This invention relates to the electric furnace art and is particularly directed to an electrode holder. While the holder may be found of use in connection with various types of electric furnaces, it has been particularly designed for use in connection with that type of furnace structure shown in my pending application for patent, Serial No. 670,674, filed May 18, 1946, now Patent Number 2,529,519.

The object of the invention is to produce an electrode holder which will be of the utmost simplicity but incorporated in which is a very efficient pair of electrode clamping jaws, a fluid circulating system for keeping the holder in the upper part of the electrode cool, and in which the holder, in addition to providing for the cooling fluid circulating means, incorporates therein, and as a part of the circulating means, conductors for conducting the flow of electricity to and from the electrode.

Another important object of the invention is to provide a means whereby the electrode arms can be easily adjusted and positioned in any plane in order to properly align the electrodes with the holes in the furnace roof.

These objects are accomplished by means of the structure and relative arrangement of parts described in detail in the following specification and defined in the appended claims.

In the drawings:

Figure 1 is a top plan view of one of the electrode holders foreshortened.

Figure 2 is a side elevation of the holder likewise foreshortened and being shown partly in section.

Figure 3 is a sectional view taken on a line 3—3 of Fig. 2.

Referring now more particularly to the characters of reference on the drawings, the numeral 1 indicates generally a supporting and clamping means by which the electrode holder may be secured to the supports which in turn are secured to the desired part of the furnace itself. This clamping means and its associated parts provide instrumentalities for adjusting and positioning the electrode arms in any plane in a manner and for a purpose as will presently be described in more detail. This clamp and support unit holds the entire electrode holder which in the present invention includes an outer arm 2 here shown preferably as being of cylindrical form. At the outer end of this member 2 is an annular flange 3. Bolted to this flange 3 is another flange 4 which supports a jaw 5. This jaw 5 is preferably in the form of a semi-circle, as shown, and has inwardly projecting clamping lugs 6 on its inner circumference. These clamping lugs are preferably removable. To this end the bosses 5a through the later described water jacket 7. These bosses are drilled to receive cap screws 60 removably engaging the lugs 6. The jaw 5 is provided with the inner fluid circulating passageway 17 which extends completely around the jaw except at the inner end where the passageway is broken to form entrance and exit openings 8. These openings 8 are in register with the outer ends of tubes 9 which are supported within the element 2 and project through the same to the rear end thereof where they may be connected with a source of fluid supply and with electrical conductors in a manner as will presently appear. It will thus be seen that fluid flowing through one tube 9 will pass completely about the jaw 5 through the passageway 17 and out the other opposite tube 9 thus effecting the cooling of the jaw 5.

A cross plate 10 is fixed within the member 2 at a point somewhat back of the outer end thereof and a like cross plate 11 is disposed in spaced relation forwardly of the plate 10. Mounted for movement longitudinally relative to the member 2 are a pair of spaced tubes 12; said tubes being mounted for such longitudinal movement through the plates 10 and 11 and projecting forwardly of the latter. At the outer ends of these tubes 12 is secured a clamping jaw 13 which has a substantially semi-circular outer face which is disposed in opposed relation with respect to the inner face of the jaw 5 whereby an electrode 14 may be clampingly engaged between such opposed faces of the jaws 5 and 13.

The jaw 13 is formed with an inner passageway 18 which is in register and communication with each of the tubes 12. The outer ends of these tubes 12 likewise project to the rear of member 2 where they may be connected to a source of fluid supply and with electrical conductors in a manner as will presently appear. Fluid will flow through one tube 12 thence through the passageway 18 and out the other tube 12 to effect the cooling of the jaw 13.

A short rod 16 is movable through the plates 10 and 11 and its outer end is in contact with the jaw 13. On this rod, between the plates 10 and 11, is a collar 17 and there is a compression spring 19 interposed between the collar 17 and the plate 10. Said spring 19 tends to constantly urge the jaw 13 toward the jaw 5 to frictionally hold the electrode 14 therebetween. However, such spring will compress to allow the
jaw 13 to be withdrawn from the electrode for the purpose of removing the same from the jaws when a replacement is to be made. This movement of the jaw 13 may be effected by the following described mechanism.

A lever 20 is fulcrumed adjacent the rear end of the member 2, as at 21, independently of the movable tubes 12. A fluid pressure actuated cylinder unit 22 has the piston pin 23 thereof projecting ordinarily and arranged for engagement with the free end of the lever 20. Fluid may be admitted to the cylinder 22 from any desired source, as at 24, to move the piston within the cylinder and cause the pin 23 to move the lever 20 on its fulcrum. A pin 25 is clamped centrally of the tubes 12 by means of a clamp 26 rigidly secured to both of said tubes. Said pin 25 normally engages a pad 27 on the lever 20. When the lever 20 is swung on its fulcrum through the action of the pin 23, the pad 27 will engage the pin 23 and through the medium of the clamp 25 move both of the tubes 12 rearwardly. Since these tubes 12 are connected to the jaw 13 this action will retract said jaw 13 with respect to the jaw 5 and the electrode 14.

After a new electrode has been put in position the pressure will be relieved from the cylinder 22, and the spring 18 will then function to return the jaw 13 toward the jaw 5 for clamping engagement with the electrode 14. This action will then return the lever 20 and pin 23 to their initial starting positions. The means for connecting the tubes 9 and 12 to the source of fluid supply and to the electrical conductors may be briefly described as follows:

A male and female union 28 is clamped against an annular flange about the end of each tube. A hose fitting 29 is shrunk on the outer surface of the female union half and a short copper pipe 30 is threaded into the interior of such female union half. A hose 31 is mounted over the hose fitting and leads the fluid to the tube. Electrical conductive wires 32 are led through the hose leading to one of the tubes 9 and 12, respectively, and are brazed to the corresponding short tube 33. The tubes 9 and 12 are of copper, hence a circuit may be established from the wires through the tubes 9 and 12, hence through the jaws 5 and 13, the electrode 14, the furnace charge and to the other electrodes. The wires 32 being constantly immersed in the cool liquid within the hose will be likewise kept cool.

The clamping and holding means 1 for the electrode arms includes a combination of elements by which the arms may be adjusted and positioned in every plane in order to properly align the electrodes with the holes in the rod. Thus clamping straps 33 and bolts 34 clamp the arm 2 to the base bracket 35 in such a manner that the arm may be adjusted longitudinally along its axis and also revolved about the same horizontal axis. The bracket 35 has an ear 36 pivoted in a horizontal plane at right angles to the longitudinal axis of the arm, as at 37, to the forked upper end 38 of a pin 39 turnable in a supporting piston rod 40 and resting on a shoulder 41 formed in piston rod 40. Lug 42 project laterally from the fork 38 and adjusting set screws 43 project therethrough and engage bracket 35. Through adjustment of these set screws the arm 2 may be adjusted in a vertical arc about the axis 37. The arm 2 may be also adjusted in a horizontal plane about the vertical axis of the piston rod 40 and set in any adjusted position by a set screw 44 projecting through the wall of the piston rod 40 and engaging the pin 39. These several adjustments provide means to locate the electrode with precision over the hole in the roof of the furnace through which the electrode is projected.

The clamping straps 33 provide an easy means for insulating the arm 2, there being an insulating fiber bushing 45 interposed between the strap and the arm 2.

It will be obvious from the foregoing description that there has been produced by the present invention a very compact and simplified form of electrode holder which fully answers all of the objects of the invention as disclosed herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention, the following is claimed as new and useful and upon which Letters Patent is desired:

1. An electrode holder comprising a supported arm, a semi-circular jaw fixed to the outer end of said arm, a movable jaw mounted in juxtaposition with respect to the fixed jaw and having its fixed mounting attached to the arm for longitudinal movement relative to the arm, said movable jaw being provided with means for operating thereon whereby an element may be clamped between said jaws, a pair of rods fixed to the movable jaw and supported by the arm for moving the movable jaw toward the fixed jaw, and a set of springs mounted on the arm and connected with the rods and operable to move the rods relative to the arm to pull the movable jaw in a direction away from the fixed jaw.

2. A structure as in claim 1 in which the movable jaw is hollow, the rods being tubular and their bores being in register with the hollow interior of the movable jaw, and means for connecting a source of cooling liquid to the tubular rods.

3. A structure as in claim 2 in which the lever means for moving the rods comprises a lever pivoted on the arm, a contact element secured to the rods and in detached engagement with the lever, and a fluid pressure motor fixed to the arm and having its piston rod engageable with the free end of the lever.

4. A structure as in claim 2 in which the yieldable means comprises a pair of spaced apart cross plates on the arm to the rear of the movable jaw, a pin movable through the plates with one end in contact with the movable jaw, a collar on the pin at a point between the plates and a compression spring interposed between one of the plates and the collar and normally urging the pin against the movable jaw.

5. An electrode holder comprising an elongated tubular supporting arm, means supporting the arm adjacent its rear end, a hollowed-out semi-circular jaw, a cross plate at the inner end of said jaw, means detachably connecting said plate with the outer end of the arm, tubes fixedly supported in the cross plate and in register with the hollowed-out portion of said jaw, said tubes projecting through the arm and out the rear end thereof, means circulating cooling liquid through said tubes and the jaw, a second pair of tubes mounted for sliding movement in the cross plate longitudinally of the arm and the rear ends of said second named tubes projecting to the rear of
the arm, a hollowed-out clamping jaw fixed on
the outer ends of said second named tubes with
the tubes in register with the hollowed-out por-
tion of said clamping jaw, means for circulating
a cooling liquid through the second named tubes
and said clamping jaw, electric conductive wires
connected to one of the first named tubes and to
one of the second named tubes at the rear end
thereof, yieldable means normally urging the
clamping jaw toward the fixed jaw, and other
means carried by the arm and co-operating with
the slidable tubes to effect selective movement of
the clamping jaw in a direction away from the
fixed jaw.

6. A structure as in claim 5 in which the last
named means comprises a pin clamped to the
second named tubes to the rear of the arm, a
lever pivoted on the rear of the arm and having
an element for engagement with the pin, and
fluid pressure operated means mounted on the
rear of the arm and operative to swing the lever
element into engagement with the pin to move
the second named tubes rearwardly.

EDOUARD THYS.

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