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ELECTRIC WELDING.

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1,283,715.

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Fig. 1.

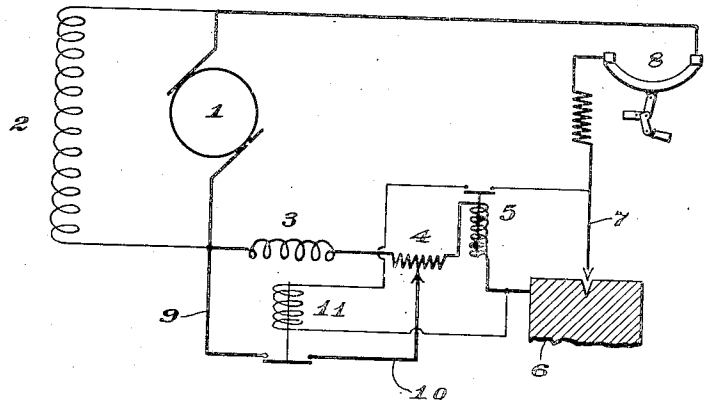
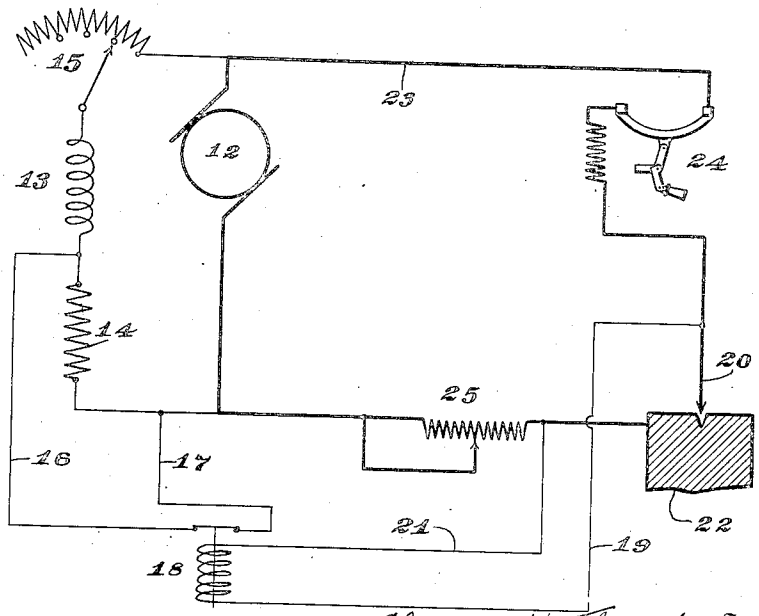


Fig. 2.



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UNITED STATES PATENT OFFICE.

CHARLES H. FLORANDIN AND ALAN M. BENNETT, OF WESTFIELD, NEW JERSEY, ASSIGNORS TO C. & C. ELECTRIC AND MANUFACTURING COMPANY, OF GARWOOD, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ELECTRIC WELDING.

1,283,715. Specification of Letters Patent. Patented Nov. 5, 1918.

Application filed January 10, 1917. Serial No. 141,523.

To all whom it may concern:

Be it known that we, CHARLES H. FLORANDIN and ALAN M. BENNETT, citizens of the United States, both residing at Westfield, county of Union, and State of New Jersey, have invented new and useful Improvements in Electric Welding, of which the following is a specification.

This invention relates to welding, brazing, repairing or the like treatment of metal by the electric arc.

Usually the work constitutes one of the electrodes, the arc being struck by touching the manually operated electrode against it. When the electrodes are separated the arc is drawn between them.

It is desirable that the impressed voltage be regulated in accordance with the conditions of the arc and it is one object of the present invention to provide improved means for regulating the voltage in accordance with the current and voltage conditions of the arc.

A high initial impressed voltage is desirable. It makes more certain striking of the arc even if the initial contact is prevented by dirt, rust or other causes, from being the best, and also makes the incipient arc more tenacious as well as having other advantages. It is a further object of the invention, therefore, to provide improved means whereby the desired initial voltage may be obtained in an electric circuit of the character indicated and subsequently changed to normal working value.

Other and ancillary objects of the invention will appear hereinafter.

In the accompanying drawings which illustrate the invention,

Figure 1 is a diagram of apparatus and connections of an arc welding system embodying the invention, and

Fig. 2 is a similar diagram of a modification.

Referring to the drawings and first to Fig. 1, the system comprises a constant potential direct current generator having an armature 1, a shunt field 2 and a series field 3, the series field being adapted to compound the voltage. The series field has one end connected with one terminal of the armature while the other end is connected through the resistance 4 and the coil of a load relay 5 with one of the terminals of the arc formed between the work 6 and the manually operable electrode 7. The other terminal of the generator is connected through the overload circuit breaker 8 with the other terminal of the arc.

A shunt about the series field 3 is adapted to be closed through the conductors 9 and 10 by the contacts of the contactor 11. One terminal of the coil of this contactor is connected through the contacts of the relay 5 with one arc electrode and the other terminal of the contactor 11 is connected with the other electrode so that when the relay 5 is operated the coil of the contactor 11 is connected across the arc.

The resistance 4 is chosen of such a value as to limit the initial current flow to the desired amount. The conductor 10 has a movable connection with the resistance 4 so that a greater or less amount may be included within or excluded from the shunt. The result is that at starting (the shunt being then open) the whole of the resistance 4 is in circuit and properly limits the current on striking the arc while the amount of the resistance, for steadying purposes, included in the normal working circuit (with the shunt closed) may be varied without interfering with the above condition.

The apparatus in the diagram is shown in its normal inoperative position, the electrodes being separated and with no arc between them; also the relay and contactor are deenergized and their contacts open. The generator armature under the inductive action of the shunt field is generating a suitable electromotive force. If now the movable electrode 7 be struck against the work, the circuit will be completed through the overload circuit breaker 8, the electrodes, the coil of the load relay 5, the resistance 4 and the series field 3. Current will instantly flow and in so doing will energize the series field 3, which will add its induction to that of the shunt field and increase the impressed voltage. This high initial voltage will aid in establishing the arc. The current will also energize the relay 5 closing its contacts and thereby closing the circuit for the coil of the contactor 11 between the electrodes. The operator draws the arc by moving the electrode 7 away from the work and when the fall of potential across the arc has become sufficient, the energization of

the coil of the contactor 11 will close the contacts of that contactor thereby closing the shunt about the series field and that part of the resistance 4 between the series field and the conductor 10. This cutting out of action of the series field winding will reduce the magnetic field of the generator and correspondingly reduce the voltage at the generator terminals, the resistance in circuit being also reduced to the desired steadying value for normal working. The generator voltage will then be that due to the shunt field and of a suitable value for the normal working of the system. It will be seen that by this arrangement the normal working voltage of the generator is initially increased to a higher value so as to aid in establishing the incipient arc and in response to the arc current is cut out of action when the voltage across the arc is suitable, so that the impressed voltage is reduced to that required for normal working. Upon the flow of excessive current beyond the predetermined value by reason of the operator accidentally striking his electrode against the work or by bringing it unduly near thereto so that the arc is shortened and its resistance decreased, or for other reasons, the overload relay 8 will operate to break the circuit.

Referring to Fig. 2, the generator comprises an armature 12 and a shunt field 13. In series with the shunt field 13 across the armature terminals, is a resistance 14 and also a variable rheostat or resistance 15. A shunt is adapted to be closed about the resistance 14 through the conductors 16 and 17 by the contacts of the relay 18. The coil of that relay is connected across the arc electrodes, one terminal being joined through the conductor 19 with the manually operable electrode 20 and the other terminal through the conductor 21 with the work 22. The working circuit is from one terminal of the generator through the conductor 23, the overload relay 24, the electrode 20, the arc when drawn, the work 22, and the variable steadying resistance 25 to the other generator terminal. The rheostat 15 is so adjusted that with the resistance 14 shunted the desired initial voltage will be produced. The resistance 14 is of such value that when it is inserted in the circuit the generator voltage will be cut down to the desired normal working amount. With the parts in the positions as shown in the drawing, the electrodes being separated with no arc between them, and the generator field shunted, if the movable electrode is struck against the work and the arc drawn the potential across the arc will increase as the arc lengthens and at a certain value will energize the relay 18 sufficiently to lift its contacts and open the shunt about the field resistance. This operates to insert the resistance in the field circuit with a corresponding decrease in the generator voltage to normal value. Should the arc become extinguished or so reduced that the voltage across it becomes less than that required to hold the contacts of the relay 18 closed they will drop together, cutting the resistance 14 out of circuit and placing the apparatus in condition for producing the high initial voltage for striking the arc and which is subsequently lowered to the normal working value by the drawing of the arc as described.

While the invention has been illustrated in what are considered its best applications, it may have other embodiments without departing from its spirit and is not therefore limited to the structures shown in the drawings.

What we claim is:

1. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator for impressing voltage on the circuit, electrodes, conductors connecting said electrodes and said generator in circuit and means controlled by the working current and arc voltage for varying the voltage of said generator.

2. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator for impressing voltage on the circuit, electrodes, conductors connecting said electrodes and said generator in circuit and means controlled by the arc voltage for varying the voltage of said generator.

3. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator having series field winding, of electrodes, conductors for connecting said generator and electrodes in circuit and means for shunting said series field winding.

4. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator having a series field, of electrodes, conductors for connecting said generator and electrodes in circuit and means controlled by the working current for changing the number of the effective turns of the series field winding for a given working current.

5. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator, having a series field, of electrodes, conductors for connecting said generator and electrodes in circuit and means controlled by the working current for shunting the series field.

6. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator having series winding, of electrodes, conductors for connecting said generator and electrodes in circuit and means controlled by the arc voltage for changing the number of effective

turns of said series winding for a given working current.

7. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator having a series field, of electrodes, conductors for connecting said generator and electrodes in circuit and means controlled by the arc voltage for shunting the series field.

8. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator having shunt and series field windings, of electrodes, conductors for connecting the said generator and electrodes in circuit, shunt connections for said series field, a relay controlling the shunt about the series field having its coil adapted to be connected across the arc and a relay controlling the circuit of said coil and having its coil in the work circuit.

9. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator for impressing voltage on the circuit, electrodes, conductors connecting said electrodes and said generator in circuit and means controlled by the working current and arc voltage for varying the voltage of said generator, the generator voltage being reduced on rise of working current and arc voltage.

10. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator for impressing voltage on the circuit, electrodes, conductors for connecting said electrodes and said generator in circuit and means controlled by the working current for varying the voltage of said generator, the generator voltage being reduced on rise of working current.

11. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator for impressing voltage on the circuit, electrodes, conductors for connecting said electrodes and said generator in circuit and means controlled by the arc voltage for varying the voltage of said generator, the generator voltage being reduced on rise of arc voltage.

12. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator having series field winding, of electrodes, conductors for connecting said generator and electrodes in circuit and means controlled by the working current and arc voltage for shunting said series field winding.

13. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator of electrodes, conductors for connecting the said generator and electrodes in circuit, a relay controlling the voltage of said generator, a circuit therefor, and a relay in the work circuit controlling the circuit of the aforesaid relay.

14. In an arc system for welding, repairing and otherwise treating metals, the combination with a generator of electrodes, conductors for connecting the said generator and electrodes in circuit, a relay controlling the voltage of said generator, a circuit therefor, and a relay in the work circuit controlling the circuit of the aforesaid relay, the first mentioned relay being connected in shunt to the arc between said electrodes.

In testimony whereof we have signed this specification this 27th day of October, 1916.

C. H. FLORANDIN.
ALAN M. BENNETT.