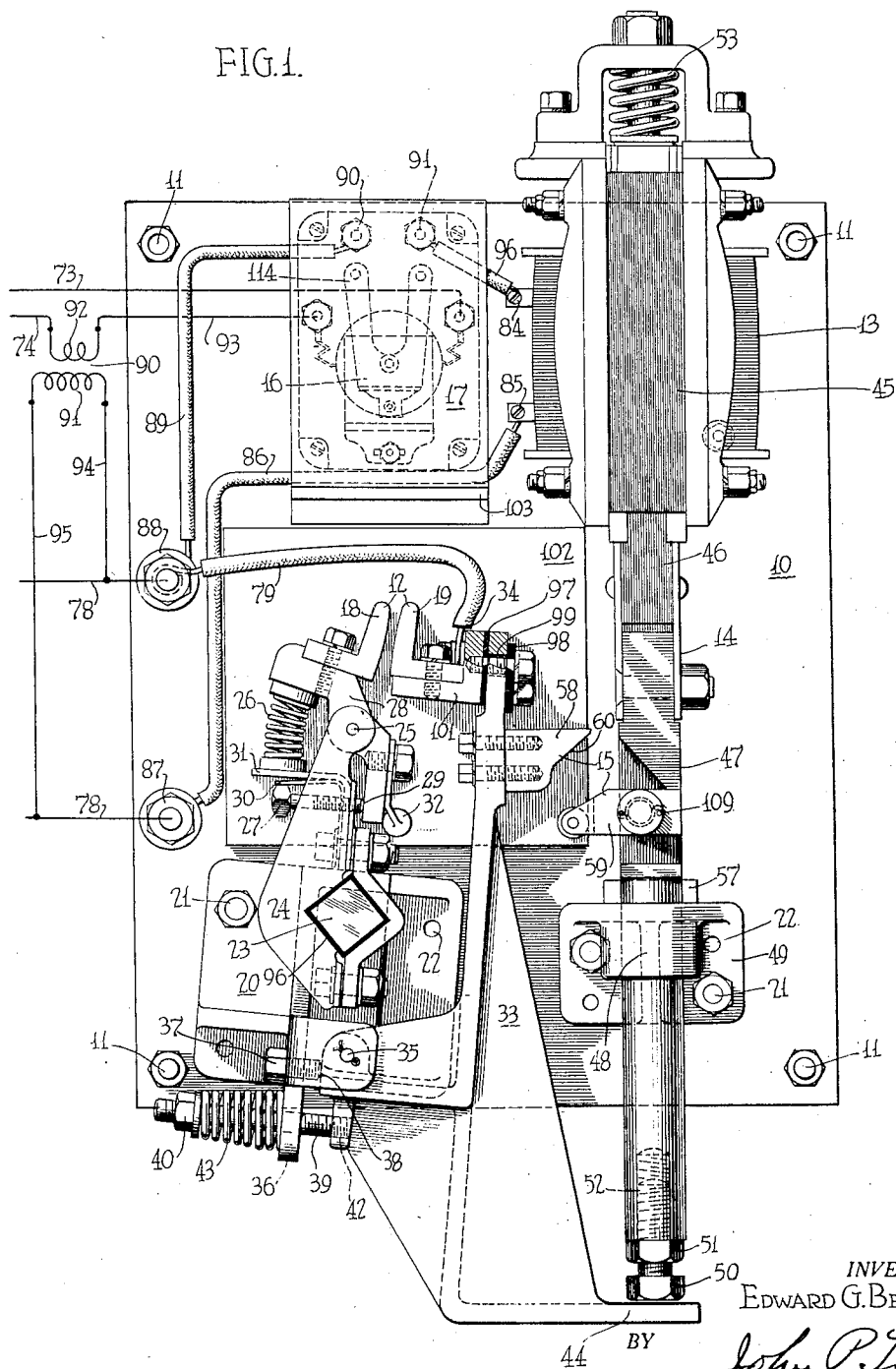
2,097,410

ELECTRIC WELDING CIRCUIT TIMER

Filed March 27, 1934

3 Sheets-Sheet 1

FIG. 1.



INVENTOR.

EDWARD G. BEIDERMAN

BY

John P. Tarbox

ATTORNEY.

Oct. 26, 1937.

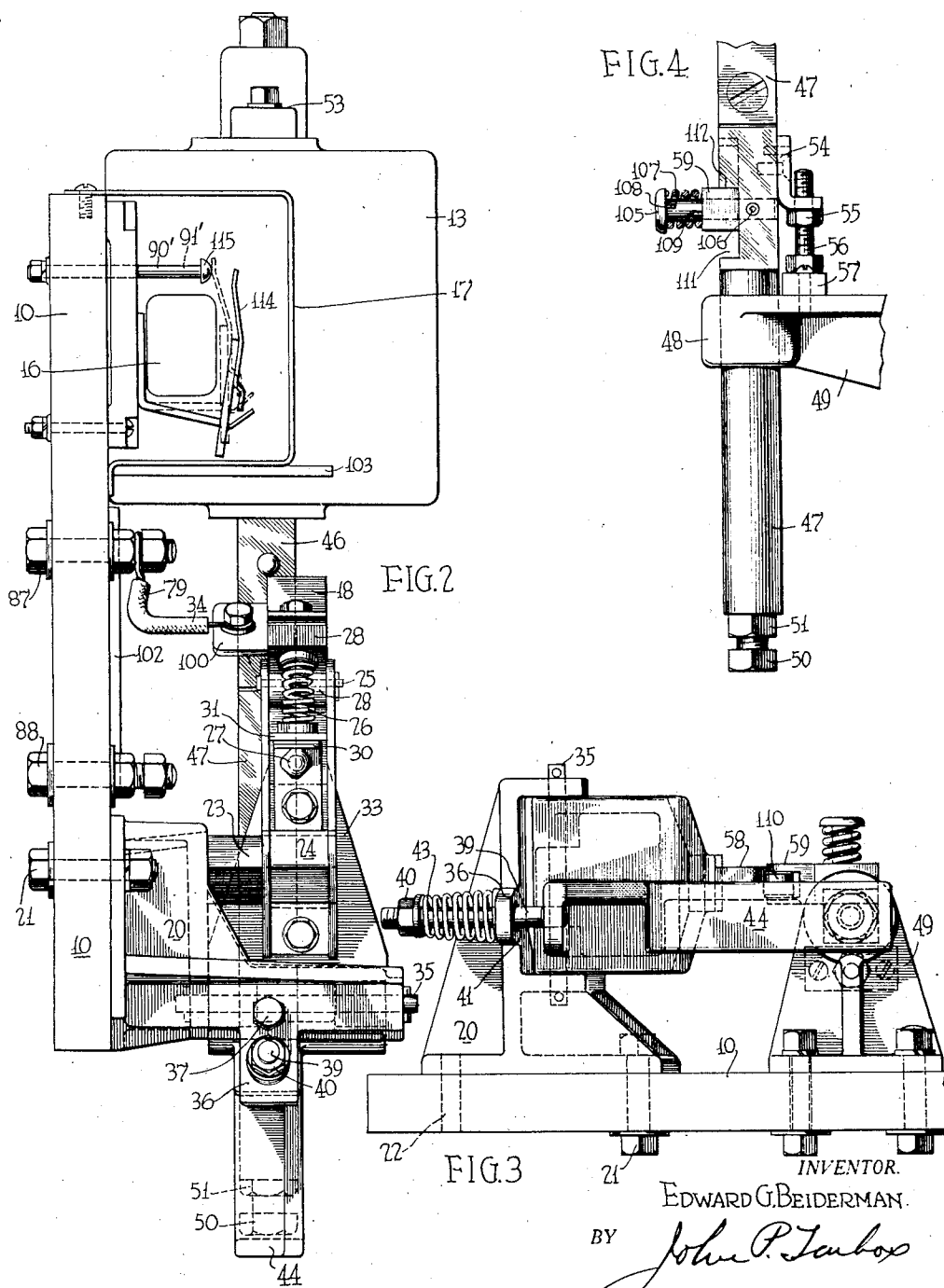
E. G. BEIDERMAN

2,097,410

ELECTRIC WELDING CIRCUIT TIMER

Filed March 27, 1934

3 Sheets-Sheet 2



INVENTOR.  
EDWARD G. BEIDERMAN.  
BY *John P. Tarbox*  
ATTORNEY.

Oct. 26, 1937.

E. G. BEIDERMAN

2,097,410

ELECTRIC WELDING CIRCUIT TIMER

Filed March 27, 1934

3 Sheets-Sheet 3

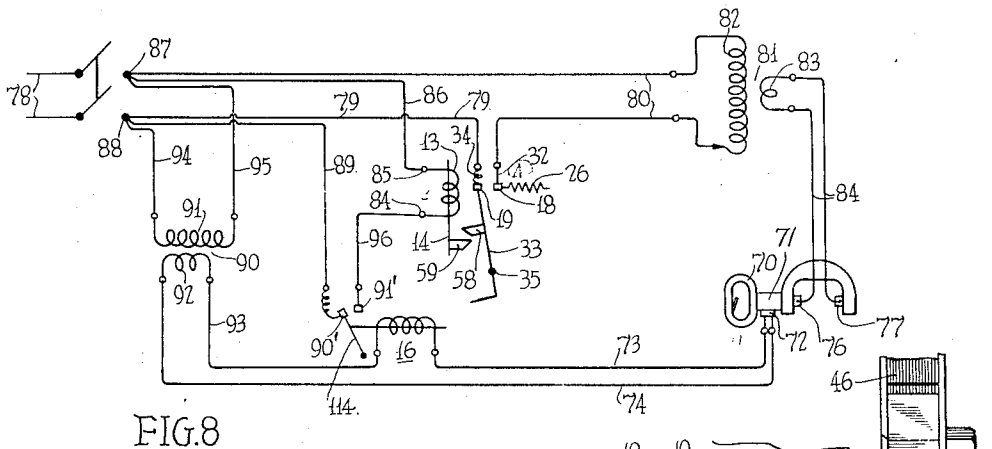


FIG. 8

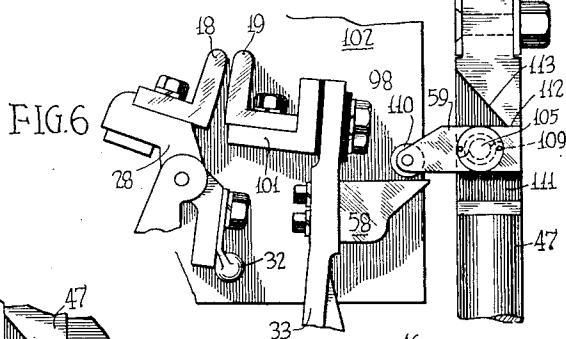


FIG. 6

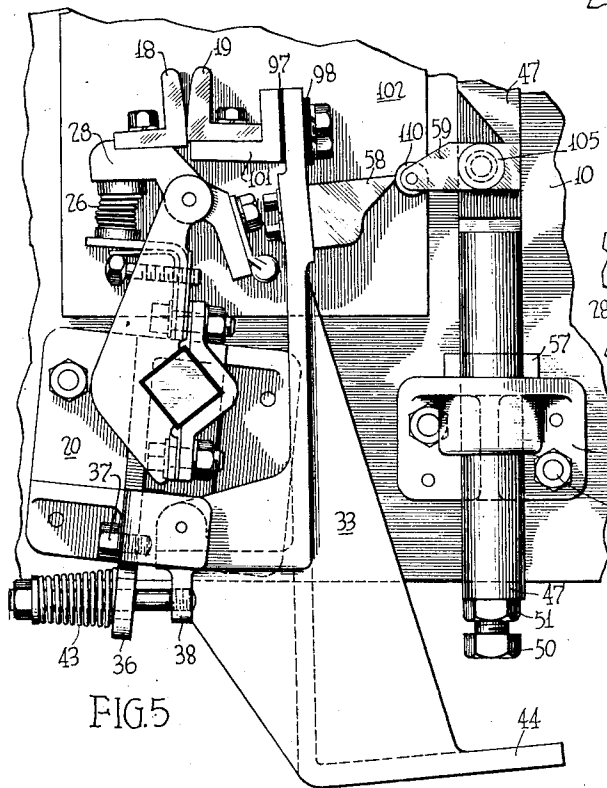


FIG. 5

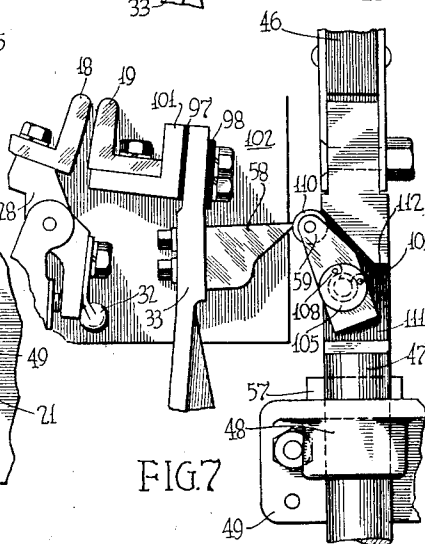


FIG. 7

INVENTOR.

EDWARD G. BEIDERMAN.

BY

*John P. Janbo*  
ATTORNEY.

## UNITED STATES PATENT OFFICE

2,097,410

## ELECTRIC WELDING CIRCUIT TIMER

Edward G. Beiderman, Detroit, Mich., assignor  
to Edward G. Budd Manufacturing Company,  
Philadelphia, Pa., a corporation of Pennsylvania

Application March 27, 1934, Serial No. 717,977

3 Claims. (Cl. 200—111)

This invention relates to timing devices for electric circuits and is especially useful for the timing of electric welding circuits.

Among the objects of my invention are the construction of a timer for an electric circuit and more particularly a welding circuit having a very small number of parts and ability to withstand the rigid use in production processes, the construction of a timer having accurate adjustability and timing and simplicity in construction, the construction of an electro-mechanical timer of few parts, the construction of a timer having a long operating life, accurate timing, accurate control and other objects not specifically enumerated.

I attain the foregoing and other objects of my invention by constructing an electric circuit timer comprising relatively movable contacts arranged to effect the energization and de-energization of the circuit and cam means arranged to effect a timed closure of said contacts.

My invention will be better understood when considered in connection with the accompanying drawings wherein

Fig. 1 is a front elevational view,

Fig. 2 is a side elevational view,

Fig. 3 is a bottom plan view,

Fig. 4 is a fragmentary view of the operating cam and its armature.

Figs. 5, 6, and 7 are a partial front elevational view showing the switch operation.

Fig. 8 is a simplified and schematic wiring diagram showing the electrical connections of the parts.

Considering the drawings in more detail, the timing apparatus of my invention is seen in front elevation in Fig. 1 comprising a base 10 of insulating material arranged for securement to any suitable support by means of the bolts 11. Mounted upon this base are the various component parts of the timing mechanism comprising contacts 12 arranged to effect the energization and de-energization of the timed circuit, a timing solenoid 13 and armature 14, and cam means 15 in cooperating relation with the contacts 12 and the armature 14 to effect the timed energization of the circuit, and auxiliary equipment in addition to the solenoid 13 and its associated parts which upon operation of an initiating means effects the energization of the solenoid. This latter equipment includes a relay 16, and a transformer 90 to reduce the applied voltage and may be housed within a single cover member 17. Although the relay alone is shown in Fig. 1 of the drawings in this position, it will be readily understood that these specific disclosures are for purposes of illustration and are readily subject to variation due to the needs and expedencies of the application or particular use of the device.

The relatively movable contacts 12 comprise the parts 18 and 19, the contact 18 being relatively fixed with respect to the base 10 and the contact 19 being relatively movable with respect to both the base and the contact 18. These contacts are mounted in insulated relation upon a bracket 20 which is secured to the base 10 by bolts 21 and dowel pins or other means 22. The insulated relation is obtained by means of a plurality of members comprising insulating material. One of these members comprises a substantially square sleeve 96 encompassing the arm 23 and positioned between the component parts of the arm 24. This arrangement effectually insulates the contact 18 and its correlated electrical parts from the remainder of the apparatus. The contact 19 is insulated from its arm 33 by means of insulating washers 97 and 98 and a tube of insulating material 99. The electrical connection from lead 79 to contact 19 is by way of a projection 100 upon the conducting angle member 101 to which the contact 19 is secured. The tubes and washers effectually insulate this electrical part from the remainder of the apparatus. Other incidental insulating elements are the parts 102 and 103 comprising sheet insulating material which prevents any arc at the contacts 18 and 19 from jumping to the electrically conducting parts of the apparatus. The bracket 20 is so arranged to provide an arm 23, of substantially square cross-section, to which is rigidly secured a metal arm 24. At the extremity of this metal arm is pivotally secured the contact member 18 by means of a pin 25. This contact 18 is positioned in space in a yieldable manner by the spring 26 and the limit stop bolt 27 which limits pivoting movement of the lever 28 at the point 25. A latching device 30 retains this limit stop member 27 in said position and adjustment can be further accomplished by varying the operating characteristics of the spring 26 and the arrangement of the lever arms of the member 28 as well as adjustment of the bracket 31. Electrical connection to contact 18 is attained through the terminal 32. Terminal 19 is likewise pivotally mounted upon bracket 20 and arranged to be relatively movable with respect to contact 18. This is accomplished by the mounting of contact 19 at one end of the lever 33, at which end an electrical connection 34 is made. The lever 33 is pivotally secured by the pin 35 to the bracket 20 and pivots thereabout.

The bracket 20 is also provided with an extending portion 36 to which is secured an adjustable limit stop member 37 which adjustably limits the movement of the lever 33 about the pin 35. The adjustment of this limit stop member 37 predetermines the spacing of the contacts 18 and 19 while in disengaged position. This limit stop engages a projecting portion 38 on the le-

ver 33. Where additional means are desired to assist rapid opening of the contacts and dissipation of inertias of the parts, a further connection between the parts 33 and 36 may be made by a connecting pin 39 having collars or nuts 40 at the opposite extremities thereof, passing through suitable openings 41 and 42 and a spring 43 which is adjustable both as to its inherent characteristics and properties and likewise with respect to the length of the pin 39 and its free length. The adjustable features herein named and the adjustable features with respect to the parts 26, 27 give multiple compensation and adjustment. To the extending portion 44 of lever 33 may, if desired, be added counter-weights in secured relation thereto, which weights may be used to effect rapid opening of the contacts and eliminate unbalanced forces. The description so far has been limited to the relatively movable contacts 18 and 19 and their movement and adjustment about the bracket 20. These two contacts effect the energization of the circuit being timed and may preferably be directly in the circuit unless otherwise controllably associated therewith.

The immediate means for effecting the timed engagement of contacts 18 and 19 comprises the solenoid 13 and its armature 14. The solenoid is mounted rigidly against the base 10 and comprises the laminated core 45 and laminated armature 46. To this laminated armature 46 is secured an armature extension member 47 which is relatively fixed in space by means of the bearing 48 of bracket 49, which bracket is likewise secured to base 10 by bolts 21 and dowel pins 22. At the lower end of the armature 47 are adjustable members comprising a bolt 50 and lock nut 51 arranged for screw threaded engagement 52 with the armature 47. This adjustment may, if desired, be such as to engage the projecting arm 44 of the lever 33 if the contacts 18 and 19 should stick and provide a hammer blow to additionally open the said contacts. These adjustable elements may be adjusted in such a manner as to preclude engagement under normal operation and to only engage the said parts under conditions of adverse operation such as the said sticking of the contacts, the normal operation being such that the contacts open of their own initiative after the cam engagement is complete.

Further inertia devices comprise the spring mechanism 53 and its component parts at the top of the solenoid to absorb inertias at the completion of the upward stroke, which spring is likewise adjustable both as to its characteristics and to its adjusted relation in position. Upon the armature 47 may likewise be secured the bracket 54 having an adjustable means 55 and 56 for engagement with the member 57 which is secured to the bracket 49 and may comprise shock absorbing mediums such as rubber or some other means. It should be readily understood that the shock absorbing mediums may likewise take other forms, for example dash pots or such other means as are suitable, although the disclosed construction has been found entirely satisfactory.

Interconnecting the armature 14 and the contacts 12 is a cam means 15 effecting the engagement of the contacts when the armature 14 operates. This means comprises a cam member 58 secured to the lever 33 and a cam member 59 secured to armature 47. The cam member 58 has a control surface 60 which determines

the timing engagement of the contacts. This surface may be longer or shorter and may be spaced nearer or farther away from the cam member 59 in its position in space. The cam member 59 is preferably secured to armature 47 by a pivotal connection. Such a connection in one form is by means of a pin 105 which has a suitable connection with the part 47 and is secured thereto by a set screw 106. Obviously other arrangements may be utilized, although this connection has been found satisfactory. Positioned about the pin 105 is a spiral spring 107 which may be connected to pins 108, 109, or the springs themselves may have extending terminal portions which may be received in slots at these locations. The cam 59 may preferably have a hardened roller 110, although other arrangements can as readily be used. The cam and pin are so associated with the armature by means of a depression or slotted portion 111, which portion has a defining side wall providing a limit stop 112 and a diagonally extended wall portion 113 to facilitate the operation of the cam as well as to limit its pivotal motion about its axis. The cam 59 engages cam 58 during upward movement and operates the timer but on the return stroke the cam 59 pivots and rides freely by cam 58.

Adjustment of contact 18 further to the right in its position in space will provide a longer contact period between the parts 18 and 19 with respect to the position in time of cam engagement, whereas the position of the said contact 18 further to the left provides a shorter period of contact engagement under the influence of the cams. Adjustment of the limit stop 37 may position contact 19 closer or farther away from the contact 18 in its disengaged spaced position. This adjustment extends or shortens respectively the period intervening between the beginning of motion by cam 59 and its engagement with cam surface 60. The engagement of contacts 18 and 19 may be arranged for short or long periods of engagement or spaced relation of non-engagement, either before or after cam engagement, or during cam engagement and/or independently of the cam surfaces or by means of the cam surfaces and/or combinations thereof.

The timing of the apparatus readily follows as actuation of solenoid 13 moves armature 14 and through the intermediation of cams 15 closes contacts 12. This effects the timed energization and effective termination of the energization of the circuit. The solenoid 13 may be operated directly or through transformer connections from the main power line and its energization and de-energization may be controlled from an initiating means in the nature of a push button, treadle or pressure operated switch upon or associated with the electrodes. The solenoid 13 may be preferably connected through the interposition of potential transformers reducing the voltage from the power lines to a low control equipment voltage to insure safety to operators as well as to materially limit the danger of damaged equipment. In any event the solenoid should be connected to a source of substantially constant voltage so as to have a substantially constant time cycle of operation.

One manner of electrically connecting the timer for operation is shown in Fig. 8. A hand operated tool 70 as shown or a pedestal machine or some other type machine may be controlled by the timer. Associated with the cylinder 71, is a pressure operated switch 72 having leads 73

and 74. Upon positioning of the welding tool with respect to the work and application of pressure the electrode elements 76 and 77 are forced together upon the work. When this electrode engagement with the work reaches the proper predetermined such engagement, the pressure operated switch 72 will be actuated and in turn cause the timer to operate and send a welding impulse through the welding circuit which comprises a primary circuit 80 of welding transformer 81 having primary and secondary windings 82 and 83, respectively, the secondary 83 being connected by leads 84 to the electrodes 76 and 77. One of the primary leads 80 connects the transformer to the power source 78 and the other lead 80 passes through the contacts 18 and 19 to the other side of the power source by means of the line 79. With the connection shown, the solenoid 13 is operated by the closure of the circuit from relay 16 to contacts 90' and 91'. This arrangement is such that the control circuit is of low voltage. The circuit of relay 16 is connected to the low voltage side of a transformer 90 having a high voltage primary 91 of possibly 220 volts and a low voltage secondary 92 of possibly 15 or 20 volts. This secondary is connected through leads 74 and 93 to the pressure operated switch 72 and the one side of the relay 16, the other connection of relay 16 being by means of lead 73 to the switch. This arrangement of connections can be materially simplified if it were desired to have the solenoid 13 operated directly from the switch 72, under which circumstances an equivalent operating circuit would be made by connecting lead 73 to terminal 84 of solenoid 13, allowing terminal 85 to remain connected by lead 86 and the terminal 87, and connecting terminal 88 directly to lead 74. Under this set of connections the relay 16 and transformer 90 would be eliminated, but there would be high voltage in the control circuits which is to be avoided, if possible. The illustrated connections are preferable and provide low voltage. The primary of transformer 90 is connected by leads 94 and 95 to terminals 87 and 88. A second circuit of main line voltage connects terminal 87 by lead 86 to terminal 85 of solenoid 13, and by lead 89 connects terminal 88 to contact 90', the circuit being completed by lead 96 connecting contact 91' to terminal 84.

The operation of the timer is in the following manner. The electrodes being positioned with respect to the work and engagement having been made, switch 72 operates due to air pressure conditions or is a push button or treadle operated switch or some other means arranged to effect energization of relay 16 which in turn closes contacts 90' and 91' energizing the circuit of solenoid 13. Relay 16 is illustrated in the wiring diagram as having a movable contact and a fixed contact providing relatively movable contacts thereby, but can equally well be of the type shown in Fig. 1 wherein there is provided a movable armature 114 which engages the two contact elements 115. Any other suitable form of relay may equally well be used. This in turn raises armature 14 and causing a consequent engagement of the cams 58 and 59 in their turn effect a timed engagement of contacts 18 and 19, closing the primary circuit of the welding transformer 81 and passing an impulse of effective welding energy from the leads 84 to the electrodes 76 and 77. The apparatus automatically

re-sets itself and is ready for a consequent second welding operation, and in practice these devices are making hundreds and/or thousands of operations per day.

Figs. 5, 6, and 7 show the parts of the timer in operation, Fig. 5 showing the contacts 18 and 19 in engagement effectuating the timed energization of the circuit, Fig. 6 showing these parts after the cam 59 has passed beyond the operative position, and in Fig. 7 showing the cam 59 tilted in its downward movement showing that in this direction of movement the cam is ineffective to close the contacts 18 and 19.

I aim to cover the generic spirit of my invention by the hereto appended claims wherein the specific terminology is not to be construed as a limitation, but merely as a circumspective form of definition.

What I claim is:

1. A timing device for electric circuits comprising a pair of pivotally mounted contacts in said circuit biased to open position, one of said contacts being relatively fixed but having fine adjustment means for adjusting its distance from the other contact and means yieldingly biasing it toward the other contact, the other contact being biased away from the first contact and having fine adjustment means for adjusting its position with respect to the first-named contact, a cam associated with said last named contact and a rectilinearly movable cam actuator, timing solenoid and armature means for actuating said rectilinearly movable cam into engagement with said first cam to close the contacts for a constant predetermined time each time the solenoid is actuated, depending upon the distance between the contacts, the adjusted relation of the cams, and characteristics of the solenoid and armature.

2. A timing device for electric circuits comprising a pair of pivotally mounted contacts in said circuit biased to open position, said contacts having fine adjustment means associated therewith to adjust the distance between the contacts when in open position, a cam device associated with one of said contacts, a rectilinearly movable actuator having a predetermined time constant and carrying a cam device for engagement with the cam device of said contact and active in one direction of movement of the actuator to time the closing of the circuit through said contacts, but inactive to operate the contact on the reverse movement, fine adjustment means for adjusting the relative position of said cam devices to accurately determine the linear extent of the engagement of the cam devices and thus the time of closure of the circuit.

3. A timing device for electric circuits comprising relatively movable contacts in the circuit, cam means arranged to effect closure of said contacts, a reciprocating actuator arranged to effect the operation of said cam means, said cam means arranged to be effective in one direction of movement of said actuator and non-effective in the opposite direction of movement thereof, time-controlled means for moving said actuator in its actuating movement each time at the same predetermined speed for uniform timing of the successive closures of the circuit, and means operable in the closed position of said contacts to effect a positive opening of the contacts in the return movement of the actuator.

EDWARD G. BEIDERMAN,