C. M. AGNEW.

ELECTRIC WELDING MACHINE.

APPLICATION FILED MAY 4, 1914.

1,166,648.

Patented Jan. 4, 1916.

2 SHEETS—SHEET 1.

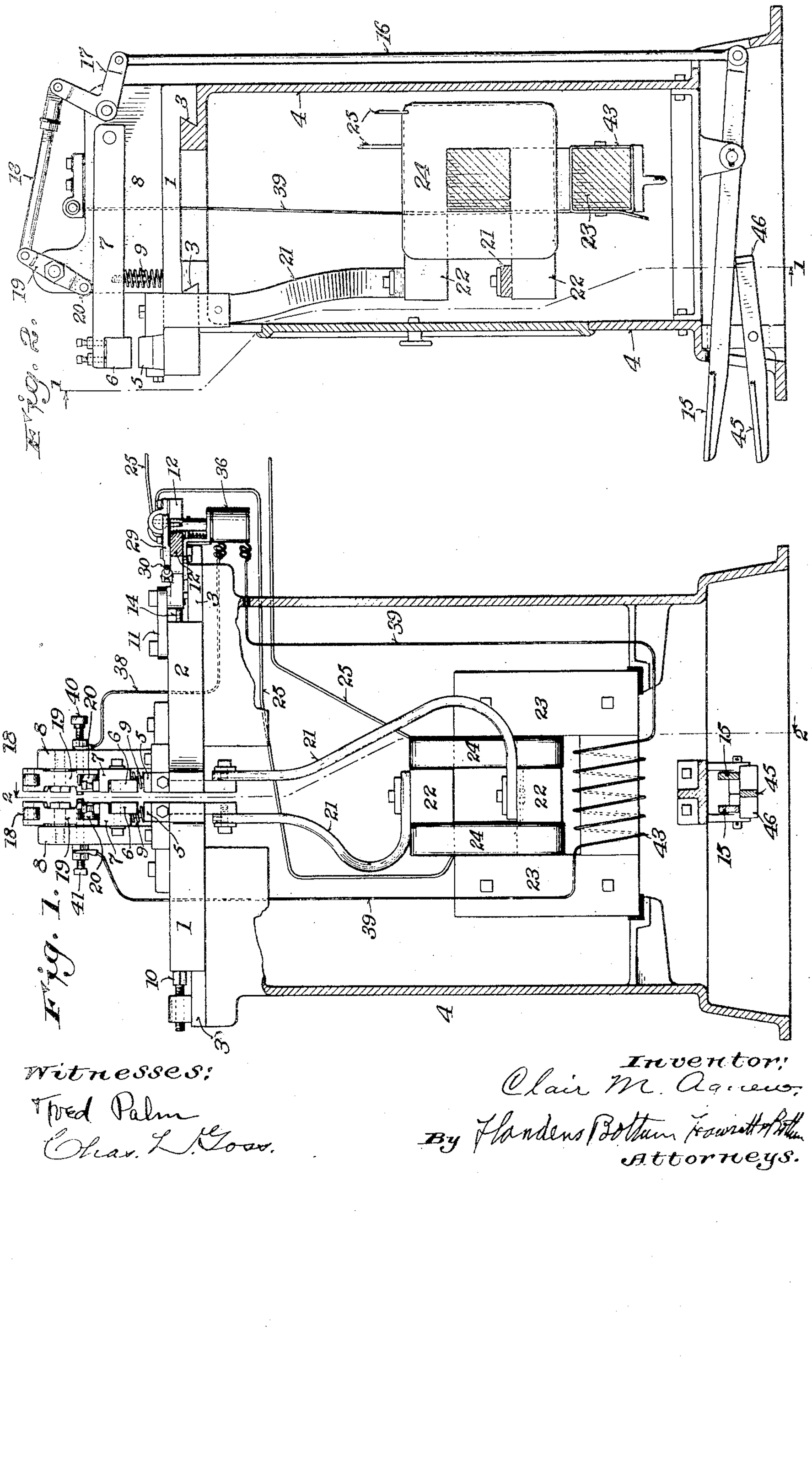

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Fig. 6.

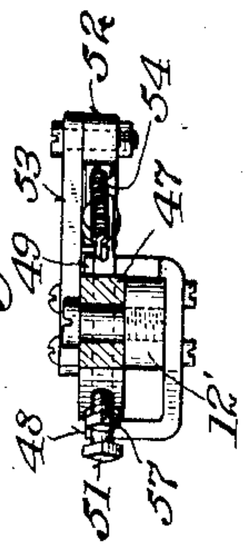


Fig. 5.

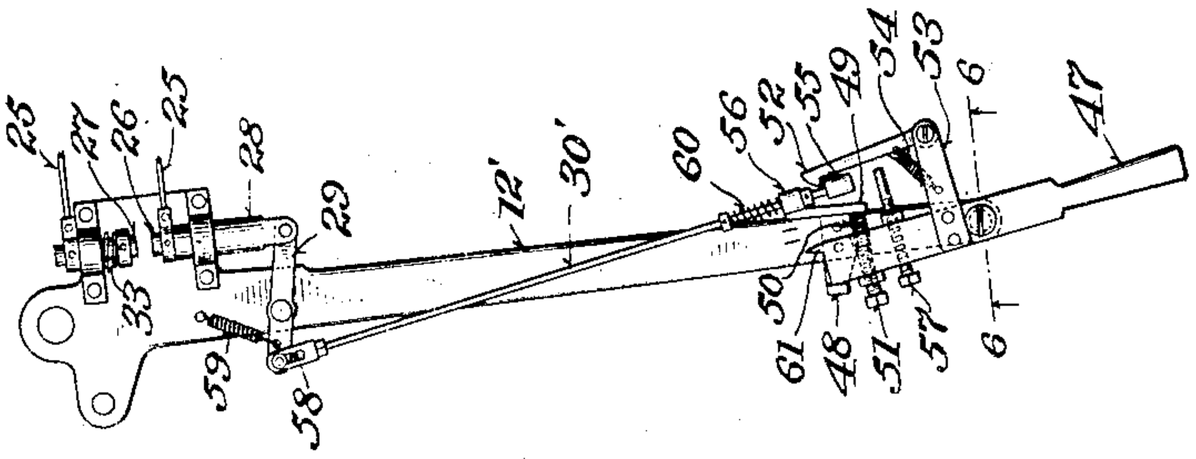


Fig. 3.

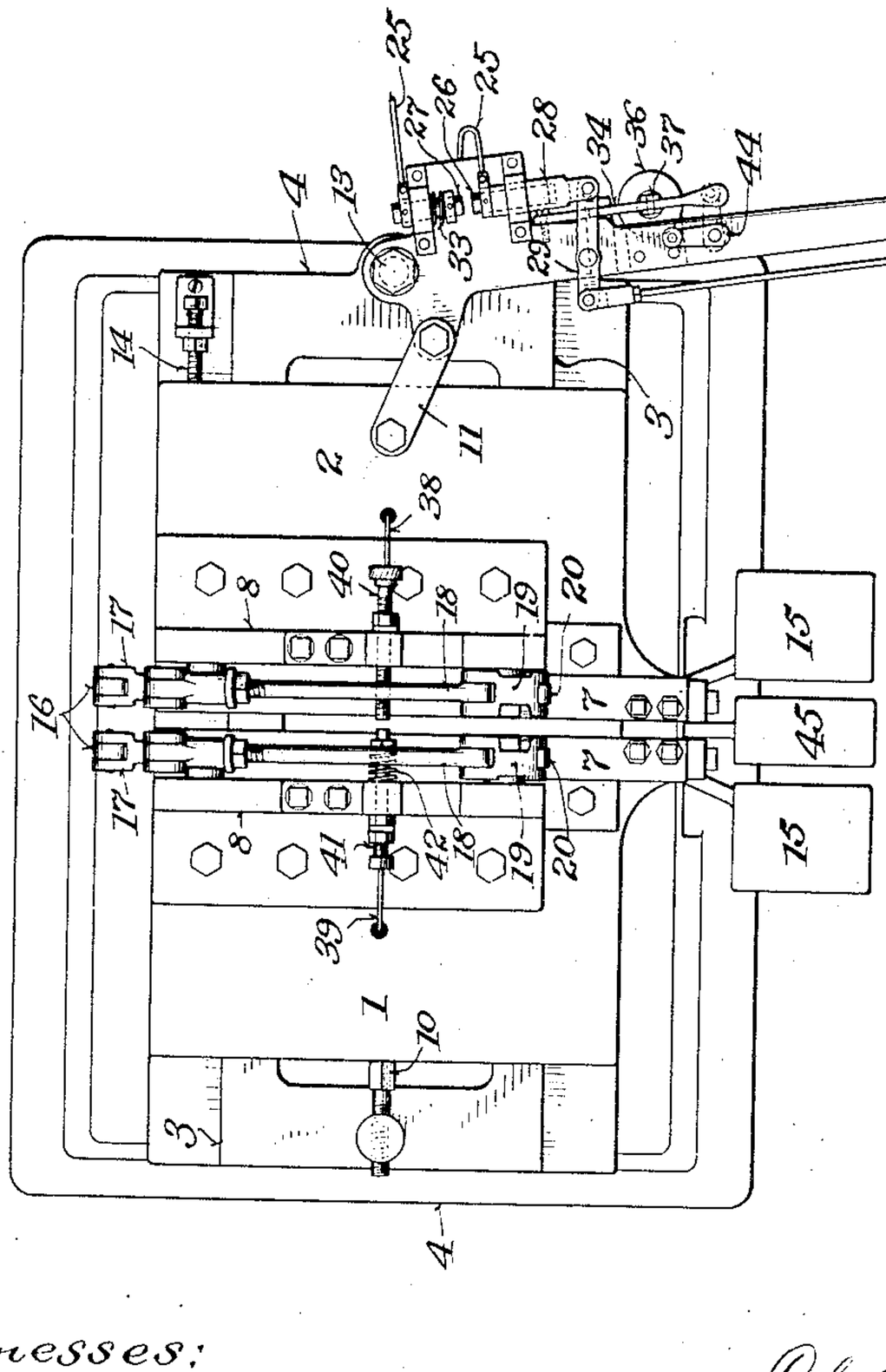
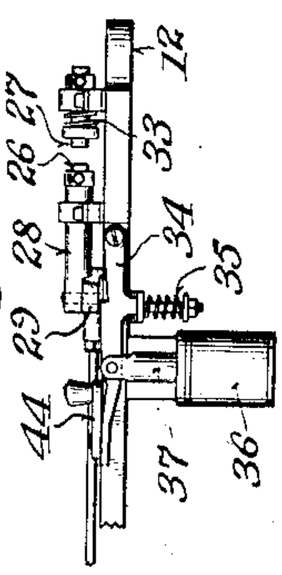


Fig. 4.



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UNITED STATES PATENT OFFICE.

CLAIR M. AGNEW, OF MILWAUKEE, WISCONSIN.

ELECTRIC WELDING-MACHINE.

1,166,648. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed May 4, 1914. Serial No. 836,070.

To all whom it may concern:

Be it known that I, CLAIR M. AGNEW, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Electric Welding-Machines, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates more particularly to "butt-welding" machines, so-called, and its main objects are to facilitate the control or closing of the electric circuit by the operator; to automatically open the circuit when the proper weld has been effected; to enable the operator to determine and regulate the degree of pressure applied to a weld; to prevent overheating the metal and waste of time and power; to readily predetermine the amount of upset of metal parts of any given cross section to produce proper welds; to produce better and more uniform welding; and generally to improve the construction and operation of machines of this class.

It consists in the construction, arrangement and combination of parts as hereinafter particularly described and pointed out in the claims.

In the accompanying drawing like characters designate the same parts in the several figures.

Figure 1 is a view partially in front elevation and partially in vertical section on the line 1—1, Fig. 2, of a machine embodying the invention; Fig. 2 is a vertical section on the line 2—2, Fig. 1; Fig. 3 is a plan view of the machine; Fig. 4 is a side elevation of the circuit closing, locking and releasing device as viewed from the right relative to Fig. 3; Fig. 5 is a plan view of a modification of the clamp operating lever and circuit controlling devices connected therewith; and Fig. 6 is an enlarged cross section on the line 6—6, Fig. 5.

Referring to Figs. 1, 2, 3 and 4, the machine comprises two clamping members mounted on slides 1 and 2, fitted and movable on transverse horizontal ways 3, on the top of a box frame 4. Each clamping member consists of a pair of jaws 5 and 6, the lower jaws 5 being detachably mounted upon and secured to the slides 1 and 2, and the upper jaws 6 being adjustably and detachably fastened to arms 7, which are pivoted at their rear ends to standards 8, on said slides. The jaws 6 are moved upwardly from the relatively stationary jaws 5, and are normally held separated therefrom by springs 9 interposed between said slides and the arms 7.

The relatively stationary clamping member which is mounted on the slide 1, is held in place against the pressure exerted upon the pieces to be welded by an adjustable stop 10. The slide 2 of the movable clamping member is connected by a link 11 with a hand lever 12, which is fulcrumed at 13 on the top of the frame 4 at one side thereof. An adjustable stop 14, limits the movement of the slide 2 away from the slide 1, and determines the degree of separation of the clamping members by the lever 12.

The vertically movable jaws 6 of the clamping members are forced against the tension of the springs 9 toward the jaws 5, and the parts to be welded are clamped and held between said jaws by treadles or foot levers 15, which are fulcrumed in the base or lower part of the frame 4, and are connected at their rear ends by rods 16 with rearwardly projecting arms of bell crank levers 17, which are fulcrumed at their elbows on the standards 8 of the slides 1 and 2 respectively the joints between the rods 16 and levers 15 and 17 are sufficiently loose to permit the movement of the slide 2 by the lever 12, and the adjustment of the slide 1 without causing the operating connections of the jaws 6 to bind. The upwardly projecting arms of the levers 17 are adjustably connected by rods 18 with the upper ends of levers 19, which are fulcrumed on the standards 8, and are provided at their lower ends with rollers 20, engaging the upper sides of the arms 7.

The jaws 5, which serve also as electrodes for conducting current to the parts to be welded, are connected by flexible conductors 21 with the secondary coil or conductor 22 of a transformer, which is inclosed in the box frame 4. The coil or conductor 22, which is U-shaped, embraces the upper limb of an annular or four-limbed laminated core 23. The transformer has two primary coils or conductors 24, surrounding the upper limb of the core 23 on each side of the secondary coil or conductor 22, and these primary coils are connected, as shown in Figs. 1 and 3, by wires or conductors 25, with an electric generator or source of current (not shown), and with normally separated contact pieces

26 and 27, which for convenience are called closing-contact pieces, and are mounted on the laterally extended shank of the clamp operating lever 12. The contact piece 26 is removably fitted in or attached to a holder 28, which is guided in a bearing on the lever 12 and is movable toward and from the contact piece 27. The holder 28 is pivoted to one end of a transverse lever 29, which is fulcrumed on the lever 12 and is connected at its opposite end by a rod 30 with an angular hand grip 31, pivoted to the lever 12 adjacent to its handle, as shown in Fig. 3. A spring 32, interposed between the lever 12 and the hand grip 31, tends to retract the contact piece 26 and hold it out of engagement with the contact piece 27. The contact piece 27 has a sliding bearing on the lever 12 and is yieldingly held projected toward the contact piece 26 by a spring 33, to insure good electrical contact between said contact pieces when they are brought together. A latch 34, pivoted to the outer side of the lever 12, is adapted by engagement with the lever 29, to hold the contact pieces 26 and 27 in engagement with each other when they are brought together. A spring 35, shown in Figs. 1 and 4, tends to hold the latch 34 in engagement with the lever 29. A magnet 36, whose plunger 37 is connected with the latch 34, operates when energized, to withdraw the latch against the tension of the spring 35 from engagement with the lever 29. The winding of magnet 36 is connected by wires 38 and 39 with contact pieces 40 and 41, which are mounted upon and insulated from the standards 8 of the clamping members, in axial alinement with each other. The wire or conductor 39 is formed into or connected with an auxiliary secondary coil 43 on the lower limb of the transformer core 23. The contact pieces 40 and 41 for convenience are called cut-out contact pieces. The contact piece 40, made in the form of a screw which is threaded in an insulated block, is adjustable toward and from the contact piece 41, being locked in adjusted position by a nut which serves also to clamp and fasten the terminal of the wire 38 to the insulated block in which the screw is threaded. The opposing contact piece 41 with which the terminal of the wire 39 is connected between two clamping nuts, is fitted to slide in the insulated block mounted on the standard 8 of the slide 1, and is yieldingly held projected toward the contact piece 40 by a spring 42 interposed between said insulated block and a collar fastened on the contact piece, which is made in the form of a partially threaded bolt.

The latch 34 is formed or provided, as shown in Figs. 3 and 4, with a handle, by which it can be manually operated if desired, to release the lever 29 and permit the separation of the contact pieces 26 and 27 independently of the magnet 36. A detent 44 is pivoted on the lever 12 and adapted to be turned into position as indicated by dotted lines in Fig. 3, to hold the latch 34 out of engagement with the lever 29, so that the circuit may be opened as well as closed by the hand grip 31 at the will of the operator.

The lever connections for closing the jaws 5 and 6 of the clamping members are constructed and adjusted so that the axes of the rollers 20 will pass backward beyond a vertical plane intersecting the fulcrums of the levers 19, and thus lock and hold the upper jaws 6 in closed position when the levers 15 are depressed.

To facilitate throwing the lower ends of the levers 19 forward and releasing the jaws 6, the machine is provided with a treadle or foot lever 45 located between the levers 15 and having a cross piece 46 at its rear end adapted by engagement with the levers 15 on the under side thereof to lift their front ends when said lever 45 is depressed.

In the operation of the machine, as hereinbefore described, the jaws 6, the stops 10 and 14, and the cut-out contact pieces 40 and 41 having been properly adjusted for butt-welding metal parts of a given thickness or section, the parts to be welded are clamped between the jaws 5 and 6 by depressing the levers 15. The operator then grasping the hand grip 31 with the handle of the lever 12, moves the contact piece 26 into engagement with the contact piece 27, thereby closing the circuit through the primary coils or conductors 24 of the transformer and inducing a welding current in the secondary coil or conductor 22 of the transformer, conductor 21, clamping jaws 5, and the parts to be welded, which are gripped and held between said jaws and the jaw 6, the clamping members and the parts held thereby being forced together by the operator pulling the lever 12 toward him. When the primary circuit of the transformer is closed by means of the hand grip 31, the latch 34 is forced upward by the spring 35 into engagement with the lever 29, thereby locking and holding the contact piece 26 in engagement with the contact piece 27. As soon as the parts to be welded, which are heated to a welding temperature while they are subjected to pressure, have been upset sufficiently to permit the contact piece 40 to be brought into engagement with the contact piece 41, the circuit including the magnet 36 and the coil 43, is closed, and the magnet being thus energized by the current induced in the coil 43, retracts the latch 34 and releases the lever 29, whereupon the contact piece 26 is separated from the contact piece 27 by the spring 32, thereby breaking the primary circuit of the transformer and cutting off the welding current while the parts at a welding temperature are still subjected to pressure.

In the adjustment of the cut-out piece 40 for welding parts of a given thickness or section, it is set at a distance from the contact piece 41 equal to about one-half the thickness of the parts to be welded when they are held between the jaws of the clamping members in contact with each other. This provides for the requisite upsetting of the metal to produce a good weld when the parts to be welded are sufficiently heated and forced together, and relieves the operator of the care and attention required to cut off the current at the proper time in making a weld.

By depressing the lever 45 the front ends of the levers 15 are thrown upwardly and the lower ends of the levers 19 are swung forwardly, thereby releasing the jaws 6 and permitting them to be thrown upwardly by the springs 9. The work being thus released by the clamping jaws, the slide 2 with the jaws mounted thereon, is withdrawn by the lever 12 to its original position against the stop 14 for making another weld.

Under certain conditions it is sometimes desirable to enable the operator to open as well as to close the circuit manually, independently of the magnet 36 and the cut-out contact pieces 40 and 41. To accomplish this the detent 44 is turned outwardly into position, as indicated by dotted lines in Fig. 3, to hold the latch 34 out of operative position relative to the lever 29. The circuit is then kept closed by the grasp of the operator pressing the hand grip 31 toward the handle of the lever 12. The circuit is opened at will by the operator releasing his grasp of the hand grip 31 and thus permitting the spring 32 to withdraw the contact piece 26 out of engagement with the contact piece 27.

To enable the operator to determine and regulate the pressure applied to a weld and further facilitate controlling the electric current or closing the circuit, the clamp operating lever 12′ is preferably provided, as shown in Figs. 5 and 6, with a pivoted handle 47, having a limited movement independent of said lever between opposing stops 48 and 49. A spring 50 interposed between the stop 49 and an adjusting screw 51, threaded in the shank of the handle transversely thereto, holds the handle normally in the position in which it is shown with its shank against the stop 48, the screw 51 being locked in adjusted position by a jam nut. A hook or dog 52, pivoted to an arm 53, projecting laterally from the handle shank, is held by a spring 54 normally in engagement with the head 55 on a rod 30′, which is pivotally connected with the lever 29, and is guided by a bearing 56 on the lever 12′. The shank of the handle is provided with an adjustable trip for disengaging the hook or dog 52 from the head 55, when the handle 47 is turned on its pivot to the left or toward the machine and the spring 50 is compressed to a certain extent. This trip consists, as shown, of a screw 57, threaded in the handle shank transversely thereto and secured in adjusted position by a jam nut. With this construction of the clamp operating lever and circuit closing mechanism, the latch 34, the cut-out contact pieces 40 and 41 and the magnet 36 may be omitted, but for certain kinds of work they are desirable, and the machine is preferably supplied with such parts so that the same amount or degree of upset in different welds may be obtained without care or attention on the part of the operator. For this reason the end of the rod 30′, which is connected with the lever 29, is formed with a slot 58, and a retracting spring 59 is connected with said lever to permit the hook or dog 52 to release the rod 30′ without releasing the lever 29 and permitting the contact piece 26 to close the circuit when a certain degree of pressure is exerted on the lever handle 47 before the parts being welded have been upset to the desired extent. The rod 30′ is also provided with a retracting spring 60 interposed between a collar thereon and the bearing 56 so as to return the rod to its initial position before the lever 29 is released by the latch 34 to permit the spring 59 to withdraw the contact piece 26 from engagement with the contact piece 27.

To enable the operator to determine approximately the pressure exerted by the lever 12′ on a weld and by comparison to subject successive welds of like articles to corresponding pressures, the shank of the handle 47 is provided with an index or pointer 61 and the adjacent face of the lever is provided with a scale.

In the operation of the machine with the hand lever 12′ and circuit controlling devices constructed as shown in Figs. 5 and 6 without using the latch 34, the tension of the spring 50 and the trip screw 57 having been adjusted to release the contact piece 26 when a certain pressure is exerted on the weld, the initial movement of the handle 47 to the left compresses the spring 50, applies more or less pressure to the work according to the adjustment of said spring, and thrusts the contact piece 26 into engagement with the contact piece 27, thereby closing the circuit through the primary windings 24 of the transformer and inducing a current through the secondary conductor 22 and parts to be welded. After the circuit is closed the pressure may be gradually or rapidly increased or varied at will, but when it is increased to a certain degree, depending upon the adjustment of the spring 50 and the trip screw 57, the hook or dog 52 is thrust by the trip screw out of engagement with the head 55 of rod 30′, thereby releasing the lever 29 and permitting the springs 59 and 60, or either of them in case but one is used, to withdraw the contact piece 26 from engagement with

the contact piece 27 and thus break the circuit. When the handle 47 is released by the operator, the spring 50 returns it to its initial position relative to the lever 12′ and carries the hook or dog 52 into engagement with the head 55, so that the circuit may be closed through and pressure applied again to the same weld if desired, or another weld may be made. The yielding contact piece 27 permits further movement of the contact piece 26 and of the handle 47 relative to the lever 12′ after the circuit is closed, in order to increase the pressure on the weld by further compression of the spring 50.

In connection with the latch 34, magnet 36 and cut-out contact pieces 40 and 41 for automatically breaking the primary circuit of the transformer when a certain amount of upset of the parts being welded has been effected according to the adjustment of the contact piece 40, irrespective of the pressure to which the weld is subjected, the hand lever 12′ and circuit controlling devices shown in Figs. 5 and 6, operate as follows: The spring 50 having been adjusted by the screw 51 and the trip screw 57 having been set to exert the desired initial pressure on the weld and to disengage the hook or dog 52 shortly before the contact pieces 40 and 41 would ordinarily be brought together, the initial movement of the handle 47 to the left against the resistance of the contacting parts to be welded, compresses the spring 50, and through the connection of said handle with the lever 29 closes the primary circuit of the transformer. The latch 34 engaging with the lever 29, prevents the separation of the contact pieces 26 and 27, until the latch is withdrawn by the magnet 36. The operator now controls the pressure exerted through the lever 12′, increasing or varying it at will, such pressure being approximately indicated by the pointer 61 on the scale, until the trip screw thrusts the hook or dog 52 out of engagement with the head 55. The rod 30′ being thus released, is thrust by the spring 60 back to its initial position without effect on the lever 29 because of its slotted connection therewith. The pull of the operator on the lever 12′ being continued, as soon as the contact piece 40 is brought into engagement with the contact piece 41, the circuit is closed through the magnet 36 and coil 43, and the magnet being thus energized, retracts the latch 34, releasing the lever 29 and permitting the spring 59 to withdraw the contact piece 26 from the contact piece 27 and open the primary circuit of the transformer, while the weld is subjected to pressure. Thus the preliminary pressure to which the weld is subjected after the circuit is closed, is determinable and variable by the operator below a certain maximum limit dependent upon the adjustment of the spring 50 and of the trip screw 57, and after that limit is reached the circuit is broken automatically when the weld has been upset to such an extent as will permit the contact piece 40 to engage the contact piece 41.

Various modifications in the construction and arrangement of parts other than those shown and described may be made, without departing from the principle and scope of the invention as defined in the following claims.

I claim:

1. In an electric welding machine the combination of clamping members, one of which is movable toward and from the other, provided with insulated cut-out contact pieces one of which is adjustable relative to the member on which it is mounted toward and from the other, a source of current connected with the clamping members and with said contact pieces, a lever connected with the movable clamping member for applying pressure to a weld, circuit controlling mechanism comprising normally separated closing contact pieces one of which is movable and has an operating connection with said lever, a spring actuated latch for holding said closing contact pieces in engagement with each other, and a magnet in circuit with the cut-out contact pieces adapted when said contact pieces are brought together to retract said latch and break the circuit.

2. In an electric welding machine the combination with clamping members, one of which is movable toward and from the other, having electric circuit connections, of a lever for applying pressure to a weld connected with the movable member and provided with a pivoted handle and with stops for limiting the independent movement of the handle, circuit controlling mechanism comprising contact pieces one of which is movable toward and from the other, a lever connected with the movable contact piece, a spring tending to retract the movable contact piece and to break the circuit, a rod connected with the contact lever and guided on the clamping lever, a dog connected with the pivoted lever handle and adapted by engagement with said rod to close the circuit during the initial advance movement of the handle, a spring tending to hold the handle in its initial position, and a trip on the handle adapted to disengage the dog from said rod and release the movable contact piece at a predetermined point in the independent advance movement of the handle.

3. In an electric welding machine the combination with clamping members, one of which is movable toward and from the other, having electric circuit connections, of a lever for operating the movable member and applying pressure to a weld and provided with a pivoted handle and with stops for limiting the independent movement of the handle, circuit controlling mechanism comprising

contact pieces one of which is movable toward and from the other, a lever connected with the movable contact piece, a spring tending to retract the movable contact piece and to break the circuit, a rod guided on the clamping lever and connected with the contact lever, a dog connected with the pivoted lever handle and adapted by engagement with said rod to close the circuit during the initial advance movement of the handle, an adjustable spring tending to hold the handle in its initial position and offering variable resistance to its advance movement, and an adjustable trip on the handle adapted to disengage the dog from said rod and release the movable contact piece when the handle is subjected to a predetermined pressure.

4. In an electric welding machine the combination with clamping members having electric circuit connections, one of the members being movable toward and from the other, of a lever for operating the movable member and applying pressure to a weld, provided with a pivoted handle and with stops for limiting the independent movement of the handle, circuit closing contact pieces, one of which is movable toward and from the other, a lever connected with the movable contact piece, a spring tending to retract the movable contact piece and to break the circuit, a rod guided on the clamping lever and having a slotted connection with the contact lever, a spring tending to retract said rod to its initial position, a dog connected with the pivoted handle and adapted by engagement with said rod to close the circuit, a spring tending to hold the handle in its initial position, a trip on the handle adapted to disengage the dog from said rod at a predetermined point in the independent advance movement of the handle, an automatic latch for holding the movable closing contact piece in engagement with the other contact piece, cut-out contact pieces mounted on the clamping members, and a magnet in circuit with the cut-out contact pieces and adapted when they are brought together to retract said latch and release the movable closing contact piece.

5. In an electric welding machine the combination with clamping members, one of which is movable toward and from the other, having electric circuit connections, of a lever connected with the movable member for applying pressure to a weld and provided with a pivoted handle capable of limited movement independently thereof, contact pieces one of which is movable toward and from the other, mounted on said lever, one of said contact pieces being yieldingly mounted, a lever fulcrumed on the clamping lever transversely thereto and connected with the movable contact piece, a rod connected with the contact lever and guided on the clamping lever, a dog connected with the pivoted lever handle and adapted by engagement with said rod to close the circuit during the initial advance movement of the handle, a spring tending to hold the pivoted handle in its initial position and resisting its advance movement relative to the clamping lever, and a trip adapted to disengage the dog from said rod and to release the movable contact piece when the handle is turned to a predetermined extent relative to the clamping lever.

6. In an electric welding machine the combination with clamping members having electric circuit connections, one of said members being movable toward and from the other, of a lever connected with the movable member for applying pressure to a weld and provided with a pivoted handle capable of a limited movement independently thereof, circuit closing contact pieces, one of which is movable toward and from the other, mounted on said lever, a lever fulcrumed on the clamping lever transversely thereto and connected with the movable contact piece, a spring tending to retract the movable contact piece and to break the circuit, a rod guided on the clamping lever and having a slotted connection with the contact lever, a spring tending to retract said rod to its initial position, a dog connected with the pivoted lever handle and adapted by engagement with said rod during the initial movement of the handle independently of the clamping lever to close the circuit, a spring tending to hold the pivoted handle in its initial position and resisting its advance movement independently of the clamping lever, a trip on the pivoted handle adapted to disengage the dog from said rod when the handle is subjected to a predetermined pressure, a latch on the clamping lever adapted to automatically lock the contact lever in position to close the circuit, cut-out contact pieces mounted on the clamping members, and a magnet in circuit with said cut-out contact pieces, adapted when they are brought together, to retract said latch and release the movable closing contact piece.

7. In an electric welding machine the combination with clamping members having electric circuit connections, one of said members being movable toward and from the other, of a lever connected with the movable member for applying pressure to a weld, circuit controlling contact pieces, one of which is movable toward and from the other, mounted on said lever, a lever fulcrumed on said clamping lever transversely thereto and connected with said movable contact piece, an operating rod connecting the contact lever with the handle of the clamping lever, a spring tending to retract the movable contact piece and to

break the circuit, a spring latch pivoted on the clamping lever and adapted to automatically lock the movable contact piece in closed position, a detent for holding the latch out of operative position, cut-out contact pieces mounted on the clamping members, and a magnet connected with the cut-out contact pieces and adapted when they are brought together, to retract said latch and release the movable closing contact piece.

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

CLAIR M. AGNEW.

Witnesses:
CHAS. L. GOSS,
FRED PALM.