C. A. DUNCAN.

WATER COOLED ELECTROCARBON CONNECTION FOR ELECTRIC FURNACES.

APPLICATION FILED OCT. 5, 1908.

915,668.

Patented Mar. 16, 1909.

2 SHEETS—SHEET 1.

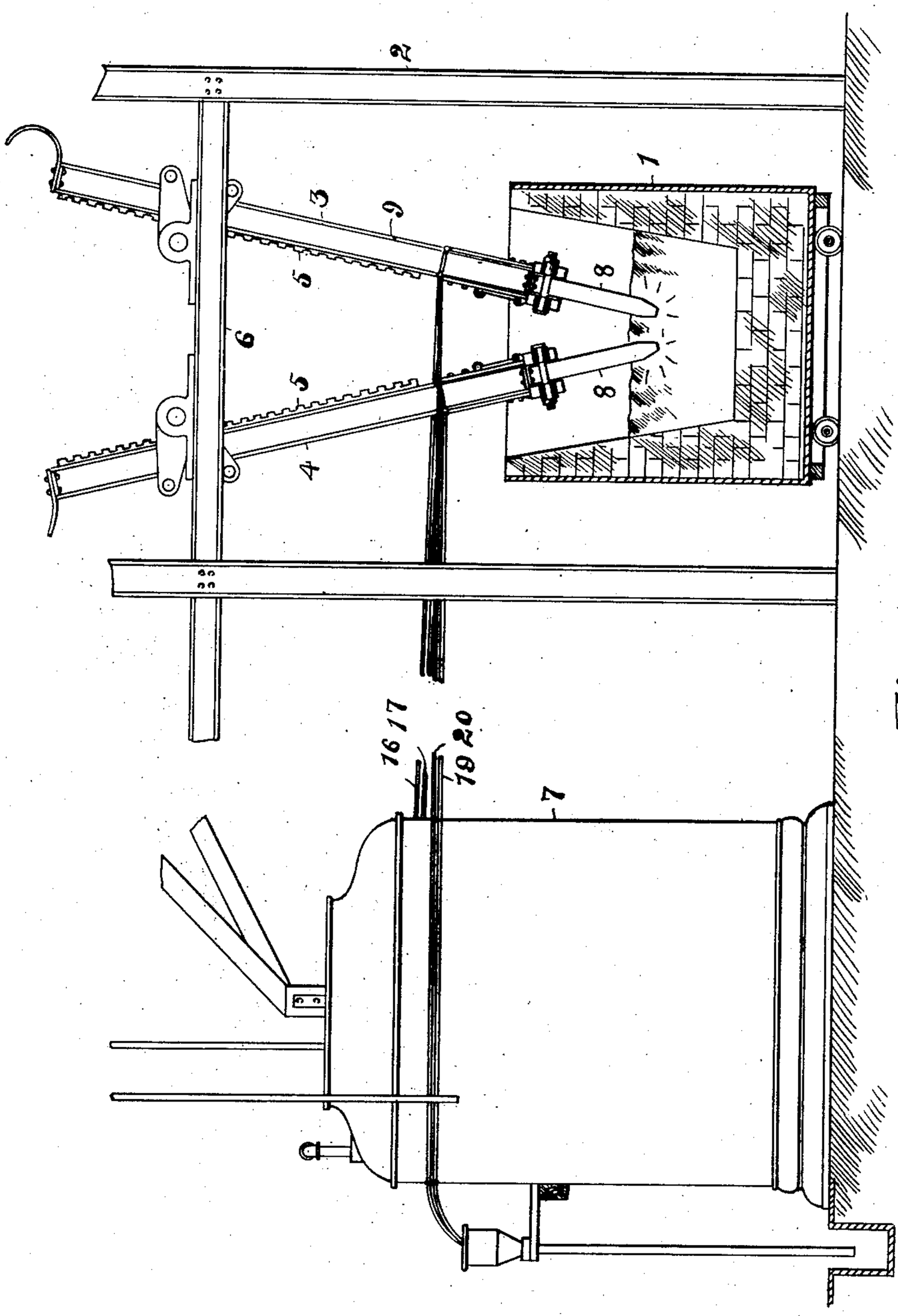

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

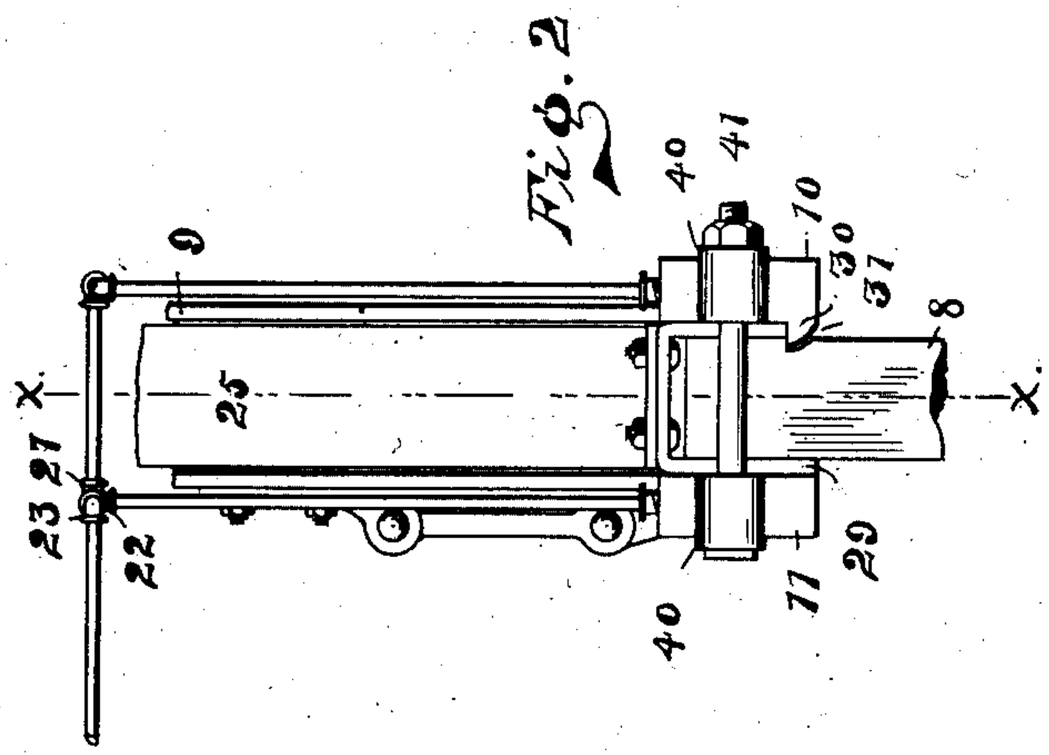
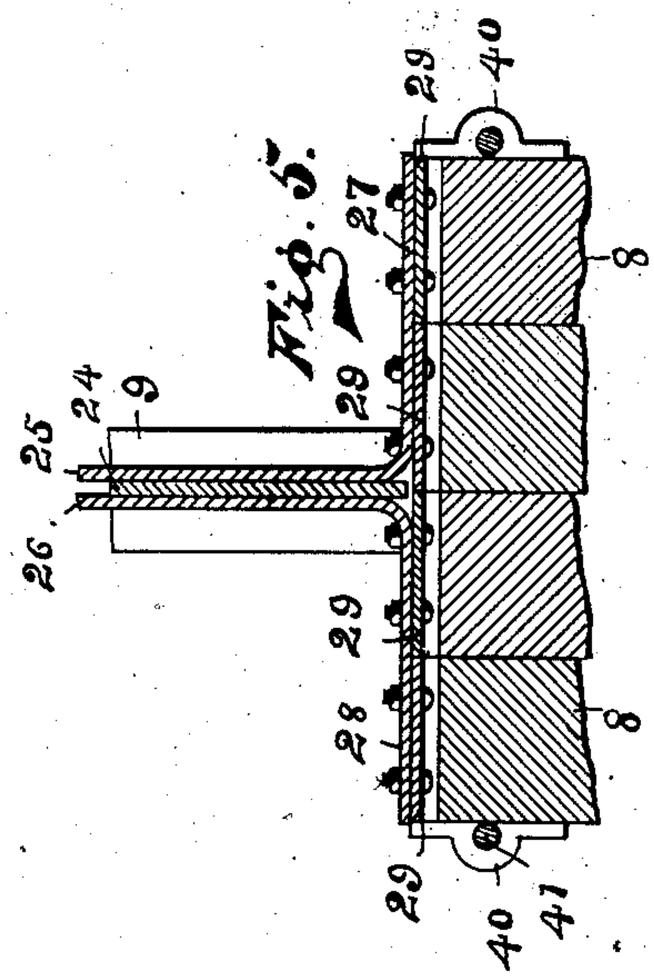


Fig. 5.



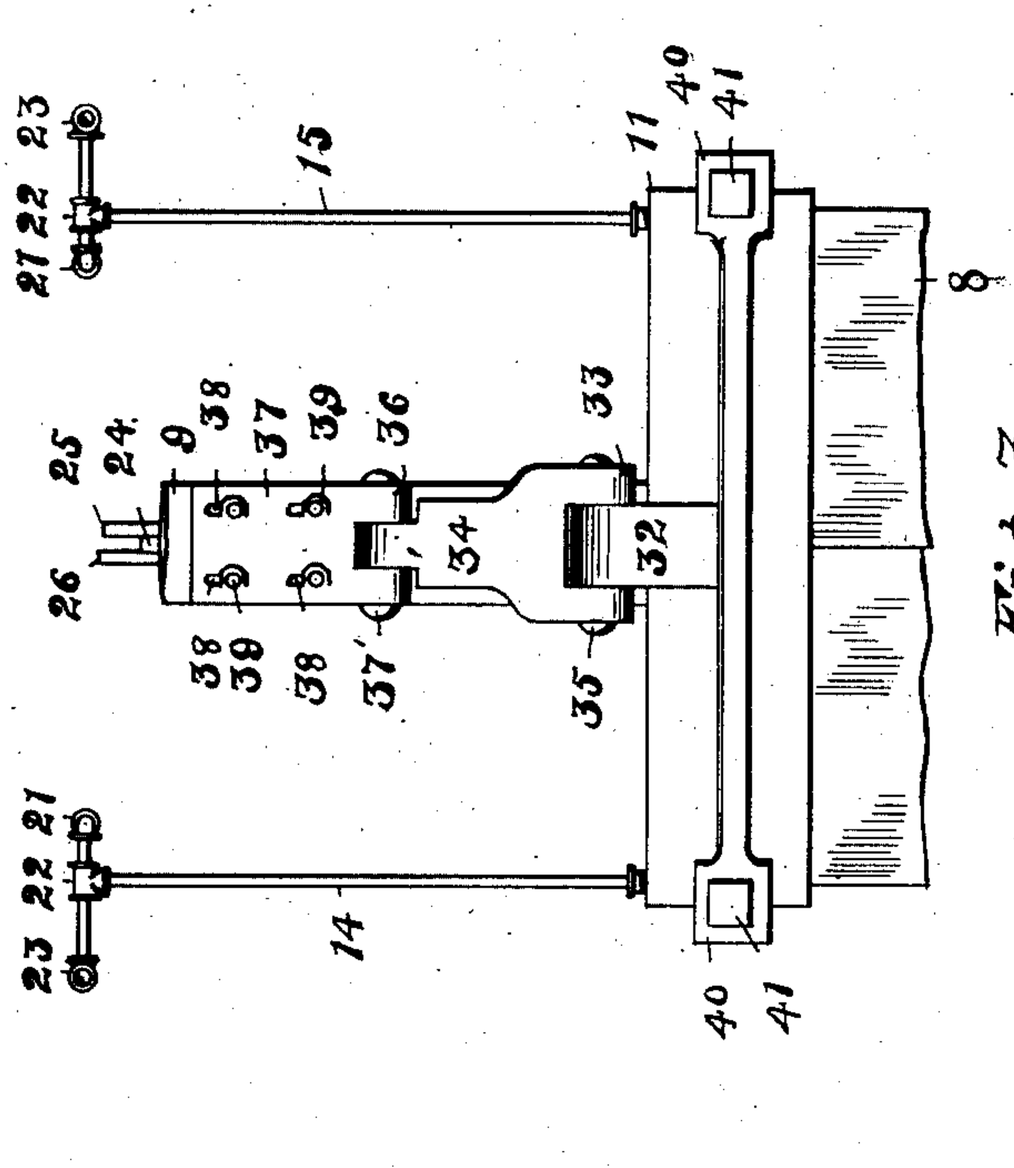


Fig. 3.

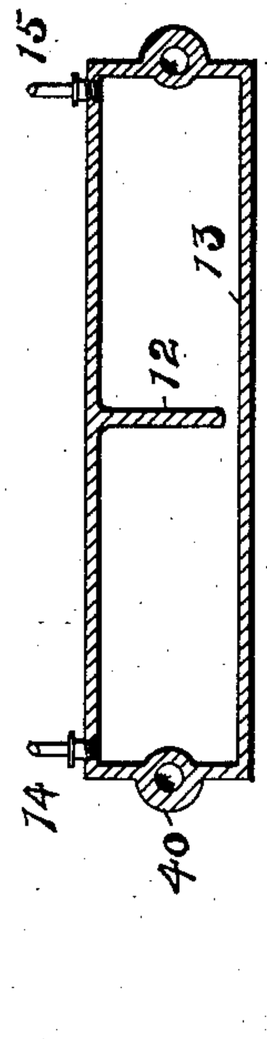


Fig. 4.

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UNITED STATES PATENT OFFICE.

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WATER-COOLED ELECTROCARBON CONNECTION FOR ELECTRIC FURNACES.

No. 915,668. Specification of Letters Patent. Patented March 16, 1909.

Application filed October 5, 1908. Serial No. 456,225.

To all whom it may concern:

Be it known that I, CHARLES A. DUNCAN, a citizen of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Water-Cooled Electrocarbon Connections for Electric Furnaces, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to improvements in water cooled electro-carbon connection for electric furnaces.

The object of my invention is to provide a connection of this character which is supplied with water-circulating means and thus provide a cool and practically indestructible connection between the metal and carbon parts of the electrode, which will not only preserve such parts but render them handable very soon after being used in the furnace. It is well understood that such electrodes, after being in use for some time, become very hot and cannot be taken apart or handled for many hours after removal from the furnace for renewing or repairing any of the parts.

Another object of my invention is to provide a more simple, cheap and effective means for cooling the connections which in no way interferes with the usual operation of such connections.

In the accompanying drawings, Figure 1, is a side elevation partly in section of an electric furnace showing the application of my improved water-cooled connections. Fig. 2, is an enlarged end view of one of my improved electro-heads or connections showing the carbon and the upper end of the head broken away. Fig. 3, is a side elevation of Fig. 2. Fig. 4, is an enlarged, vertical, sectional view of one of the jaws showing the water chamber and the water inlet and outlet. Fig. 5, is a vertical, sectional view taken on the line *x*—*x* of Fig. 2.

My invention relates, as heretofore stated, to electric furnaces, and pertains more particularly to open furnaces for the smelting and manufacture of calcium carbid where the heat is allowed to come directly in contact with the carbons and their connections, and in order to properly illustrate the invention I have shown a portable furnace 1 mounted within the frame-work 2, and carried by said frame-work are the two vertically-adjustable electrodes 3 and 4 which extend into the furnace. The electrodes are preferably arranged at an angle as shown in Fig. 1, and the inner edges thereof are provided with rack-bars 5 which mesh with suitable pinions carried by the cross-bar 6 of the frame 2, and said pinions are operated in any suitable manner whereby the electrodes may be raised or lowered as desired. The upper ends of the electrodes are electrically connected to the transformer 7 in any desired manner, while the opposite or lower ends have secured therein the removable carbon 8 which extend into the mixture within the furnace 1 to be smelted.

The electrodes 3 and 4 are identical in every respect except that they carry the opposite polarity of the current of electricity and therefore I will specifically describe but one electrode. The electrode is preferably composed of an I-beam 9 upon the inner edge of which is placed the rack-bars 5 heretofore described. Carried by the lower end of the I-beam 9 are the water-cooled heads which consist of a fixed hollow metal jaw 10, and the hinged hollow metal jaw 11, and between which the carbon is clamped as will be hereinafter more fully described. The said jaws are of a hollow form and have a central depending partition 12 extending within a short distance of the lower wall 13 to cause the water to take a zig-zag course through the jaw and thus more thoroughly cool the jaw. The jaws 10 11 have at one end a water supply pipe 14 and at the opposite end a discharge pipe 15, and thus it will be seen that the water under pressure circulates through the jaws and keeps them comparatively cool. The water is supplied through the pipes 16 and 17 from the transformer 7 and discharged through the pipes 19 and 20 from the jaws into the drains. By means of the joints 21, 22 and 23 the swinging jaw is allowed to readily operate without disconnecting any of the joints when the jaw is opened for replacing the carbon or other repairs.

Secured to the web 24 of the I-beam 9 on each side are the plates 25 and 26 which have their lower ends turned outwardly as indicated at 27 and 28. Secured to the lower face of the outwardly-turned ends 27 and 28 are inverted U-shaped plates 29 into which the carbon is inserted. The heads or jaws 10 and 11 are of a hollow form, as shown and described in respect to Fig. 4. The jaw 10 is

securely fastened permanently to the side of the I-beam 9 while the other jaw is mounted so that it might swing outwardly for removing the carbon. The lower end of the rigid jaw is provided with the inwardly-extending lug 30 which enters notches 31 in the carbon and whereby the same is permanently held when the movable jaw is in its inward position.

The movable jaw 11 is provided with an upwardly-extending lug 32 over which the bifurcated end 33 of the link 34 extends and connected by a pin or bolt 35 serving as a pivot. The upper end of the link 34 enters the bifurcated end 36 of the plate 37 and the pin 37′ passes through the same pivoting it. The plate 37 is provided with slots 38 through which bolts 39 pass, and by means of which the plate is securely fastened to the I-beam, yet allowing of the vertical adjustment of the plate.

In order to securely fasten the two jaws in their inward position, clamping the carbons in position, the jaws at each end are provided with enlarged portions 40 having openings through which the bolts 41 pass, and by means of which the jaws are clamped with the carbons between the same. The bolts, as shown, are provided with nuts.

The carbons can either be made in one or two pieces, or could be made in a series of pieces, as shown in Fig. 5, although this forms no part of my invention, and in no way affects the operation of the device.

The joints 21, 22 and 23 allow the movable jaw to be swung outwardly and still have the water circulation therethrough without uncoupling any of the connections.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:—

1. A water cooled electrode, comprising a stationary jaw, a hinged jaw carried by the stationary jaw, and a pipe connection for the movable and stationary jaws.

2. A water cooled electrode comprising a stationary jaw, a jaw hinged to the stationary jaw, a water supply pipe for each jaw, and a water discharge pipe for each jaw.

3. A water cooled electrode comprising a stationary hollow jaw, a jaw hinged to the stationary jaw, means for clamping the jaws together with the carbon between them, and a water supply and discharge for each jaw.

4. A water cooled electrode comprising a stationary jaw, a jaw hinged to the stationary jaw, means for locking the jaws together with the carbon between the same, a water supply and discharge pipe for the stationary jaw, and a water supply and discharge pipe connected to the movable jaw, and a swinging connection between the supply and discharge pipes of the stationary jaw and the supply and discharge pipes of the movable jaw.

5. A water cooled electrode comprising a stationary jaw, a movable jaw hinged to the stationary jaw, bolts passing through said jaws for clamping the carbon between the jaws, said stationary and movable jaws having water cooler means.

6. A water cooled electrode comprising a stationary jaw, a movable jaw hinged to the stationary jaw, bolts passing through said jaws for clamping the carbon between the jaws, said stationary and movable jaws having independent water circulating means for cooling the jaws.

7. A water cooled electrode comprising a stationary jaw, a movable jaw having a link hinge connection with the stationary jaw, and said jaws being hollow, and water supply and discharge pipes for causing a circulation of water through the jaws.

8. A water cooled electrode comprising a stationary jaw, a movable jaw having a link hinge connection with the stationary jaw, bolts passing through the said jaws for clamping the carbon between the jaws, said jaws being hollow, and water supply and discharge pipes for causing a circulation of water through the jaws.

9. The combination with a smelting furnace, a frame above the same, electrodes supported by the frame and formed of I-beams, rack-bars carried by beams, pinions carried by the frame and meshing with the rack-bars, a hollow stationary jaw carried by the I-beam, a movable jaw hinged to the stationary jaw, means for clamping the jaws together with the carbon between the same, and a water supply and discharge pipe for each jaw.

10. The combination with a smelting furnace, a frame above the same, electrodes supported by the frame and formed of I-beams, rack-bars carried by the beams, pinions carried by the frame and meshing with the rack-bars, a hollow stationary jaw carried by the I-beam, a movable jaw hinged to the I-beam, bolts passing through the jaws for clamping the carbon between the same, and a water supply and discharge pipe for each jaw.

11. A water cooled electrode comprising a stationary hollow jaw, a hinged hollow jaw, bolts for clamping the same together with the carbon between the same, a water supply for each jaw, and a discharge for each jaw.

12. An electrode comprising a beam, a hollow jaw rigidly secured to the lower end of said beam, a hollow jaw pivotally mounted upon the lower end of the beam, and means for causing a circulation of water through the said jaws.

13. An electrode comprising an I-beam, plates secured to the web thereof and having their ends turned at right angles, a U-shaped carbon-receiving member secured to the laterally-turned ends of the plates, a jaw rigidly

carried by one edge of the beam, a jaw pivoted to the opposite side of the beam, and means for clamping the jaws together.

14. An electrode comprising an I-beam, a jaw rigidly carried thereby and having an inwardly-extending lug to enter a recess in the carbon, a plate adjustably secured to the opposite edge of the beam, a link pivotally connected to the plate, a jaw pivotally connected to the lower end of the link, and means for clamping said jaws together.

15. An electrode comprising an I-beam, plates secured to the sides of said beam and having laterally-turned lower ends, an inverted U-shaped member secured to the laterally-turned ends of the plates, a hollow jaw rigidly secured to one edge of the beam, a plate adjustably secured to the opposite edge of the beam, a link pivotally connected to said plate, a hollow jaw pivotally connected to said link, a water supply pipe for each jaw, and a discharge pipe for each jaw, and bolts clamping the jaws together, with the carbon between the same.

16. The combination with a smelting furnace, a frame above the same, electrodes supported by the frame, and rack-bars carried thereby, pinions carried by the frame and meshing with the rack-bars for raising and lowering the same, a transformer adjacent the furnace and electrically connected to the electrode, a water cooled means carried by the electrode, and means for supplying the water from the transformer to the electrode.

17. An electrode comprising a beam, hollow jaws carried by the lower end of the beam for supporting the carbon, a division plate within the jaw intermediate its ends and extending from one wall adjacent the other wall, a water supply at one side of the plate, and a discharge at the opposite side of the plate.

18. An electrode comprising an I-beam, plates secured to the sides of said beam, and having laterally-turned lower ends, an inverted U-shaped member secured to the laterally-turned ends of the plates, a hollow jaw rigidly secured to one edge of the beam, a plate adjustably secured to the opposite edge of the beam, a link pivotally connected to said plate, a hollow jaw pivotally connected to said link, a water supply and discharge pipe for the rigid jaw, a water supply and discharge pipe for the movable jaw and having a swinging connection with the water supply and discharge pipe of the stationary jaw, and means for clamping the jaws together with the carbon between the same.

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

CHARLES A. DUNCAN.

Witnesses:
W. W. McMillan,
S. Geo. Stevens.