H. R. WOODROW.

APPARATUS FOR ELECTRIC WELDING.

APPLICATION FILED MAR. 13, 1915.

1,145,642.

Patented July 6, 1915.

2 SHEETS—SHEET 1.

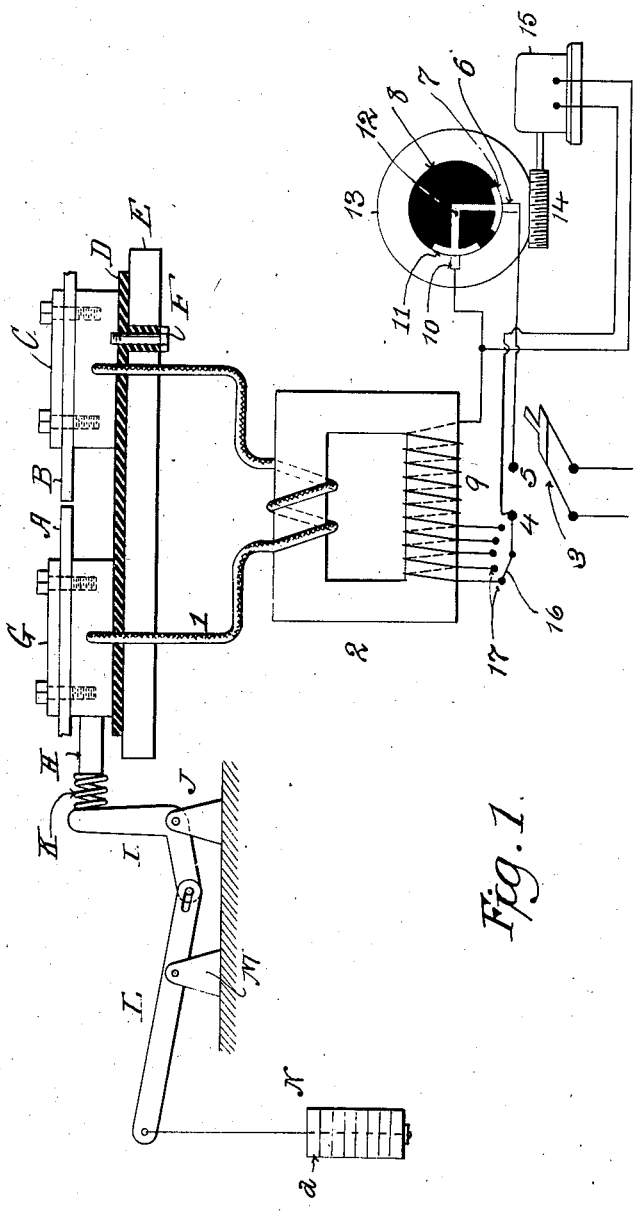

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

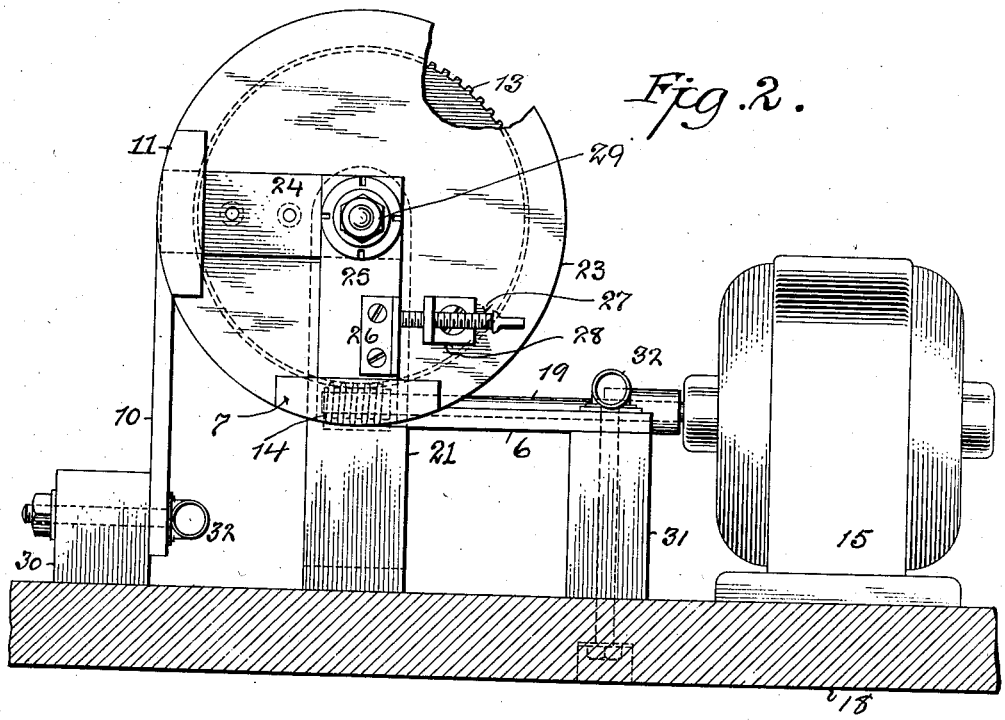
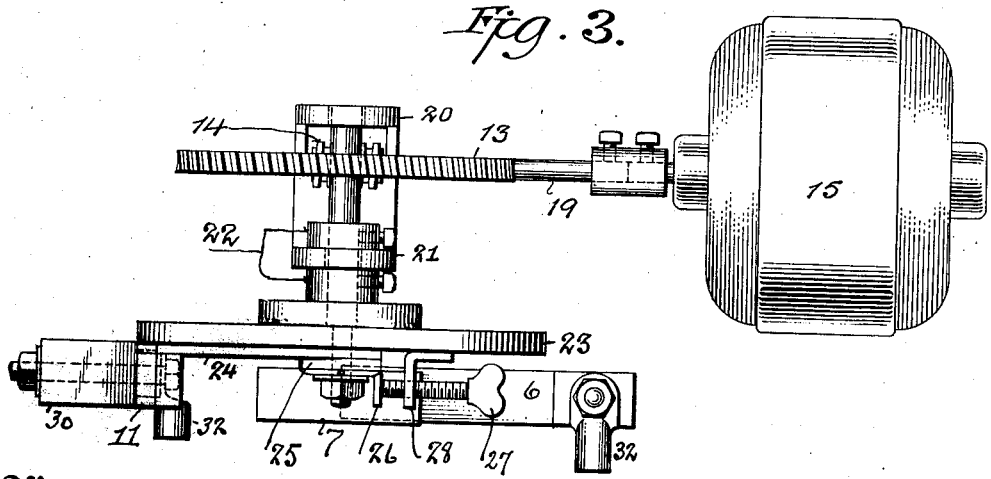


Fig. 3.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR ELECTRIC WELDING.

1,145,642. Specification of Letters Patent. Patented July 6, 1915.

Application filed March 13, 1915. Serial No. 14,193.

To all whom it may concern:

Be it known that I, HARRY R. WOODROW, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Apparatus for Electric Welding, of which the following is a specification.

The invention relates to electric welding, and consists in an automatic apparatus embodying an electric motor energized by the welding current, which motor controls the duration of said current. Means are provided whereby an initial duration of the welding current is established, and thereafter this duration is controlled by the variations in resistance at the welding electrodes, which variations affect the speed of the motor to vary the duration of the current correspondingly to the resistance changes.

In the accompanying drawings Figure 1 illustrates generally my apparatus. Fig. 2 is an elevation, and Fig. 3 a plan view of a device for determining the duration of the welding current.

Similar letters and numbers of reference indicate like parts.

Referring first to Fig. 1: A and B are two bars to be welded together at their ends. The bar B is held in a metal screw clamp C which is immovably held upon a plate D of insulating material which rests upon the base E, by means of an insulated screw bolt F. The bar A is held in a similar screw clamp G which is slidable upon said plate D. On the clamp G is a projecting stud H.

I is a bell crank lever pivoted in a suitable fixed bracket J. Between the upright arm of said lever and the stud H is interposed a helical spring K. The other arm of said lever has a pin which enters a slot in the lever L pivoted in a fixed bracket M. On the opposite side of the bracket M a suspended weight N is attached to lever L. The weight N is to be of predetermined magnitude, and in order to adjust said magnitude it may be formed of disks *a* of metal, which can be varied in number as desired. Said weight operates through the levers L, I to slide the clamp G toward the clamp C, and so to press the end of bar A against the end of bar B with a constant pressure, which is rendered elastic by the interposed spring K. To the clamps C, G respectively are connected the terminals of the secondary coil 1 of a transformer 2.

The source of welding current (not shown) is connected to the switch 3 which coöperates with the terminals 4, 5. Terminal 5 is connected to a brush 6 which bears upon a contact 7 on the periphery of a rotary cylinder 8 of insulating material. Terminal 4 is connected through the primary coil 9 of said transformer to a brush 10 bearing upon a contact 11 on the periphery of cylinder 8. The contacts 7 and 11 are connected by bar 12. The cylinder 8 carries a pinion 13, with which engages a worm 14 on the shaft of a motor 15, which is connected in parallel with the brushes 6 and 10. Instead of connecting the terminal 4 to the end of primary coil 9, I may connect it to a pivoted switch lever 16 which coöperates with a plurality of contacts 17 connected to successive turns of said primary coil, so that by suitably adjusting said lever I may cut out one or more of said turns as desired. The relation of the primary and secondary conductors in said transformer is to be such that the strength of the current delivered at the secondary will be augmented.

The operation is as follows: The pieces A, B to be welded are inserted in the clamps G, C, and the weight N is adjusted so as to cause the end of piece A to press against the end of piece B with a certain predetermined pressure. The switch 3 being closed, a current of predetermined strength is delivered to said pieces at their joint. Said strength is primarily adjusted by suitably proportioning the primary and secondary coils 9 and 1, and more closely adjusted by means of the pivoted switch lever 16 operated to cut one or more turns of the primary coil into or out of circuit. By reason of said current, the metal at the joint between pieces A, B is melted and a weld is produced under the pressure exerted, as already described. The motor 15 is simultaneously set in operation to rotate the cylinder 8. When the contact plates 7, 11 on said cylinder touch the brushes 6, 10, circuit is closed through the bar 12 connecting said plates, to the joint to be welded, and this closure and hence the duration of the welding current continues until by the rotation of said cylinder, circuit is broken at said brushes. The period of rotation of said cylinder may be determined by varying

the speed of the motor 15, and in this way I can establish the duration of the welding current.

It will now be obvious that by this apparatus I am enabled (1) to determine the mechanical pressure at the joint to be welded, (2) to determine the strength of the welding current, and (3) to determine the duration of said current. And thus I may give to each of these factors at the outset a predetermined value which may be governed by the contact areas of the two pieces to be welded. Hence if the members of a large number of pairs of similar pieces are to be united, the conditions being adjusted for one pair will remain the same for all succeeding pairs, and hence I can effect a practically perfect weld in every pair entirely independently of the personal equation of the operator.

The control of the time factor is here of especial importance, since it is preferable to use a very strong welding current for a very short interval of time. As this interval may be but a fraction of a second, it is practically impossible to control it by manually operating a switch. If the interval be made too short, an imperfect weld results—if too long, the weld is apt to be burned and again rendered imperfect, and besides energy is wasted. With automatic control of the time factor, as above described, the interval may be adjusted with accuracy.

Instead of regulating the duration of the welding current by varying the speed of the motor, the contact plates 7, 11 being set at an invariable distance apart, I may do so by varying the distance between the contact plates on the cylinder 8, so that current will remain established for a greater or less time—the speed of the motor then being constant; or I may vary both the speed of the motor and the relative spacing of the said contact plates.

In Figs. 2 and 3, I illustrate a circuit-controlling device, in which the contact plates may be adjusted to vary the distance between them with much accuracy. The motor 15 is here shown mounted on any suitable insulating base 18. The shaft 19 of worm 14 extends through the upright arms 20, 21 of a bracket also mounted on said base. Collars 22 on opposite sides of the bracket arm 21 prevent endwise play of said shaft, which carries a metal disk 23, on the face of which is secured a fixed arm 24 carrying the contact plate 11 and a pivoted arm 25 carrying the contact plate 7. On the pivoted arm is a projecting plate 26 which receives the thrust of an adjusting screw 27 which passes through a lug 28 on the face of plate 23. There is a nut and washer 29 on the pivot bolt of arm 25 which is first loosened so that the distance of plate 7 from plate 11 may be approximately adjusted by hand. After said bolt is tightened, the adjusting screw 27 may be used for setting said plate 7 with greater accuracy to any desired distance. For convenience, the brushes 10 and 6 are here carried upon blocks 30 and 31 mounted on base 18 and provided with sockets 32 for the attachment of the circuit conductors.

So long as the resistance offered to the current at the welding electrodes remains constant, the duration of the current will be regulated by the means described and will remain corespondingly constant. But if, through any cause—as, for example, scale on the welding faces—the resistance to the current increases, then the strength of the welding current diminishes, and as it is this current which also actuates the motor, the motor speed decreases; so that the duration of the current is thus automatically increased to an extent proportionate to the resistance encountered at the welding electrodes.

I claim:

1. An apparatus for electric welding, comprising means for holding the parts to be welded in contact, circuit connections to said holding means, and means controlled by the welding current for determining the duration of said current.

2. An apparatus for electric welding, comprising means for holding the parts to be welded in contact, circuit connections to said holding means, a motor controlled by the welding current, and a device actuated by said motor and interposed in the circuit of said welding current for determining the duration of said current in said circuit.

3. An apparatus for electric welding, comprising means for holding the parts to be welded in contact, circuit connections to said holding means, a motor controlled by the welding current, and a rotary circuit breaker actuated by said motor and interposed in the circuit of said welding current for determining the duration of said current in said circuit.

4. An apparatus for electric welding, comprising means for holding the parts to be welded in contact, circuit connections to said holding means, and two branches from said circuit connections; a motor controlled by the welding current in one of said branches, a rotary member actuated by said motor, connected contacts on said rotary member, and, in the other branch, fixed contacts coöperating with said first-named contacts.

5. An apparatus for electric welding, comprising means for holding the parts to be welded in contact, circuit connections to said holding means, and two branches from said circuit connections; a motor controlled by the welding current in one of said branches, a rotary member actuated by said motor,

connected contacts on said rotary member, means for varying the distance between said contacts, and, in the other branch, fixed contacts coöperating with said first-named contacts.

6. An apparatus for electric welding, comprising means for determining a constant pressure of the contacts at the joint to be welded one against the other, means for determining the strength of the welding current supplied to said contacts, and means controlled by said current for determining the duration of said current.

In testimony whereof I have affixed my signature in presence of two witnesses.

HARRY R. WOODROW.

Witnesses:
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