A. F. RIETZEL.

ELECTRIC METAL WORKING APPARATUS.

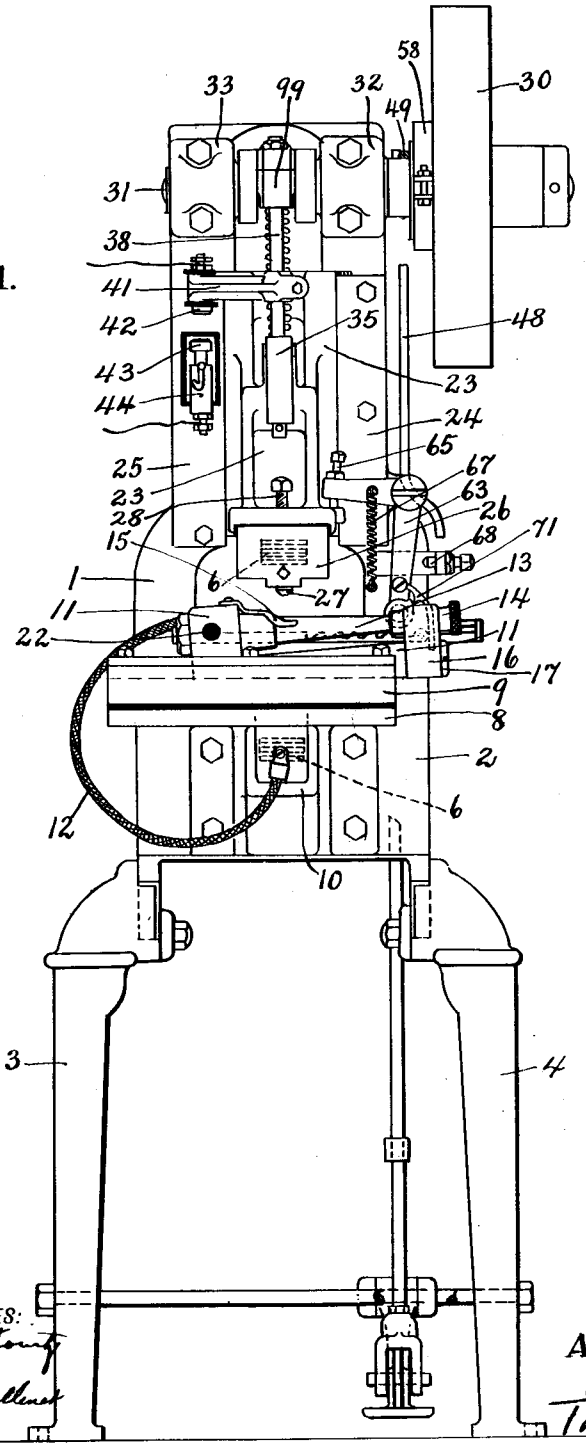
APPLICATION FILED MAY 13, 1909.

1,074,383.

Patented Sept. 30, 1913.

6 SHEETS—SHEET 1.

Fig. 1.




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6 SHEETS—SHEET 2.

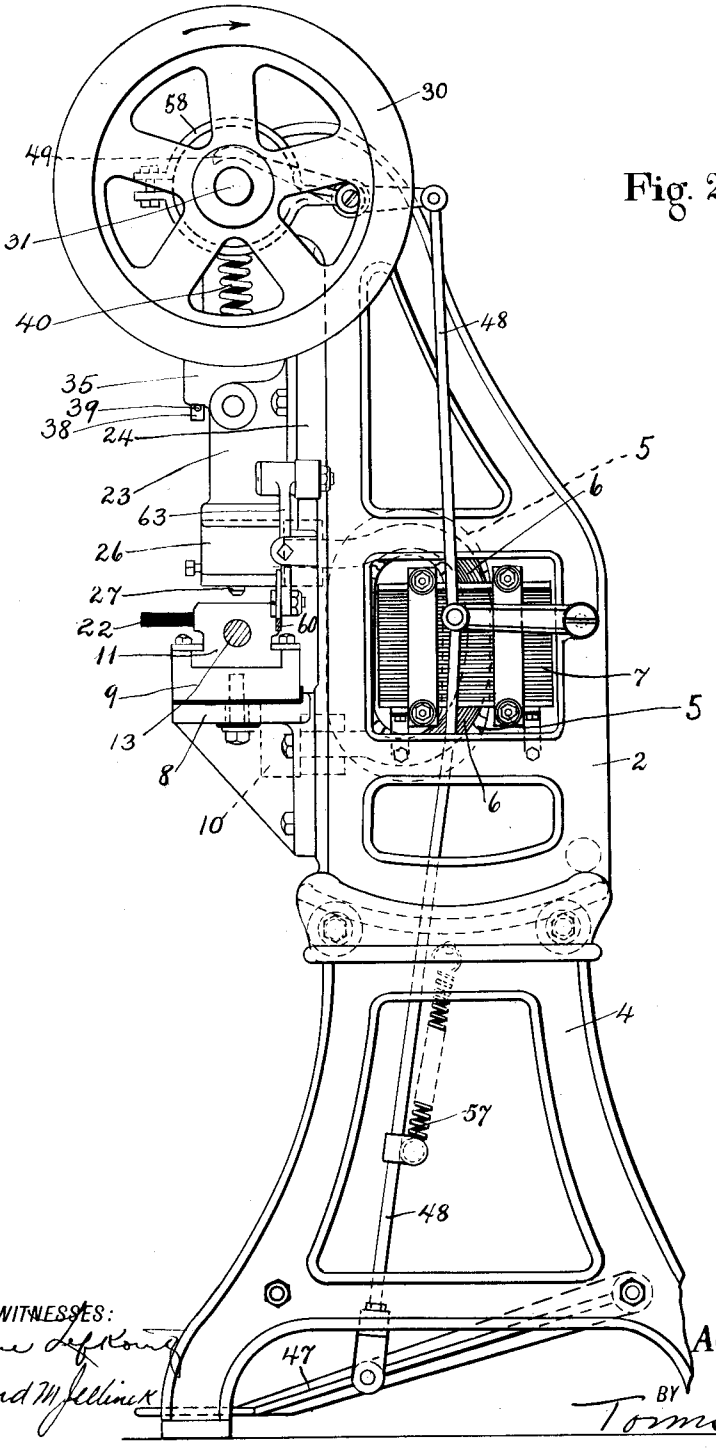



Fig. 2.

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6 SHEETS—SHEET 3.

Fig. 3.

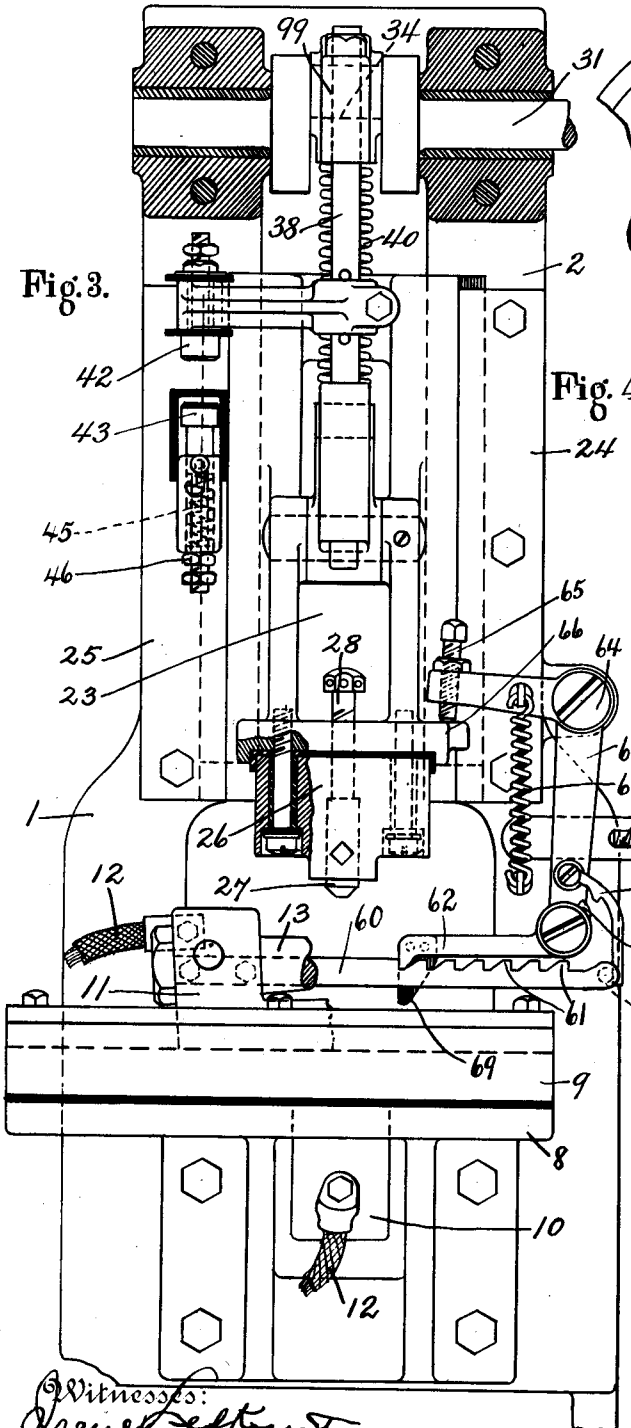
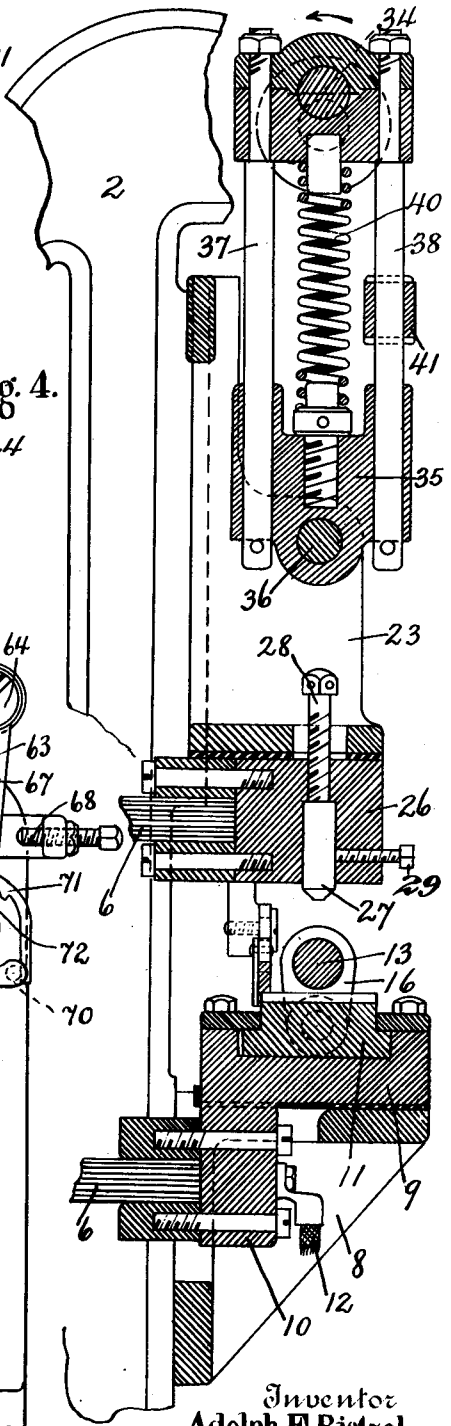



Fig. 4.




Witnesses:

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ELECTRIC METAL WORKING APPARATUS.

APPLICATION FILED MAY 13, 1909.

1,074,383. Patented Sept. 30, 1913.

6 SHEETS—SHEET 4.

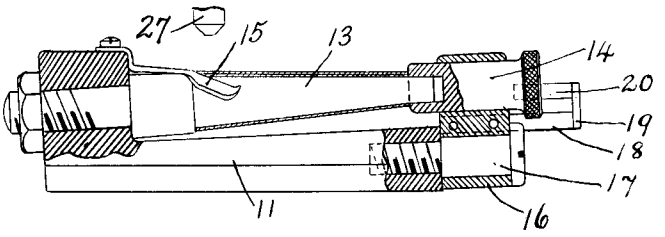



Fig. 5.

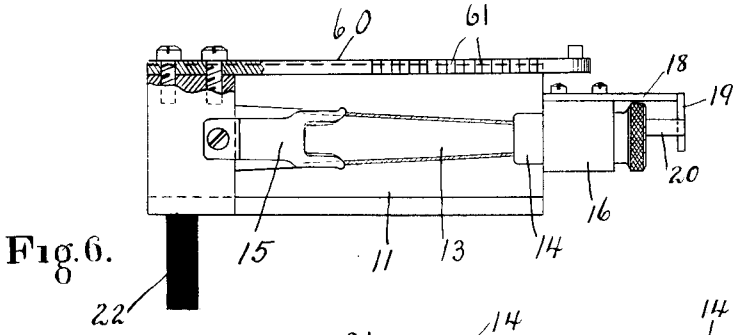



Fig. 6.

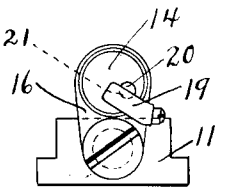



Fig. 7.

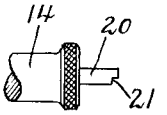



Fig. 8.

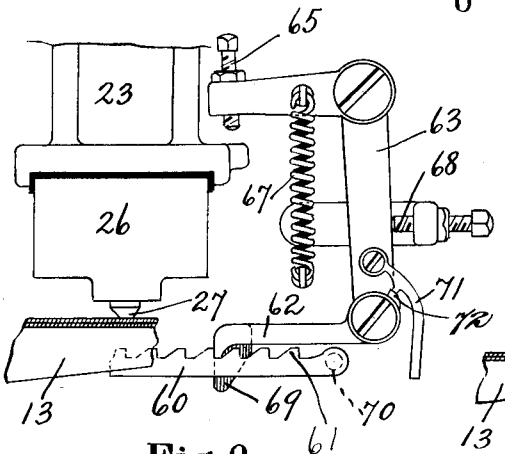



Fig. 9.

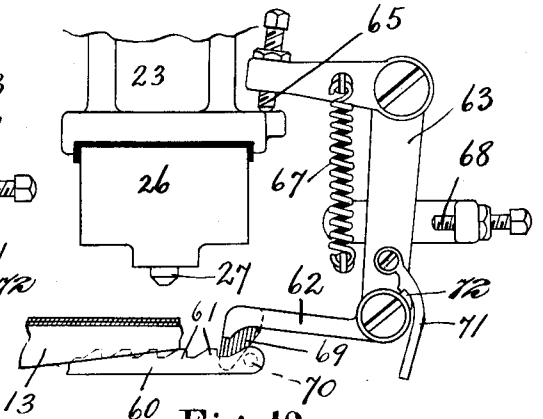



Fig. 10.

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ELECTRIC METAL WORKING APPARATUS.

APPLICATION FILED MAY 13, 1909.

**1,074,383.** Patented Sept. 30, 1913.

6 SHEETS—SHEET 5.

Fig. 11.

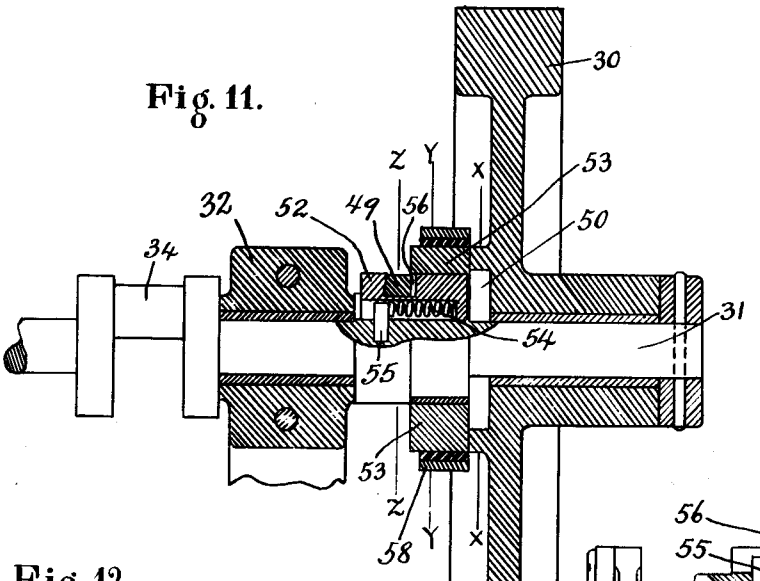



Fig. 16.

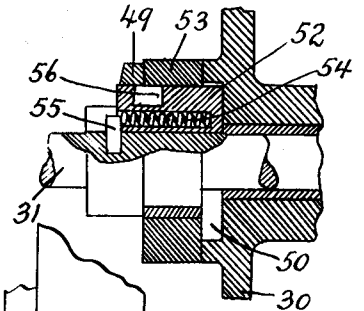



Fig. 12.

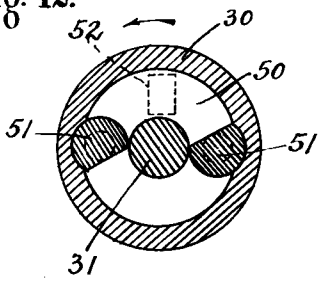
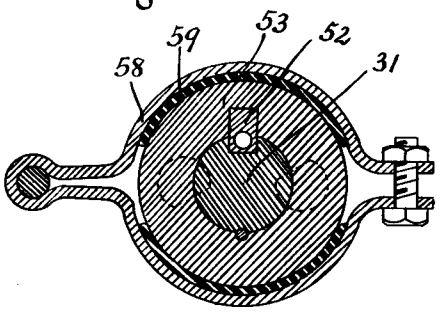






Fig. 15.

Fig. 13.



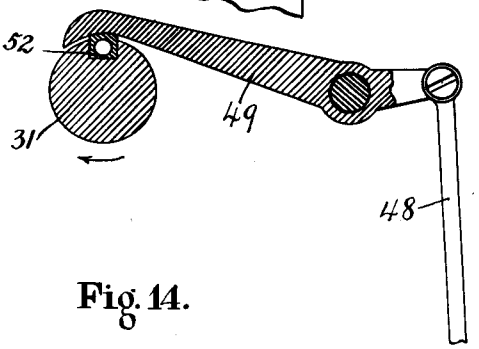




Fig. 14.

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ELECTRIC METAL WORKING APPARATUS.

APPLICATION FILED MAY 13, 1909.

**1,074,383.** Patented Sept. 30, 1913.

6 SHEETS—SHEET 6.

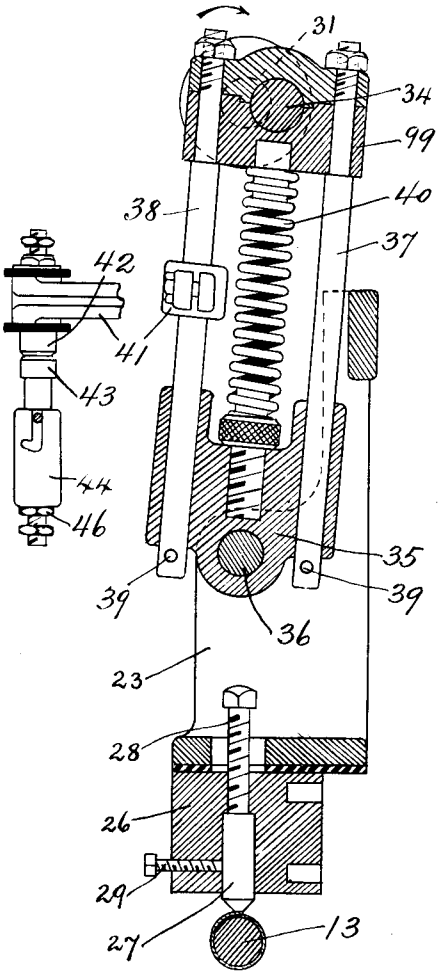



Fig. 17.

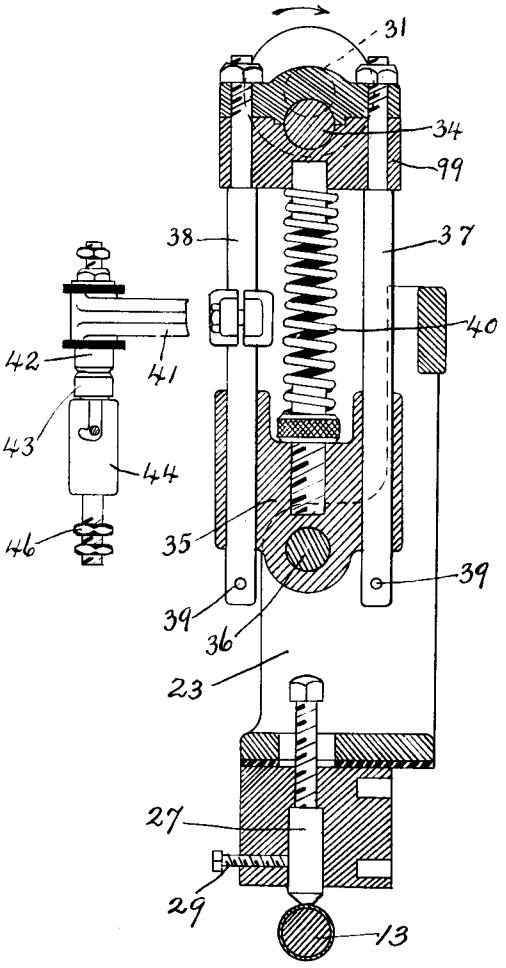



Fig. 18.

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# UNITED STATES PATENT OFFICE.

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## ELECTRIC METAL-WORKING APPARATUS.

1,074,383. Specification of Letters Patent. Patented Sept. 30, 1913.

Application filed May 13, 1909. Serial No. 495,601.

*To all whom it may concern:*

Be it known that I, ADOLPH F. RIETZEL, a citizen of the United States, and a resident of Charlestown, in the county of Washington and State of Rhode Island, have invented certain new and useful Improvements in Electric Metal-Working Apparatus, of which the following is a specification.

My invention relates to electric metal working apparatus wherein the work is heated to the desired extent by the passage of electric currents through the section of metal to be welded or otherwise operated upon and more particularly relates to an apparatus of this class wherein a seam may be welded by a step by step process.

The main object of my invention is to provide means whereby seams may be welded along the overlapping or abutting edges of metal in a quick and economical manner.

A further object of my invention is to provide a machine for doing the above class of work by making a succession of welds along the seam, which welds might be entirely distinct or separated or might overlap to form a continuous weld.

A further object is to provide a simple machine which will automatically control the flow of heating current through the work, the application of the necessary welding pressure and the intermittent feeding of the work to form the successive welds.

To these ends my invention consists broadly in means whereby a seam is formed of a succession of welds which may be separated or distinct or may overlap to form a continuous weld.

My invention consists still further in means whereby the work is mounted on a support connected to one terminal of a source of power, means for moving an electrode connected to the other terminal of said source to and away from said work support and means controlled by the movement of said electrode for intermittently feeding the work past said electrode.

My invention consists still further in the details of construction and combinations of parts hereinafter more particularly described and then specified in the claims.

To illustrate the principle and manner of operation of my invention, I will show and describe the same as carried into effect in a machine adapted particularly to welding the seams of ferrules, but it will be understood that my invention is not limited to this use as it might be employed for welding numerous and various other articles or forms without departing from the spirit thereof.

It will be understood that the apparatus herein shown and described is merely illustrative of one manner of carrying this invention into effect and that the invention is not limited to such specific apparatus but various equivalents might be resorted to without departing from the spirit of this invention, and it will be understood that the claims contemplate all such equivalents as might be employed to carry out the various features of this invention. Also the edges of the metal to be united may overlap or abut according as desired.

In the accompanying drawings, Figure 1 illustrates a front elevation of a machine constructed in accordance with my invention as carried into effect in a machine for welding seams of ferrules. Fig. 2 is a side elevation of the same. Fig. 3 is an enlarged front elevation of the upper part of said machine, parts being broken away. Fig. 4 is a transverse central vertical section of the same. Fig. 5 is a detached side elevation and partial section of the work-support or holder. Fig. 6 is a plan view of the same. Fig. 7 is an elevation of the right-hand end of the device shown in Fig. 5. Fig. 8 is a detached view of a detail. Fig. 9 is a detached view of the work-feeding mechanism preparatory to feeding the work forward. Fig. 10 is a similar view showing the position of said mechanism when the end of the work has been reached. Fig. 11 is a vertical central section and partial elevation through the clutch for coupling the operating parts of the apparatus with the power. Fig. 12 is a transverse section on the line X X Fig. 11. Fig. 13 is a transverse section on the line Y Y Fig. 11. Fig. 14 is a similar section on the line Z Z Fig. 11 but looking in the opposite direction. Fig. 15 is a plan view of the same showing the clutch operating lever. Fig. 16 is a section similar to Fig. 11 but showing the parts coupled to the power. Fig. 17 is a vertical central section through the upper slide and a side elevation of the switch or current controller and showing the position of the parts when the contact has engaged

the work and the switch closed, the switch being broken away from its connection with the slide and brought around to show its position. Fig. 18 is a similar view showing the same parts in position after the weld has been perfected.

The framework of the machine upon which the operating parts are mounted consists of two side members 1, 2, suitably supported upon standards or legs 3, 4.

The source of electric energy adapted to supply heating current to the work might be of any desired type, but is here shown as a transformer provided with a flexible secondary such as is well-known in the art. The transformer is suitably secured to but insulated from the frames 1, 2, and consists of a primary 5 and a flexible secondary 6 constructed preferably of a number of thin copper strips, to the ends of which are secured the electrodes by means of which current is fed through the work. The laminated core for the transformer is indicated at 7.

8 indicates a bracket or platform suitably mounted on the frames 1, 2, and upon which is mounted a horizontal guideway 9. The guideway 9 is suitably insulated from the bracket 8 and is provided with a depending lug 10 to which one terminal or pole of the secondary 6 is secured. A platen or carriage 11 adapted to travel in the guideway 9 is in electrical connection therewith and together with the guideway, in this construction, forms one of the electrodes of the apparatus. A flexible cable 12 secured at one end to the lug 10 and at the other end to the carriage 11 forms a shunt connection around the sliding surface of the guideway and carriage to directly conduct current to the carriage and prevent sparking across the sliding surfaces.

A work support in the form of a horn or mandrel 13 is mounted at one end upon and carried by the carriage 11, said horn forming a contact for one side of the work. The horn or mandrel, when as in this case the machine is used for welding the seams of ferrules, preferably is of the same size and form as the ferrule to be welded, which ferrule is placed upon said mandrel with its overlapping or abutting edges upon the upper surface thereof, it being preferably held between a shoulder formed on said mandrel and a sleeve 14 which supports the other end of the mandrel. A locating clip 15 secured to the carriage and provided with prongs or fingers adapted to span the seam to be welded also engages the work and serves to properly locate the same. The sleeve 14 is loosely mounted in one end of an arm 16 secured at its other end to the end of the carriage 11 by a stud 17 about which said arm is adapted to swivel. The sleeve 14 is adapted to fit over the end of the mandrel 13 when the arm 16 has been turned to a vertical position and is pushed over the mandrel until stopped by the taper thereof and its engagement with the end of the work. When the arm 16 has been turned to an upright position and the sleeve 14 forced over the end of the horn to support the free end thereof, said sleeve is prevented from slipping off said end by the following device. A strip of metal 18 provided with an upturned and forwardly projecting end piece 19 (see Figs. 5, 6, 7, 8) is secured to the arm 16. A pin 20 projecting from the end of the sleeve 14 is provided with a shoulder 21 which, after the sleeve 14 has been forced on the mandrel and turned until the pin 20 engages the edge of the projection or stop 19, butts against the face of said stop and holds the sleeve in place. When it is desired to remove the work from the mandrel the sleeve 14 is rotated until the pin 20 is free from the stop 19 after which the sleeve is drawn away from the mandrel and the arm 16 swung down about the stud 17 which leaves the end of the mandrel free. The carriage 11 is also provided with a laterally projecting handle 22 preferably of insulating material for returning the carriage and work support to its original position after the welding operation has been completed as will be presently described.

23 indicates a vertical slide mounted in suitable guides 24, 25, secured to the frames 1, 2, and has a block of metal 26 secured to the lower end thereof which block is adapted to travel with said slide. The block 26 has the other terminal or pole of the transformer secondary 6, secured thereto, said block being suitably insulated from the slide 23 and forming the other electrode of the apparatus. The electrode 26 is provided with a contact in the form of a rod or bar 27 having a tapered end which engages the work opposite the contact or mandrel 13, the slide 23 being moved to and from the mandrel 13 to cause said contact 27 to periodically engage the work as will be presently described. The contact pin 27 is held in the electrode 26 by a snug fit between the parts and driven therein, the said contact being adjustable as regards its vertical position by an adjusting screw 28, the contact being further held by a set screw 29 after adjusted to its desired position.

30 indicates a pulley which is continuously driven by a belt or otherwise and which normally runs loosely upon the driving shaft 31 but coupled thereto by any suitable form of clutch when it is desired to operate the machine. The shaft 31 is suitably mounted in bearings 32, 33, secured to the frame-work of the machine and is provided with a crank 34. The said crank is connected to a crosshead 35 pivotally mounted on a pin or shaft 36 mounted in the vertical slide 23, by a

pair of connecting rods 37, 38, fixedly secured to a bearing 99 in which the crank 34 is journaled. The connecting rods 37, 38, pass loosely through the cross-head 35 and hold the slide 23 suspended by means of pins 39 passing through the rods and engaging the under side of the cross-head 35.

40 indicates a spring compressed between the crank bearing 99 and the cross-head 35 and which with the weight of the slide and its attendant parts tends to normally keep the cross-head pressed against the pins 39. When the crank 34 rotates the slide 23 will descend due to the weight of the parts until the contact 27 engages the work which is at a time previous to the crank reaching its lowermost position. A further rotation of the crank causes the connecting rods to travel and the pins 39 to leave the cross-head 35 and the spring 40 is compressed, applying an additional pressure to the slide 23 to apply increased pressure to the work as it softens under the action of the heating current, the slide being free to descend farther owing to the lost motion between the cross-head 35 and connecting rods 37, 38. Obviously the slide 23 will not be raised from the work until the pins 39 engage the under side of the cross-head 35 on the up movement of the crank.

41 indicates an arm or bracket fixedly secured to the connecting rod 38 and adapted to travel therewith. The arm 41 carries on its outer end a contact 42 of a circuit controller, said contact being insulated from the arm 41 but electrically connected into the circuit of the primary of the transformer. The contact 42 coöperates with a contact 43 connected to the other end of the primary circuit wire whereby when the contacts 42 and 43 meet the primary circuit will be completed and current flow in the secondary circuit. The contact 43 is mounted in a bracket 44 secured to but insulated from the framework of the machine. The contact 43 is seated on a spring 45 located within the bracket 44, which spring normally keeps the contact 43 in its uppermost position, the upward movement being limited by the nut 46. The parts are so arranged that when the contact 27 engages the work, or preferably an instant after, the contact 42 has engaged the contact 43 and the current is turned on. The further movement of the connecting rods 37, 38, previously described, causes the contact 43 to compress the spring 45 and the contacts stay pressed together until an instant before the pins 39 on the connecting rods engage the cross-head 35 and the contact 27 raised from the work.

Referring more particularly to Figs. 1, 2 and 11 to 16 inclusive, 47 indicates a foot-lever pivotally mounted to the back of the machine and is connected by means of a pivoted rod 48 to one arm of a clutch operating lever 49, said lever being mounted on the frame 2 at or near the top. The pulley 30 is provided with a recess 50 formed in the hub thereof and within said recess a pair of clutch pins 51 are secured to said pulley. The heads of said pins project into the recess 50 and are adapted to be engaged by a key 52 secured to the shaft 31 in a slot therein when it is desired to couple said shaft to the driving power. The said key is retained on said shaft by a collar 53 keyed to the shaft and is provided with a spring 54 compressed between said key and a pin 55 secured to the shaft 31, which spring tends to force the key into the recess 50 to engage the clutch pins 51, but is restrained from doing so by the end of the clutch lever 49 engaging a transverse slot 56 in the key 52. Upon pressing the foot-lever 47, the end of the lever 49 is withdrawn from the slot 56 and the spring 54 forces the key 52 into the recess 50 and the shaft is coupled to the power, and will remain so coupled until the foot-lever is released. Upon releasing the foot-lever a spring 57 draws the rod 48 upward which forces the free end of the clutch lever 49 down. The end of the lever 49 rides against the side of the collar 53 and is provided with a tapered end as shown (see Fig. 15) whereby when the end of said lever is depressed it will enter into the side of the slot 56 which is of such length that the end thereof will protrude beyond the side of the collar 53 after the key has entered the recess 50. Upon further rotation of the shaft the widest part of the lever 49 will enter the slot 56 and draw the key 52 entirely out of the recess 50 and away from the pins 51 and the shaft will be uncoupled. Preferably a brake is provided which will act on the shaft 31, or a part secured to said shaft, to bring it to instant rest after the key 52 has been withdrawn. The brake preferably employed consists of a band 58 suitably mounted to a convenient part of the framework and provided on its inner surface with some friction material 59 such as leather which engages and rides on the periphery of the collar 53. The power is sufficient to rotate the shaft against the holding power of the brake but when the power is uncoupled the friction between the leather 59 and the collar 53 will instantly bring the shaft to rest.

60 indicates a feed bar secured at one end to a standard rising from the carriage 11, the other end resting on the inclined upper surface of the base of the carriage. The said bar is provided with a number of teeth 61 formed on its upper surface, which teeth are normally engaged by a pivoted latch 62.

63 indicates a bell-crank lever pivotally mounted on a stud 64 secured to the framework of the machine, one arm of said bell-crank carrying the feed latch 62. The other

arm of said bell-crank is engaged, through an adjustment screw 65, by a ledge 66 formed on the vertical slide 23, a spring 67 normally tending to keep this arm pressed against said ledge. The upward movement of the slide 23 operates on the bell-crank and causes it to actuate the latch 62 to push the feed bar 60 forward together with the carriage and the work carried thereby. Upon the downward movement of the slide 23 the spring 67 causes the bell-crank to retract the latch 62 to bring it into engagement with the next tooth 61, the retracting movement being adjustably limited by a stop 68, the work being thus fed between the electrical contacts of the machine intermittently between the times said contacts engage and clamp the work between them. The end of the latch 62 is provided on its back side with a depending plate 69 which, when the carriage has been fed so far that the contact 27 has reached the end of the work, is engaged by a projecting pin 70 on the end of the feed bar 60 which raises the latch 62 free from the teeth 61 and causes a loosely pivoted latch 71 mounted on the bell-crank lever 63 to engage a shoulder 72 on the latch 62 and thereby hold said latch in raised position. This position is shown in Fig. 10. When the latch 62 is held in raised position the carriage 11 can be returned to its original position by means of the handle 22 and when the carriage is brought back to its original position, the pin 70 strikes the latch 71 which frees the shoulder 72 and the latch 62 drops down onto the feed bar 60 in position to again start feeding, the position being shown in Fig. 3. In all other positions the latch 71 merely rests against the shoulder 72 in substantially the position shown in Fig. 9.

In the operation of the apparatus, the work is placed on the horn or mandrel 13 with its overlapping or abutting edges on the upper surface. The foot-lever 47 is depressed, which couples the shaft 31 to the driving power as previously described. The rotation of the shaft permits the slide to drop down until the contact 27 engages the work, immediately after which the contacts 42, 43, engage and the heating current flows through the work. As the shaft rotates further, the pins 39 leave the cross-head 35 and the spring 40 is further compressed, exerting an increased pressure on the work through the contact 27. The shaft continues to revolve and the connecting rods 37, 38, rise but without lifting the slide 23. Just previous to the time the pins 39 engage the cross-head 35 the contacts 42, 43, separate and the circuit is broken, immediately after which, or if preferred, at the same time, the pins 39 engage the cross-head and further rotation of the shaft lifts the slide 23 and contact 27 away from the work. The upward movement of the slide actuates the bell-crank 63 and the latch 62 feeds the carriage forward one notch and the slide again descends and the cycle repeated, the bell-crank 63, during the downward movement of the slide, retracting the latch 62 by means of the spring 67. This cycle of operation continues until the plate 69 strikes the pin 70 which raises the latch from the feed bar and the latch 71 engages the shoulder 72 and holds the latch 62 in raised position. The foot-lever is then released and the power uncoupled by the end of the clutch lever 49 entering the slot 56 in the clutch key as previously described. The carriage is then returned to its original position by means of the handle 22, the pin 70 during this return movement striking the latch 71 and freeing the latch 62 which again drops down onto the feed bar. The work is then removed by withdrawing the sleeve 14 and swiveling the arm 16.

What I claim as my invention is:

1. An apparatus for electrically welding seams to unite edges of sheets of metal, embodying electrodes having contact faces forming positive and negative electrodes respectively in opposition to each other, and, movable toward and from each other to clamp or release the work between said contact faces, one of said electrodes forming a traveling work support, means for moving said electrodes toward and from each other periodically and means for establishing the circuit through said electrodes when the work is clamped between them, said means being adapted to break the circuit before the work is released and to only establish the same after the work is clamped between the electrodes.

2. An electric step by step seam welding apparatus embodying electrodes having proximate work contacting faces located opposite to each other and forming positive and negative electrodes respectively movable toward and from each other and between which the work is fed and clamped intermittently, one of said electrodes acting as a traveling work support, and a periodically acting switch timed to interrupt the current before the electrodes are separated.

3. An electric step by step seam welding apparatus embodying electrodes having proximate work contacting faces located opposite to each other and forming positive and negative electrodes respectively, one of said electrodes forming a traveling work support, means for moving said electrodes toward and from each other and an intermittent work feeding mechanism timed to feed the work when the electrodes are moved away from each other.

4. An electric step by step seam welding apparatus embodying electrodes having proximate work contacting faces located op-

posite each other and forming positive and negative electrodes respectively, one of said electrodes forming a traveling work support, means for periodically moving said electrodes toward and from each other to clamp the work between said faces, an intermittent work feeding mechanism timed to feed the work when the electrodes are moved away from each other and an intermittently operating switch timed to establish the circuit and permit a welding current to flow only when the electrodes are pressed toward each other.

5. In an electric metal working apparatus, the combination with a pair of electrodes having contact faces adapted to engage the work located between them and movable to and from each other, one of said electrodes forming a traveling work support, and means controlled by the movement of one of said electrodes for intermittently feeding the work.

6. In an electric metal working apparatus, the combination with a pair of electrodes having contact faces for engaging the work located between them, one of said electrodes forming a traveling work support, means for periodically moving said electrodes to and from each other and means controlled by the to and fro movement of said electrodes for intermittently feeding the work.

7. In an electric metal working apparatus, the combination with a pair of electrodes, one of said electrodes forming a work-support, means for moving the other electrode to and from said work support and means controlled by the to and fro movement of said electrode for intermittently feeding said work-support past said electrode.

8. In an electric metal working apparatus, the combination with a pair of electrodes, one of said electrodes forming a work-support, the other electrode comprising a contact for engaging the work, means for periodically causing said contact to engage the work, intermittent work feeding mechanism for feeding the work past said contact and means for automatically releasing said work-support from said feeding mechanism when the end of the work has been reached.

9. In an electric metal working apparatus, the combination with a pair of electrodes having contact faces for engaging the work, one of said electrodes forming a traveling work support, means for moving said electrodes to and from each other periodically to cause said contacts to engage the work, intermittent work feeding mechanism for feeding the work between said contact faces and means for automatically releasing the work from said feeding mechanism when the welding has been completed.

10. In an electric metal working apparatus, the combination with a source of power, of a work-support connected to one terminal of said source, a contact movable to and from said work-support and connected to the other terminal of said source and intermittent work feeding mechanism for feeding the work past said contact, said feeding mechanism being actuated by the movement of said contact when said contact is moving from the work.

11. In an electric metal working apparatus, the combination of a horizontal slide connected to one terminal of a source of power, a work-support carried by said slide and forming a contact for the work, a vertical slide, a contact secured to said vertical slide and connected to the other terminal of the source of power, means for moving said vertical slide to and from said work-support to cause said contact to periodically engage the work and means for intermittently moving said horizontal slide to cause said work to be fed past said contact, said feeding mechanism being actuated by the return movement of said vertical slide.

12. In an electric metal working apparatus, the combination of a pair of electrodes having contact faces for engaging opposite sides of the work, means for moving one of said electrodes to and from the other whereby it will periodically engage the work, and means controlled by the movement of said electrodes for feeding the work between them.

13. In an electric seam welding apparatus, the combination with a source of power, of a work-support connected to one terminal of said source and adapted to support the work along the seam to be welded, a contact connected to the other terminal of said source, means for feeding the work past said contact and means for moving said contact to and from the work whereby the work will be periodically engaged by said contact.

14. In an electric metal working apparatus, the combination of a pair of electrodes, having contact faces adapted to engage the work, one of said electrodes forming a traveling work support, means for moving said electrodes to and from each other, means for intermittently feeding the work between said contact faces of said electrodes and a switch member carried by one of said electrodes and adapted to control the flow of current through the work.

15. In an electric metal working apparatus, the combination of a pair of electrodes having contact faces adapted to engage the work, one of said electrodes forming a traveling work support, means for moving said electrodes to and from each other, a latch for intermittently feeding the work between said contact faces and means actuated by the movement of said electrodes to operate said latch.

16. In an electric metal working apparatus, the combination of a pair of electrodes having contact faces adapted to engage the work, one of said electrodes forming a traveling work support, means for moving said electrodes to and from each other, a latch for intermittently feeding the work between said contact faces and a bell-crank lever secured to said latch and actuated by the movement of said electrodes.

17. In an electric metal working apparatus, the combination with a pair of electrodes having contact faces for engaging the work, means for moving one of said electrodes to and from the other to cause its contact face to periodically engage the work, and comprising rods which are freed from said electrode after said contact face has engaged the work, said moving means comprising means for applying increased pressure to said contact face after said electrode has been freed from said rods.

18. In an electric metal working apparatus, the combination with a pair of electrodes having contact faces for engaging the work, means for moving one of said electrodes to and from the other to periodically engage the work and having a lost motion between said means and said electrode, and a spring acting in conjunction with said means and adapted to apply increased pressure to said electrode.

19. In an electric metal working apparatus, the combination with a pair of electrodes having contact faces for engaging the work, one of said electrodes forming a traveling work support, means for moving said electrodes to and from each other and said means comprising means for applying a constantly increasing pressure to said contact faces.

Signed at New York in the county of New York and State of New York this 12th day of May A. D. 1909.

ADOLPH F. RIETZEL.

Witnesses:

IRENE LIFKOWITZ,

EDWARD M. JELLINEK.