H. L. HARTENSTEIN.

CARBON HOLDER.

APPLICATION FILED NOV. 19, 1906. RENEWED AUG. 20, 1909.

946,434.

Patented Jan. 11, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

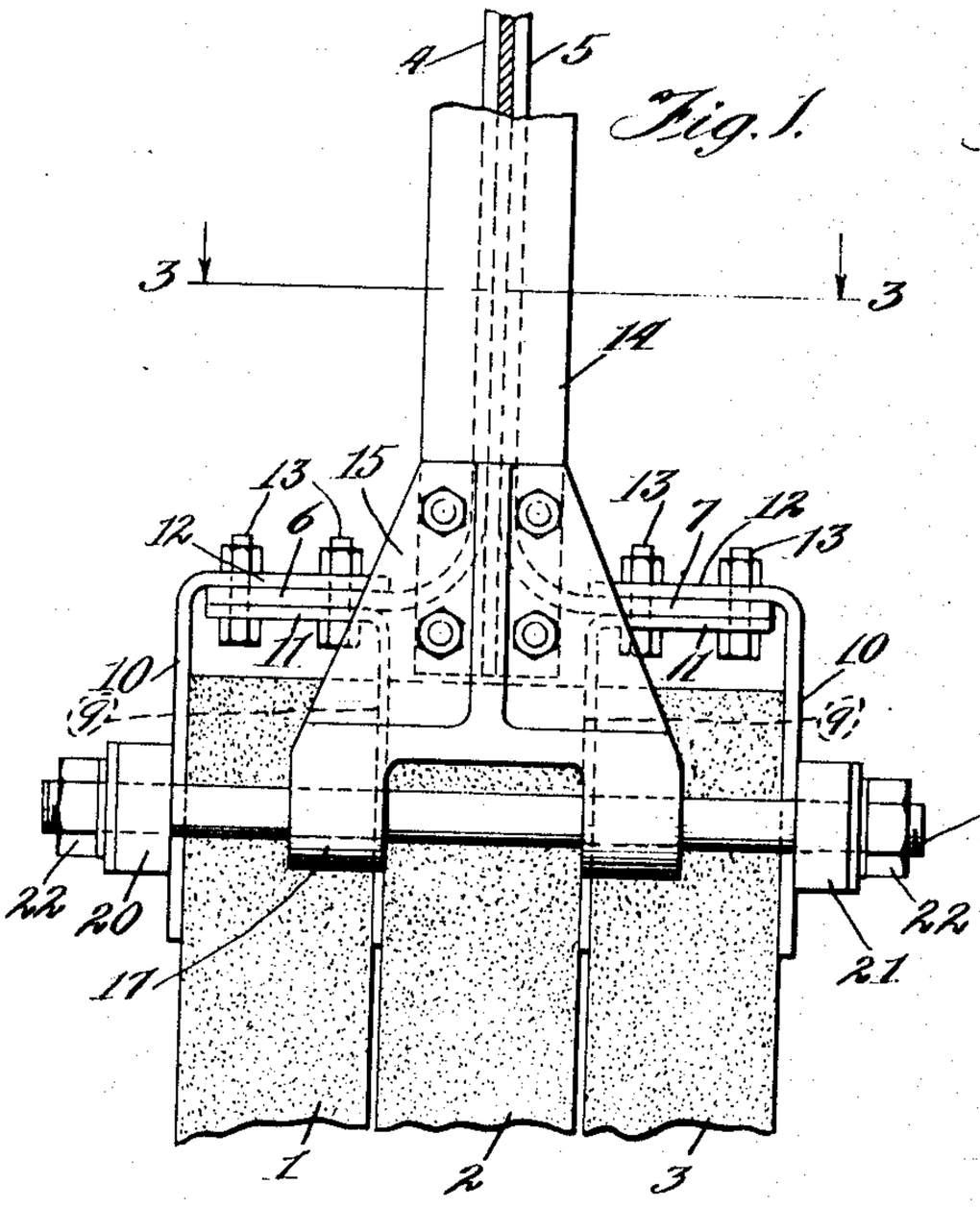


Fig. 2.

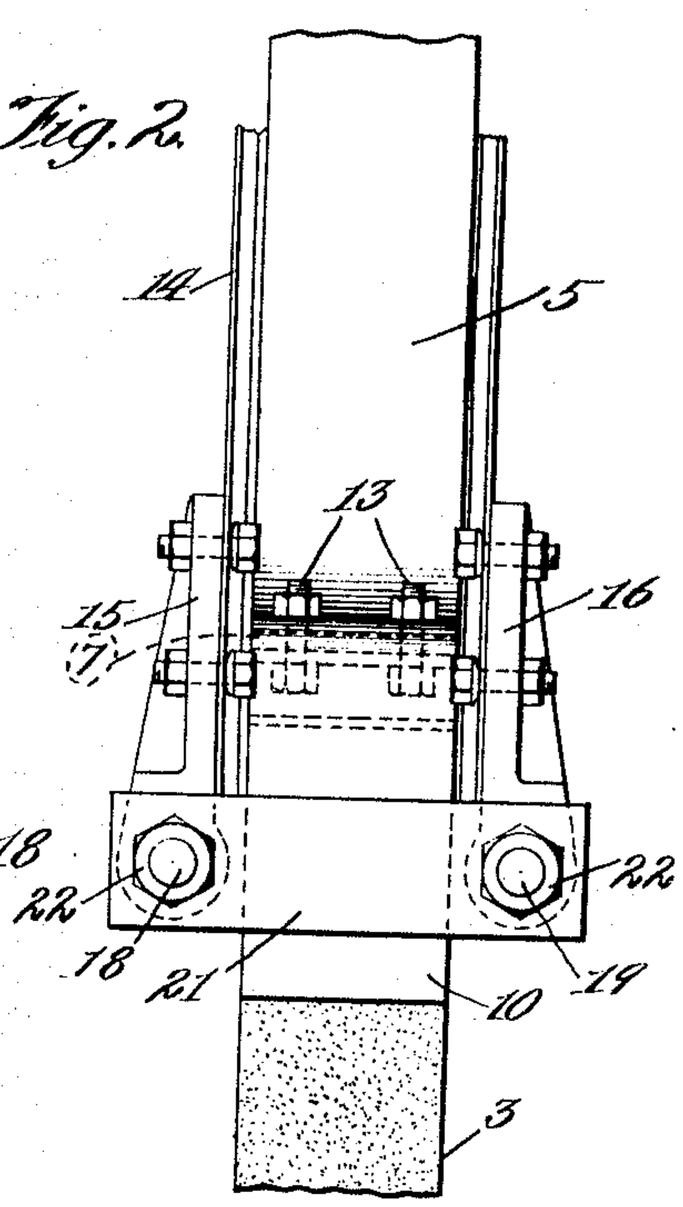
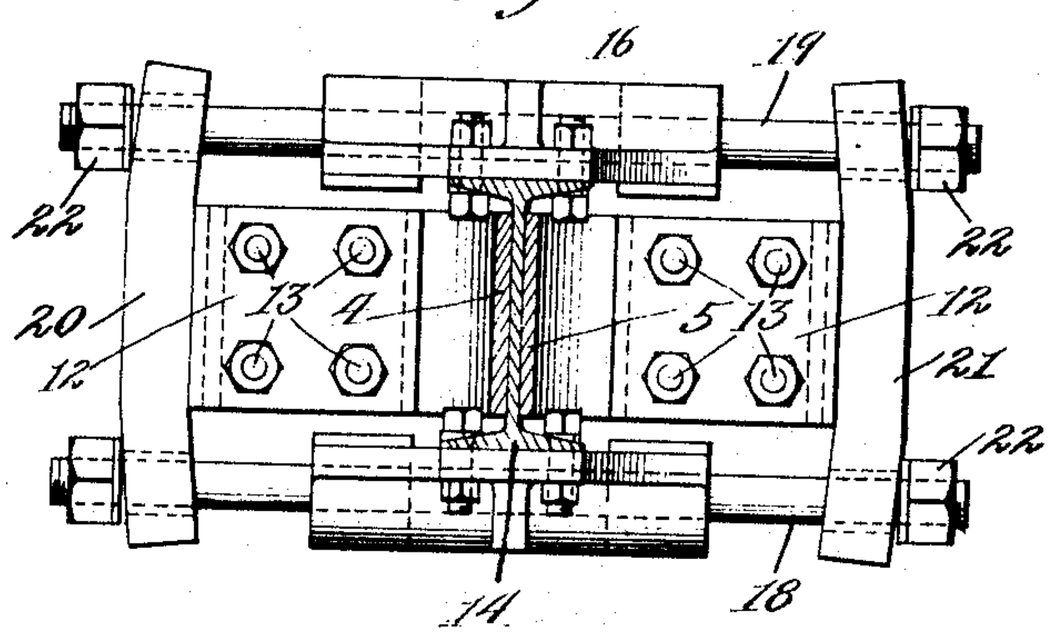


Fig. 3.



Witnesses:

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2 SHEETS—SHEET 2.

Fig. 4.

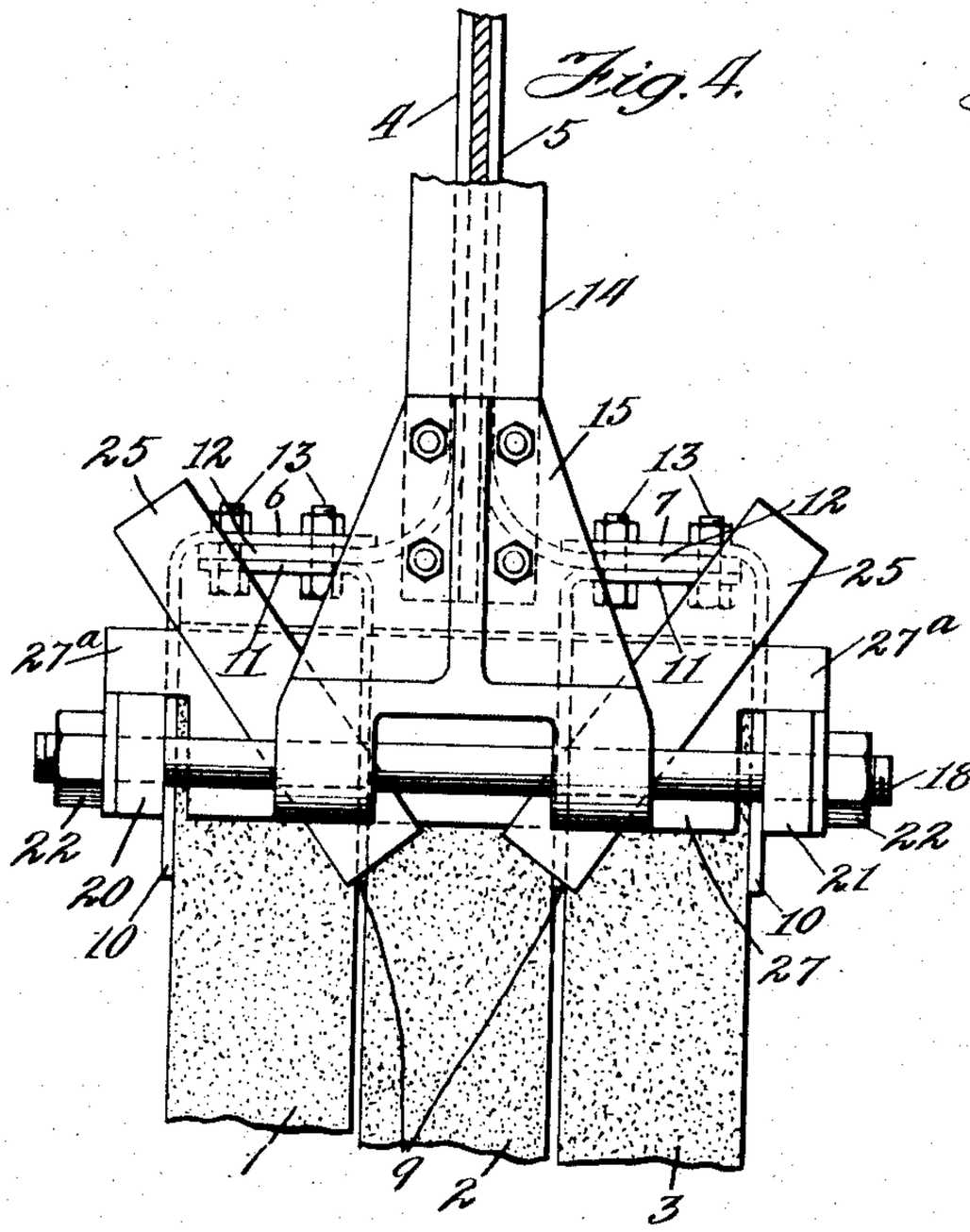

Fig. 5.

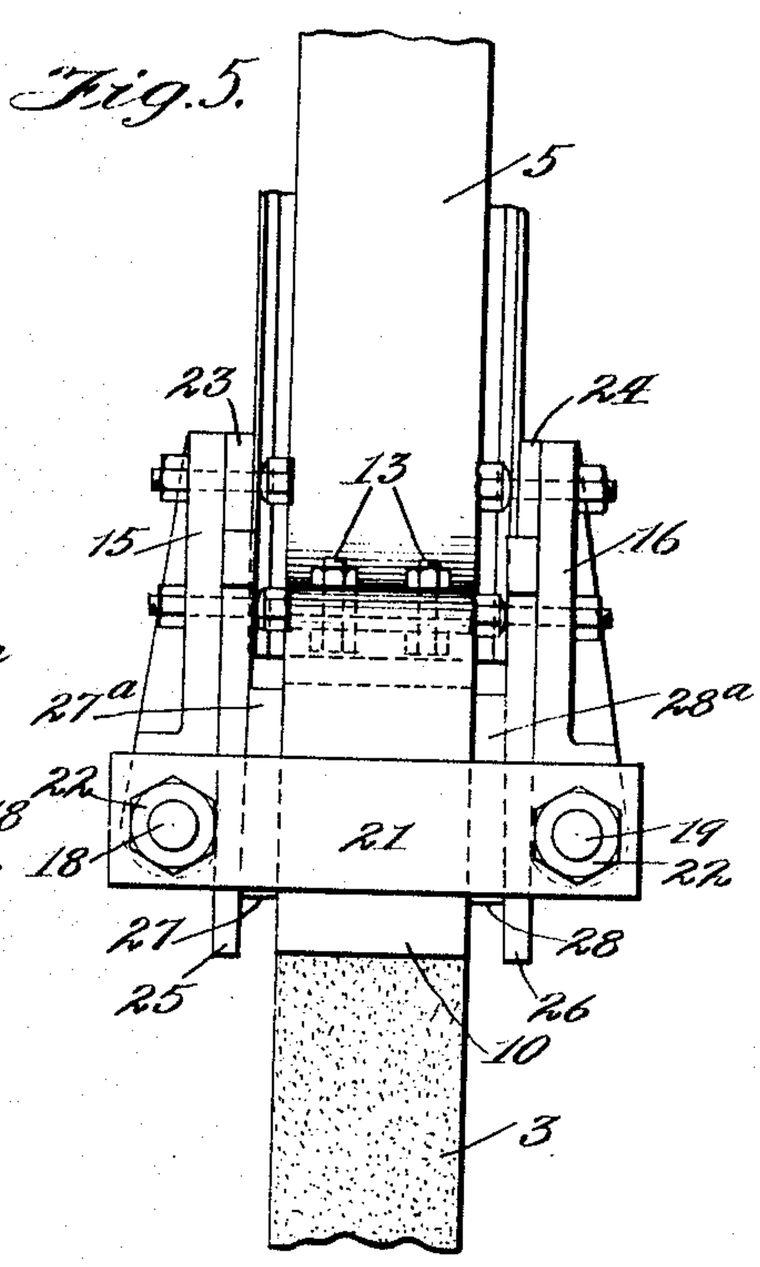

Fig. 7.

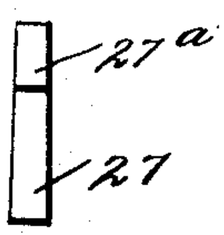

Fig. 6.

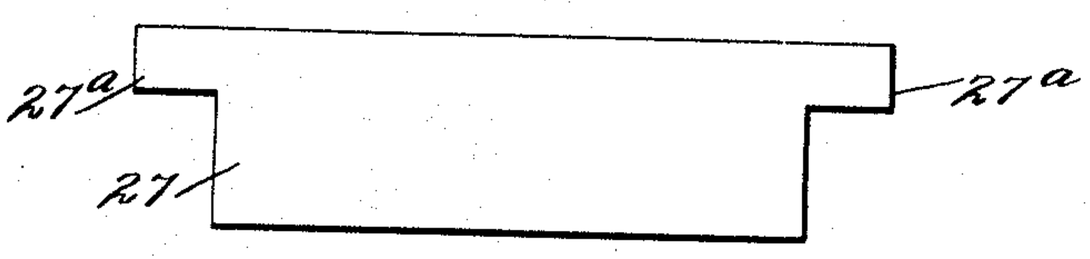

Fig. 8.

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UNITED STATES PATENT OFFICE.

HERMAN L. HARTENSTEIN, OF CONSTANTINE, MICHIGAN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CONTINENTAL INVESTMENT COMPANY, OF DULUTH, MINNESOTA, A CORPORATION OF MINNESOTA.

CARBON-HOLDER.

946,434. Specification of Letters Patent. Patented Jan. 11, 1910.

Application filed November 19, 1906, Serial No. 343,989. Renewed August 20, 1909. Serial No. 513,889.

To all whom it may concern:

Be it known that I, HERMAN L. HARTENSTEIN, a citizen of the United States, residing at Constantine, in the county of St. Joseph and State of Michigan, have invented certain new and useful Improvements in Carbon-Holders, of which the following is a full, clear, and exact specification.

This invention relates more particularly to carbon holders for electric furnaces in which electrodes carrying a plurality of carbons are employed. These carbons are usually of considerable size and of great weight and difficulty is experienced in holding them firmly together when the electrodes are tilted or shifted into different positions, and also in keeping them in perfect electrical contact with the other parts of the electrodes.

The primary object of this invention, therefore, is to provide an improved and efficient form of carbon holder which will be capable of effectually clamping one or more carbons and keeping in perfect electrical contact with the same while at the same time holding the clamped carbon against relative movement.

Another object of the invention is to provide improved and simple means for compensating for the expansion of the metallic parts of the holder when subjected to the heat of the furnace and preventing the carbons from getting loose as a result thereof.

With a view to the attainment of these ends and the accomplishment of certain other objects which will hereinafter appear, the invention consists in the features of novelty in construction, combination and arrangement of parts which will now be described with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings: Figure 1 is a side elevation of a carbon holder embodying this invention. Fig. 2 is a similar elevation looking from the diagonally opposite side to that presented in Fig. 1. Fig. 3 is a plan section thereof taken on the line 3—3, Fig. 1. Fig. 4 is a view similar to Fig. 1, showing still further improvements or a modification. Fig. 5 is a view thereof similar to Fig. 2. Fig. 6 is a detail face view of one of the clamping plates hereinafter described. Fig. 7 is an end elevation thereof, and Fig. 8 is an edge view of one of the wedges employed in the form shown in Figs. 4 and 5.

In this particular exemplification of the invention the carbon holder is designed for holding three carbons. These are shown at 1, 2 and 3 respectively, and as before stated, they may be of the usual form which is rectangular in cross section, but it is, of course, understood that the number of carbons to be employed is entirely immaterial and foreign to the spirit of this invention. The electrical conductors which conduct the current to and from the carbons usually comprise heavy copper strips or bars and in this exemplification of the invention such are employed. They are shown at 4, 5 respectively and in this instance serve to carry the current to all three of the carbons 1, 2 and 3. As shown in Fig. 1 the extremities of these strips or bars 4, 5 are turned outwardly or have lateral projections 6, 7 just over the ends of the two outer carbons 1 and 3 and bolted to these projections or otherwise suitably secured thereto are two clip or clamp plates 9, 10, two for each of the conductors 4, 5, the upper ends of the plates 9, 10 being turned at an angle toward each other respectively below and above the projections 6, 7 as indicated at 11, 12 and firmly secured to the projections 6, 7 by bolts 13 or other means. These plates or strips 9, 10 may be composed of copper or any other suitable conductor and are preferably of the same width as the outside carbons 1, 3, the outside plates 10 lying against the outer faces of the carbons 1, 3, and the inside plates 9, lying between these carbons and the intermediate carbon 2.

Copper conductors of the volume sufficient to carry all the current which may be needed with a device of this type are not sufficiently strong to sustain the mechanical stresses incident to the use of a heavy electrode, copper being a ductile and flexible metal, and there is no purpose in using copper conductors of a heavier section. In the present invention therefore the electrode carbons are carried by and supported at the end of a steel or iron arm or beam 14. This beam in the preferred specific embodiment of this invention is an ordinary steel or iron I beam. With a channeled iron of this character suitable copper conductors 4 and 5 may be accommodated

within the channels while at the lower end of this channel bar and on both sides thereof are bolted or otherwise secured two brackets 15, 16 whose lower ends are formed with perforated lugs 17 for the support of two clamping bolts 18, 19. The lugs 17 are situated considerably below the upper ends of the carbons and on both ends of the bolts 18, 19 are arranged clamping bars 20, 21 through which the threaded ends of the bolts pass and carry nuts 22 by means of which the clamping bars 20, 21 may be subjected to strain for forcing the plates 10 inwardly and firmly gripping and clamping all of the parts between them together. By making the clamping bars 20, 21 of a material possessing a slight degree of flexibility or elasticity, they may be subjected to strain until their ends bend inwardly as shown in Fig. 3 and as a consequence, when the bolts 18, 19 elongate in the heat of the furnace the strain under which the clamping bars 20, 21 are thus placed will still keep up the pressure and prevent the carbon from working loose. These plates will also prevent the oxidation of the contacting surfaces of the carbons by exclusion of the air therefrom.

A carbon holder thus constructed is effectual in holding the carbons and keeping them in perfect electrical contact with the conductors where the use does not require the tipping of the electrodes at an angle to the plane of the clamping bolts 18, 19 but where such tipping is necessary it is desirable to use the form of holder shown in Figs. 4 to 8 inclusive. In this form the construction is substantially the same as that described in Figs. 1 to 3 inclusive with the exception that the brackets 15, 16 are offset from the flanges of the I-beam 14 by spacing blocks 23, 24 to space away the inner faces of the brackets 15, 16 and make room for a number of wedges 25, 26. Two of these wedges are preferably employed on each side of the carbon holder and they are inserted between the inner faces of the brackets 15, 16 and two bearing plates 27, 28 which are adapted to be forced against the face of the carbons thereby. These plates are formed with supporting shoulders 27^a, 28^a respectively which overlap and rest upon the ends of the clamping bars 20, 21 and thus hold the plates 27, 28 against downward movement while the wedges 25, 26 are being driven. The wedges are preferably inserted in a diagonal direction as indicated in Fig. 4 and the outer faces of the plates 27, 28 are preferably tapered upwardly or beveled so that the inner face of each plate and the outer face of each wedge will be parallel in all positions of the wedges. By thus providing these bearing plates 27, 28 and the wedges 25, 26 the carbons are not only firmly held from shifting sidewise of the clamping bars 20, 21 but their upper ends are protected from the atmosphere by the plates 27, 28 and thus preserved against the deteriorating influences of the heat which, as is well known, has but little effect upon the carbons where not exposed to the air.

Lost motion between the carbons and the brackets 15, 16 may be readily taken up from time to time without removing the electrodes from the furnace by simply tapping the upper ends of the wedges, an operation which, of course, is much more feasible and convenient than would be the manipulation of bolts or clamping screws in the highly heated atmosphere in which devices of this nature are ordinarily employed. In the described device, the carbons are held in line with the steel arm and the compound electrode can be dipped and otherwise handled like a unitary structure. The copper extensions 10 not only give a good electrical contact with the carbons under the clamping pressure but being or relatively soft metal, they act as cushioning devices and enable the employment of relatively high clamping pressures upon the hard carbons.

Electrodes of the present type may be usefully employed wherever a freely movable, rigid and structurally strong electrode is required, and in a companion application, Serial No. 345,752, filed Nov. 30, 1906 (now Patent No. 883,110, March 24, 1908) this type of electrode is shown employed in a calcium carbid furnace.

What I claim is:—

1. In a device for the purpose described, the combination of a plurality of carbons, a plurality of conductors, having their ends turned at an angle, two conductor plates for each of said conductors having their ends turned toward each other and overlapped with and secured to the angle ends of said conductors, said conductor plates being arranged between said carbons and against the outer faces thereof on diametrically opposite sides, and means for clamping said carbons and conductor plates together.

2. In a device for the purpose described, the combination of an arm, brackets provided on said arm on diametrically opposite sides thereof, conductors supported by said arm between said brackets, carbons arranged between said brackets, conductor plates secured to said conductors and embracing said carbons, clamping bars crossing said conductor plates and clamping bolts engaging said clamping bars and supported by said brackets.

3. In a device for the purpose described, the combination of an arm in the form of a channeled bar, conductors lying between the flanges of such arm and having outwardly turned ends, conductor plates having ends turned toward each other and secured to the outwardly turned ends of said conductors, carbons embraced by said conductor plates,

brackets provided on said arm at diametrically opposite sides of the carbons, clamping bars crossing the conductor plates and bolts supported by the brackets and engaging said clamping bars.

4. In a device for the purpose described, the combination of an arm in the form of a channeled bar, conductors lying between the flanges of said arm and extending lengthwise thereof, a carbon in electrical connection with said conductors and means for supporting said carbon on said arm.

5. In a device for the purpose described, the combination of a supporting arm, a carbon and means for supporting and clamping the carbon to said arm, embodying a longitudinally movable wedge.

6. In a device for the purpose described, the combination of a supporting arm, a carbon and means for clamping carbon to the arm embodying a plate and a longitudinally movable wedge for forcing the plate toward the carbon.

7. In a device for the purpose described, the combination of a supporting arm, a carbon, and means for clamping the carbon to the arm embodying clamping bars engaging diametrically opposite sides of the carbon, a plate shouldered upon said bars and a wedge for forcing the plate toward the carbon.

8. In a device for the purpose described, the combination of a supporting arm, a carbon, clamping bars engaging diametrically opposite sides of the carbon, means for straining said clamping bars toward each other, means for supporting said straining means from the arm, a plate shouldered upon said clamping bars between said supporting means and carbon and a wedge interposed between said plate and supporting means.

9. In a device for the purpose described, the combination of a supporting arm, a carbon, clamping bars crossing diametrically opposite faces of the carbon, brackets secured to the arm on diametrically opposite sides of the carbon and wedging devices interposed between said brackets and the carbons for clamping the carbons on diametrically opposite sides.

10. In a device for the purpose described, the combination of a supporting arm, a plurality of carbons, brackets secured to opposite sides of the arm, clamping bars arranged on diametrically opposite sides of the carbons, plates shouldered upon said clamping bars between the brackets and the carbons, and wedges interposed between said brackets and plates for forcing the plates toward the carbons.

11. A dipping electrode comprising an I-beam, a conductor secured in a channel of said beam, a pair of brackets carried by the flanges of said beam, means for clamping carbons between said brackets and means for connecting said conductors with carbons so clamped.

12. A dipping electrode comprising an I-beam, a bracket secured to each flange at one end and extending below said end, and carbon clamps carried by said brackets.

13. A dipping electrode comprising an I-beam, conductor plates carried in the channels of said beam, a bracket on each flange at one end of the beam, said brackets extending somewhat therebelow, auxiliary conductor plates also extending therebelow and means carried by said brackets for clamping said auxiliary plates against carbon electrode elements and for securing said elements.

14. In a dipping electrode, a channeled steel beam, a copper conductor element in one of the channels thereof, said conductor elements being continued beyond the end of the beam and clamping means carried by said end, said clamping means being adapted to produce a forcible contact between the conductor continuations and carbon electrode elements and to hold said electrode elements.

15. In a dipping electrode, a steel beam, clamping means for securing carbon electrode elements at one end of said beam, said means extending beyond said end and being adapted to clamp carbon electrode elements in two directions at right angles with each other.

16. In a dipping electrode, a steel beam having a channel, a copper conductor in said channel, auxiliary conductors extending beyond the end of said beam, downwardly extending brackets carried by said end, means for clamping said auxiliary conductors to the copper conductors and means carried by said brackets for clamping said auxiliary conductors and carbon electrode elements into a rigid assemblage.

17. In a dipping electrode, a steel channeled bar, brackets at the end of the bar and extending therebelow, clamping tension rods carried by the brackets and clamping plates carried by said rods.

18. In a dipping electrode, a steel channeled bar, brackets at the end of the bar and extending therebelow, clamping tension rods carried by the brackets, clamping plates carried by said rods, auxiliary clamping plates at right angles to the first stated clamping plates and wedging means for producing pressure between said brackets and said auxiliary clamping plates.

19. A dipping electrode comprising a steel arm carrying clamping means at one end, said clamping means being adapted to exert clamping pressure from all sides upon a rectangular carbon electrode element held thereby, and means for transmitting current to said electrode element.

20. A dipping electrode comprising a steel arm, a copper conductor carried thereby, clamping means at the end of the arm adapted to exert clamping pressure upon all sides of a rectangular carbon electrode element held thereby and means for electrically connecting said conductor and said carbon element.

21. A dipping electrode comprising a channeled steel arm, a copper conductor mounted in a channel thereof, and having an extension beyond the end of the arm, a pair of brackets mounted on said end and carrying tension rods, and a pair of clamping plates mounted on the tension rods and adapted to rigidly hold rectangular carbon electrode elements therebetween and to make contact with said conductor extension.

22. A dipping electrode comprising a channeled steel arm, a copper conductor mounted in a channel thereof, and having an extension beyond the end of the arm, a pair of brackets mounted on said end and carrying tension rods, a pair of clamping plates mounted on the tension rods and adapted to rigidly hold rectangular carbon electrode elements therebetween and to make contact with said conductor extension, and a pair of auxiliary clamping plates at right angles to the first stated pair of clamping plates and to engage diagonally opposite faces of said rectangular carbon electrode elements therebetween.

23. In a dipping electrode, a steel arm and means for rigidly supporting carbon electrode elements in end-to-end engagement therewith and in line with said arm.

24. In a dipping electrode, a rigid metal arm carrying a conductor having a plate-like copper extension beyond one extremity, means at such extremity to support clamping means in line with said arm and clamping means carried thereby and adapted to exert lateral pressure on a flat-sided carbon electrode element through such plate-like extension.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 17th day of November A. D. 1906.

HERMAN L. HARTENSTEIN.

Witnesses:

FRANCIS A. HOPKINS,

CHAS. H. LEEM.