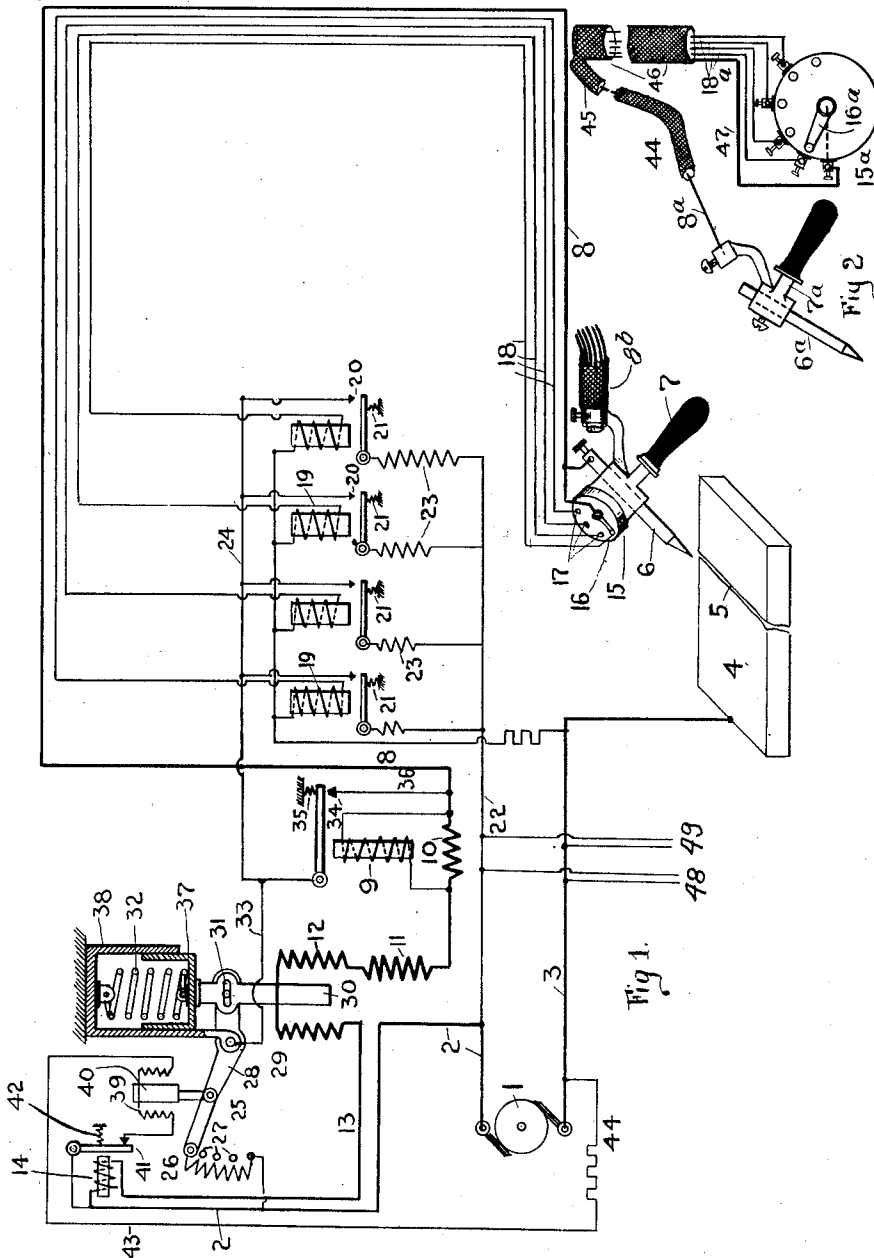


D. H. WILSON.
ELECTRIC WELDING SYSTEM.

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WITNESSES:

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ELECTRIC WELDING SYSTEM.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, DAVID H. WILSON, citizen of the United States, and resident of Paterson, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Electric Welding Systems, of which the following is a specification.

My invention consists of a system of electric welding and has for its object an arrangement of apparatus and circuits to enable an operator to conveniently manipulate a rheostat included in the circuit and thereby vary the delivery of current at the welding tool in accordance with the particular requirements of the work.

Welding sometimes has to be accomplished from the insides of furnaces or other apparatus and in places difficult of access. When the apparatus is so arranged that the operator has to go to the switch board in order to vary the current required for any particular welding requirement much time is consumed and lost.

My invention therefore aims to overcome this defect and make it possible for the workman to vary his current from the point where the welding is accomplished.

Sometimes a particular piece of work requires a welding current of say 50 amperes. Sometimes it requires 75 or 100 or more. In my invention the workman is provided with a portable switch by means of which he is enabled to vary the current from one degree to another.

In the drawing Figure 1 shows a general arrangement of apparatus and circuits by means of which my invention may be accomplished. Fig. 2 shows a modification thereof.

In my invention a suitable source of supply, such as a generator 1 for example, is connected to main conductors 2 and 3. The latter conductor may be connected in any suitable way to a metal plate 4 having a defect or crack 5 to be welded. A tool 6 is suitably held in a holder 7 and connected to the conductor 2 over the following circuit; conductor 8, coil 9 of the circuit closer shunted by the low resistance 10, fixed resistance 11, solenoid coil 12, conductor 13, circuit breaker coil 14, to the conductor 2. This circuit is adjusted to supply an initial amount of welding current which may be adjusted to any desired amount by the re-

sistance of the circuit. 25 amperes will suffice to start welding. In order to add to this amount of current an additional amount when desired by the operator is supplied by means of a portable switch 15 having a contact arm 16 adapted to be placed in contact with any one of a series of contacts 17. The operator may turn this arm 16 to any one of these contacts and supply current to any one of the conductors 18 to any one of the relay coils 19 thereby closing any one of the pairs of contacts 20 which are held normally open by the retracting springs 21. The closing of one of these pairs of contacts 20 establishes a second branch circuit for supplying current as follows; from the generator 1 over the conductor 2, conductor 22, some one of the varied resistances 23, the corresponding pair of contacts 20, conductor 24, contacts 34, conductor 8 and tool 6. The resistances 23 are varied to supply an additional 25 amperes or 50 or 75 or 100 or any other suitable amount that may be desired. The amount of current delivered to the tool may thus total 50 amperes or 75 or 100 or other amounts in accordance with the various resistances 23 introduced into the circuit.

An operator finds difficulty in holding the tool at a fixed distance from the work. An unsteady hand causes the distance to vary thus varying the resistance over which the arc from the tool to the work has to pass. This variation may cause a variation in the current sometimes as much as 15 amperes with the result that the weld becomes porous. In order to overcome this objection my system includes an automatic regulator to compensate for the variation in the resistance of the arc. For this purpose an automatic resistance varying device 25 is employed in a third branch circuit to add an additional amount of current when the resistance between the tool 6 and the arc 5 is increased which is lessened when the resistance is decreased. This automatic resistance consists of a series of coils 26 connected to contact points 27 adapted to be brought into connection with the switch arm 28 fulcrumed at 29 and operatively connected to the solenoid core 30 by means of the pin and slot connection 31. As the current is reduced by an increasing resistance in the welding arc it exerts a lesser pull upon the core 30

of the solenoid 12 thus enabling the tension spring 32 to draw the core 30 from the coil of the solenoid and thereby cause the switch arm 28 to sweep down over the resistance 26 and thereby reduce the resistance of the third branch or regulating circuit as follows; conductor 2, resistance 26, switch arm 28, conductor 33, pair of contacts 34 held normally open by the retracting spring 35, but now closed under the influence of the circuit closer coil 9, conductor 36, conductor 8 tool 6. This additional amount of current is added to the current of the other branch circuits heretofore described to compensate somewhat for the loss of current passing over this circuit when the resistance of the arc has increased. When the tool approaches the weld thus reducing the resistance of the arc, thus causing an extra amount of current to flow through the solenoid and the branch circuit containing it, the core 30 of the solenoid is drawn into the coil against the influence of the spring 32 and causes the switch arm 28 to sweep upward over the resistance 26 thereby introducing additional resistance into the second branch circuit containing the switch arm 28 and the pair of contacts 34. The resistance may increase from 0 up to 2 ohms, thereby cutting off nearly all the additional current.

In order to render the switch arm 28 sluggish in its action the solenoid core 30 is secured to the member 37 of the dash pot 38.

It is apparent that when the tool is not in use no current will pass through the circuit closer coil 9 and in this case the spring 32 will draw the core 30 out of the solenoid, causing the switch arm 28 to be brought into contact with the lowest contact point 27 of the automatic resistance 25. It is apparent that in such event the first contact of the tool with the weld would cause a rush of current over this third branch circuit which would cause fused metal to spatter. To prevent this an additional solenoid 39 is employed adapted to draw the core 40 into the position shown in the drawing so that the switch arm 28 pivotally connected thereto is caused to normally engage the upper contact 27 thus introducing the maximum resistance of the automatic resistance varying device 25 into this third branch circuit. The coil 39 is in a circuit normally closed by the pair of contacts 41, closed under the influence of the retracting spring 42 and bridged across the generator 1 by means of the conductors 2 and 43, the latter of which may contain a fixed resistance 44 to reduce the current to such an amount as may be desirable to operate the solenoid 39. When the tool is applied to the work the current passing over the first described welding circuit energizes the relay coil 14 thereby opening the pair of contacts 41 thereby releasing

the coil 40 of the solenoid so that thereafter the switch arm 29 is influenced only by the two opposing forces of the solenoid coil 12 and the spring 32. Thereafter the switch arm 28 is held in such a balanced position between these two forces as will maintain a steady current between the tool 6 and the weld.

It is clear that the conductors 8 and 18 may be bound together in a cable and connected to the switch 15 in any well known way as shown at 8^b. These connections 8 and 18 are shown merely in diagram. In this figure the switch and the tool holder 7 may be made integral with each other. In the Fig. 2 is shown a modification in which the tool 6^a, held in the holder 7^a, may be fastened to a flexible cable 44 containing a single conductor 8^a corresponding to the conductor 8 in Fig. 1. The cable may be branched at 45, the other portion of the cable 46 containing the remaining conductor 18^a corresponding to the conductors 18 in Fig. 1 and a branch conductor 47 adapted to be connected to the conductor 8^a. These various conductors 18^a and 47 may be connected to a suitable switch 15^a having contact points and a switch 16^a adapted to be manipulated by the operator to perform the work already described with relation to the switch 15 in Fig. 1. The switch 15^a may be adapted to be thrown upon the ground so that the cable leading to the tool holder 7^a may be comparatively light and flexible. The cables may be branched either near the end of the cable where the operator is at work or they may be branched near the switchboard, if desired, and separate cables led around to the operator. In other words the switch is associated with the tool or welding device, and so connected as to be portable with it.

My invention is not limited to the specific means shown, for any other means adapted to secure similar results may be substituted.

Duplicate operator's panels or sets of apparatus similar to that shown connected to conductors 2 and 3 may be connected to the pair of conductors 48 and also 49.

What I claim is:

1. In a welding system, switchboard connections, a rheostat thereat, a welding tool, electrical connections between said switchboard and rheostat and said welding tool and means associated with said welding tool adapted to manipulate said rheostat at said switchboard.

2. In a welding system, switchboard connections, a rheostat thereat, a welding tool, electrical connection between said switchboard and rheostat and said welding tool and means associated with said welding tool adapted to manipulate said rheostat at said switchboard, said means consisting of a se-

ries of relays and circuits therefor, an operator's switch adapted to be associated with said operator's outfit to selectively operate any one of said relays to vary the resistance through said rheostat.

3. In a welding system, switchboard connections, a rheostat thereat, a welding tool, electrical connections between said switchboard and rheostat and said welding tool and means associated with said welding tool adapted to manipulate said rheostat at said switchboard, said means consisting of a plurality of relays, branch circuits and circuit closers, said circuit closers being associated with the operator's outfit and adapted to selectively introduce into the welding circuit any one of the series of varied resistances.

4. In a welding system, a switchboard outfit, an operator's welding device located at a distance therefrom, a series of varied resistances at said switchboard and means at said operator's outfit adapted to selectively introduce any one of said varied resistances into the welding circuit.

5. In an electric welding system, a portable welding device, a stationary resistance varying means to vary the resistance thereat in the welding circuit, and portable means adapted to be moved with said welding de-

vice to operate said stationary resistance varying means.

6. In an electric welding system, a portable welding device, a stationary resistance varying means to vary the resistance thereat in the welding circuit, flexible connections between said stationary resistance and portable device, and portable means adapted to be carried with said welding device to operate said stationary resistance varying means, having flexible connections with said stationary resistance varying means and with said portable device.

7. In an electric welding system, a portable welding device, a stationary resistance varying means to vary the resistance thereat in the welding circuit, flexible electrical connections between said stationary resistance and portable device, and portable means adapted to be carried with said welding device to operate said stationary resistance varying means, having flexible electrical connections with said stationary resistance varying means and with said portable device.

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Witnesses:

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