

A. C. EASTWOOD.
ARC WELDING APPARATUS.
APPLICATION FILED MAY 2, 1905.

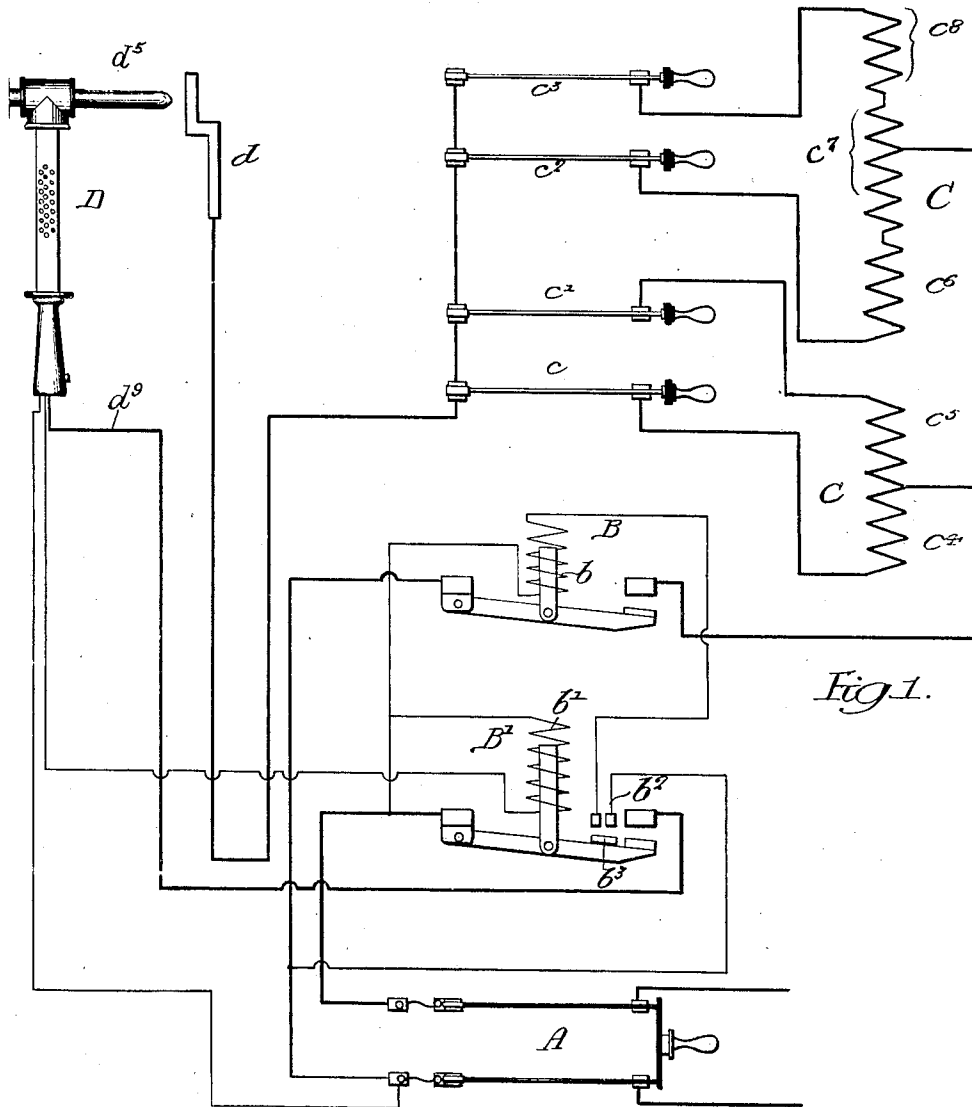


Fig. 1.

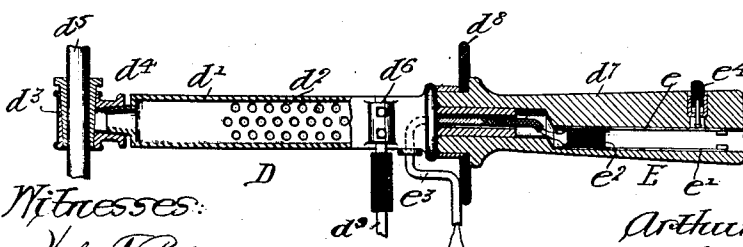


Fig. 2.

Witnesses:
Halter P. Pullinger
Augustus B. Clippes

Inventor:
Arthur C. Eastwood
by his Attorneys:
Howson & Howson

UNITED STATES PATENT OFFICE.

ARTHUR C. EASTWOOD, OF CLEVELAND, OHIO.

ARC-WELDING APPARATUS.

No. 818,361.

Specification of Letters Patent.

Patented April 17, 1906.

Application filed May 2, 1905. Serial No. 258,559.

To all whom it may concern:

Be it known that I, ARTHUR C. EASTWOOD, a citizen of the United States, residing in Cleveland, Ohio, have invented certain Improvements in Arc-Welding Apparatus, of which the following is a specification.

One object of my invention is to provide a portable and conveniently-operated combination of apparatus for heating bodies of metal, such as defective castings or the like, to such a temperature that blow-holes may be filled with melted metal and shrinkage or other cracks welded together by utilizing the intense heat caused by an electric arc.

It is further desired to provide a combination of apparatus having the above-noted characteristics which shall be so connected and arranged as to reduce to a minimum the possibility of short circuits or of the operator being injured by accidental burning from the arc.

It is also desired to provide an arc-welding apparatus by which it shall be possible to conveniently regulate the amount of current flowing in the circuit and also to control the opening or closing of a main switch or switches from a distance.

I further desire to provide an arc-welding system in which shall be included an electromagnetic switch or switches whose operation is controlled by a switch carried upon the handle of an electrode-holder manipulated by the operator.

These objects I attain as hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating the apparatus and connections therefor comprising my invention. Fig. 2 is an elevation, partly in section and on a larger scale than Fig. 1, illustrating certain features of the detail construction of the carbon or other electrode holder forming a part of my invention.

Hitherto the use of the electric arc for welding such material as steel, for example, has been limited by a number of difficulties, among which may be mentioned the danger of burns, due to even momentary contact with the arc, and again because of the fact that there has not been available any suitable combination of apparatus for applying and controlling the arc so that it could be conveniently applied to a given piece of work.

The apparatus embraced in my invention

affords ample protection to the operator from accidental burns and also avoids the possibility of short-circuiting.

Another advantage of the apparatus hereinafter described arises from an arrangement of its component parts, whereby a given operation may be carried on with the utmost despatch, as is requisite for successful welding.

In the above drawings, A is a main hand-operated switch of the double-pole type, while B and B' illustrate two electromagnetic switches having actuating-coils *b* and *b'*, there being also any desired number of resistance-controlling switches *c c' c² c³*, each having one terminal connected to some point in a bank of resistance C, which in the present instance is subdivided into five sections *c⁴ to c⁵*. The second terminals of the switches *c* to *c³*, inclusive, are all connected together and to a clamping-plate *d*, while one terminal of the switch B is connected to a point in the bank of resistance C between the sections *c⁴* and *c⁵* and also to some intermediate point of the section of resistance *c⁷*.

The second terminal of the switch B is connected to one terminal of the main switch A, whose second terminal is connected to a terminal of the switch B'. The second terminal of this latter switch is in electrical connection with the metallic body of the carbon-holder D. This holder consists of a hollow body *d'*, preferably of aluminium, in which are a number of perforations *d²*, provided to permit of the circulation of air through the interior thereof and carrying at one end a tubular holder *d³*, in which fits a tapered bushing *d⁴*, adapted to receive the carbon rod *d⁵*. There is a suitable terminal plate *d⁶* upon the holder D for the connection of a flexible cable *d⁹*, which extends between it and one terminal of the switch B', while on the end opposite that having the said carbon rod is a wooden handle *d⁷* and a relatively large protective shield *d⁸*, interposed between it and the body *d'*. The handle *d⁷* is hollow and within it is carried any convenient form of push-button or equivalent switch E. In the present instance this consists of two bars *e* and *e'*, held apart by a piece of insulating material *e²* and having respectively connected to them wires entering through a cable *e³*. One at least of the bars—in the present instance *e*—is of flexible material and has engaging its outer end a push-button *e⁴*, which when depressed causes it to electrically contact with the bar *e'*. One

of the wires of the cable e^3 is connected directly to one terminal of the main switch A, while the second terminal is connected to the coil of the switch B'. The second terminal of this coil is connected to the second terminal of the main switch A and to one terminal of the coil b of the switch B. Between the second terminal of this latter coil and the positive side of the main switch A is interposed an auxiliary switch b^2 , whose movable element b^3 is carried by the blade of the switch B'. Said auxiliary switch is adapted to be closed by the closing of the switch B' as well as opened by the opening of said switch.

In order to make a weld, the plate d is clamped to the metallic piece to be repaired, and the operator grasps the carbon-holder D in such manner as to depress the push-button e^4 . This depression causes closure of the switch E, thereby supplying current to the coils of switches B and B', so that these close one after the other.

Assuming that all of the switches c to c^3 , inclusive, are closed, the operator touches the piece of metal to be welded at the desired point with the carbon rod d^5 , thereby completing the circuit, so that when the carbon rod is drawn away from the metal an arc is formed. This arc rapidly heats the surface to be welded to the desired temperature, and if a crack or blow-hole is to be filled iron borings or punchings are dropped in place, being then melted in the arc in such a way as to fill the defective opening. When sufficient metal has been melted and the adjacent surface raised to the desired temperature, the operator releases the push-button e^4 , thereby breaking the circuit of the coils b and b' and permitting the switches B and B' to open, thereby opening both sides of the main circuit. The weld may then be perfected by peneing in the well-known manner.

It will be seen that when the push-button e^4 is first depressed current flows from the main switch A through switch E and through coil b' to the second terminal of said main switch, with the result that said coil is energized and switch B' is closed. This causes closing of the switch b^2 , so that current is then free to flow from one terminal of the main switch A to said switch b^2 , through coil b and switch B, then to the second terminal of switch A. From this it will be seen that first one side of the circuit is closed and then the other. If it be desired to decrease the amount of current flowing in the main circuit, one or more of the switches c to c^3 , inclusive, is opened, thereby increasing the total resistance of said main circuit. It is not possible, however, to cut all of the resistance out of circuit, so that there is never any opportunity for a dead short circuit to occur.

By the use of my improved combination of apparatus very material advantages are secured, since it is possible to quickly and con-

veniently repair castings which have come from molds in defective condition. With said apparatus it is possible, as above noted, to fill blow-holes and shrinkage cracks, as well as to build up ribs and portions of castings which have not run full in the mold. Defective gear-teeth may be also repaired, though hitherto this has not been feasible.

I claim as my invention—

1. Arc-welding apparatus including a portable terminal and an electromagnetic switch in circuit therewith, with a switch carried on said terminal and connected to control the said electromagnetic switch, substantially as described.

2. Arc-welding apparatus including a portable terminal, an insulated handle therefor, a hand-controlled switch on said handle, with an electromagnetic switch in circuit with the terminal and having its coil in circuit with the hand-controlled switch, substantially as described.

3. Arc-welding apparatus including two terminals for permitting current to flow to an article to be operated on, an electromagnetic switch in circuit with the terminals, a hand-operated switch in circuit with the coil of said electromagnetic switch for controlling the same, a bank of resistance, and controlling means therefor, for varying the magnitude of the current at will, substantially as described.

4. Arc-welding apparatus including two terminals for permitting current-flow to an article to be operated on, a pair of electromagnetic switches respectively in circuit with said terminals, a bank of resistance, a number of switches for controlling the amount of said resistance in circuit, with a controlling-switch in circuit with the coil of one of the electromagnetic switches, substantially as described.

5. Arc-welding apparatus including two terminals for permitting current to flow to an article to be operated on, a pair of electromagnetic switches respectively in circuit with said terminals, a switch carried by a terminal and in circuit with the coil of the first automatic switch, and an auxiliary switch operated by said first switch and in circuit with the coil of the other electromagnetic switch, substantially as described.

6. Arc-welding apparatus including a terminal having an electrode-holder, a hollow, ventilated metallic supporting-body therefor, a handle of heat-non-conducting material for said body, and a shield-piece between the body and said handle, substantially as described.

7. Arc-welding apparatus including means for connecting a body to be operated on to a source of current, a terminal having an electrode-holder, a metallic supporting-body for said holder having means for the attachment of a conductor, an insulating-handle for the

body, a switch on the handle having a push-button whereby it is operated, and an electromagnetic switch connected between the said supporting-body and the source of current, the coil of said switch being in circuit with the switch on the handle, substantially as described.

8. Arc-welding apparatus including a terminal having an electrode-holder, a hollow, ventilated supporting-body therefor, means for connecting the body to a source of current, an insulating-handle for the body, and means carried by said handle for controlling the current-flow to said body, substantially as described.

9. Arc-welding apparatus including a terminal having an electrode-holder, a supporting-body therefor, means for connecting the body to a source of current, an insulating-handle for the body, means external to said holder and body for controlling the current-flow thereto, and a device carried by said handle for controlling the operation of said latter means, substantially as described.

10. Arc-welding apparatus including a plate to be clamped to an article to be operated on, a portable terminal having an electrode from which an arc is formed to the article operated on, a pair of electromagnetic switches respectively in a circuit with the plate and with the electrode, a bank of resistance, and means for controlling the

amount of said resistance in circuit, substantially as described.

11. Arc-welding apparatus including a terminal for attachment to an article to be operated on, a portable terminal having an electrode from which an arc is formed, a pair of electromagnetic switches in circuit with said terminals, a switch carried by the portable terminal and in circuit with the coil of one of said electromagnetic switches, with means for causing said switches to be operated successively, substantially as described.

12. Arc-welding apparatus including a terminal for attachment to an article to be operated on, a portable terminal having an electrode from which an arc is formed, a pair of electromagnetic switches in circuit with said terminals, a switch carried by the portable terminal and in circuit with the coil of one of said electromagnetic switches, with an auxiliary switch in circuit with the coil of the second switch and controlled by said first switch for preventing operation of said second switch until after the first switch has been operated, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR C. EASTWOOD.

Witnesses:

WM. E. SHUPE,
JOS. H. KLEIN.