

Jan. 25, 1938.

G. E. SEIL

2,106,469

CONVEYER MECHANISM FOR ELECTRIC FURNACES

Filed March 18, 1936

6 Sheets-Sheet 2

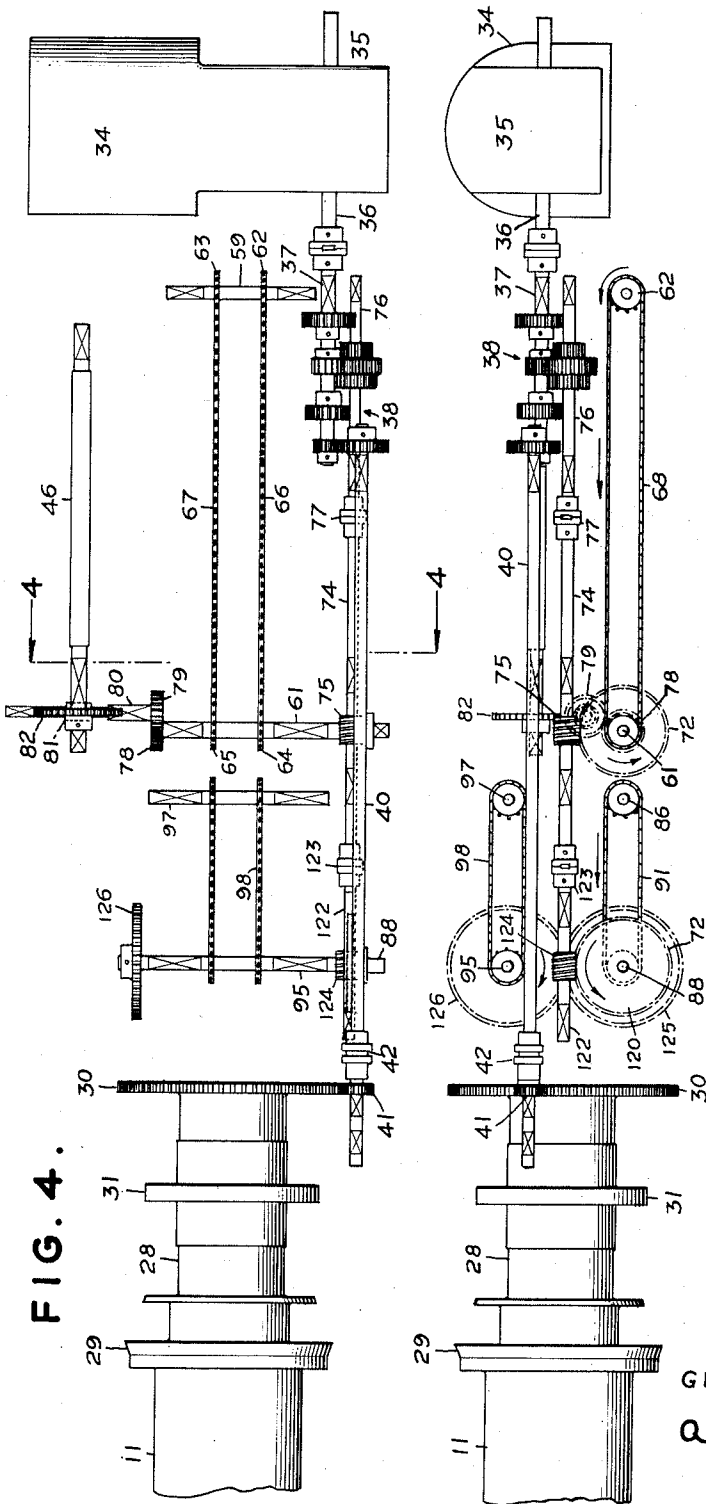


FIG. 4.

FIG. 3.

INVENTOR.
GILBERT E. SEIL,
Arthur Missel
ATTORNEY.

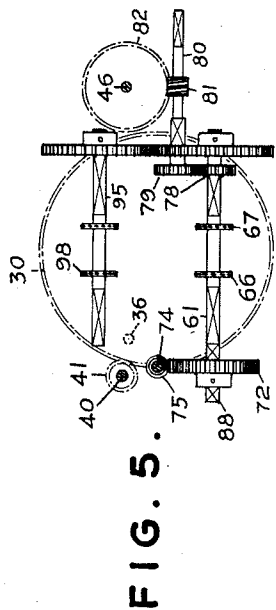


FIG. 5.

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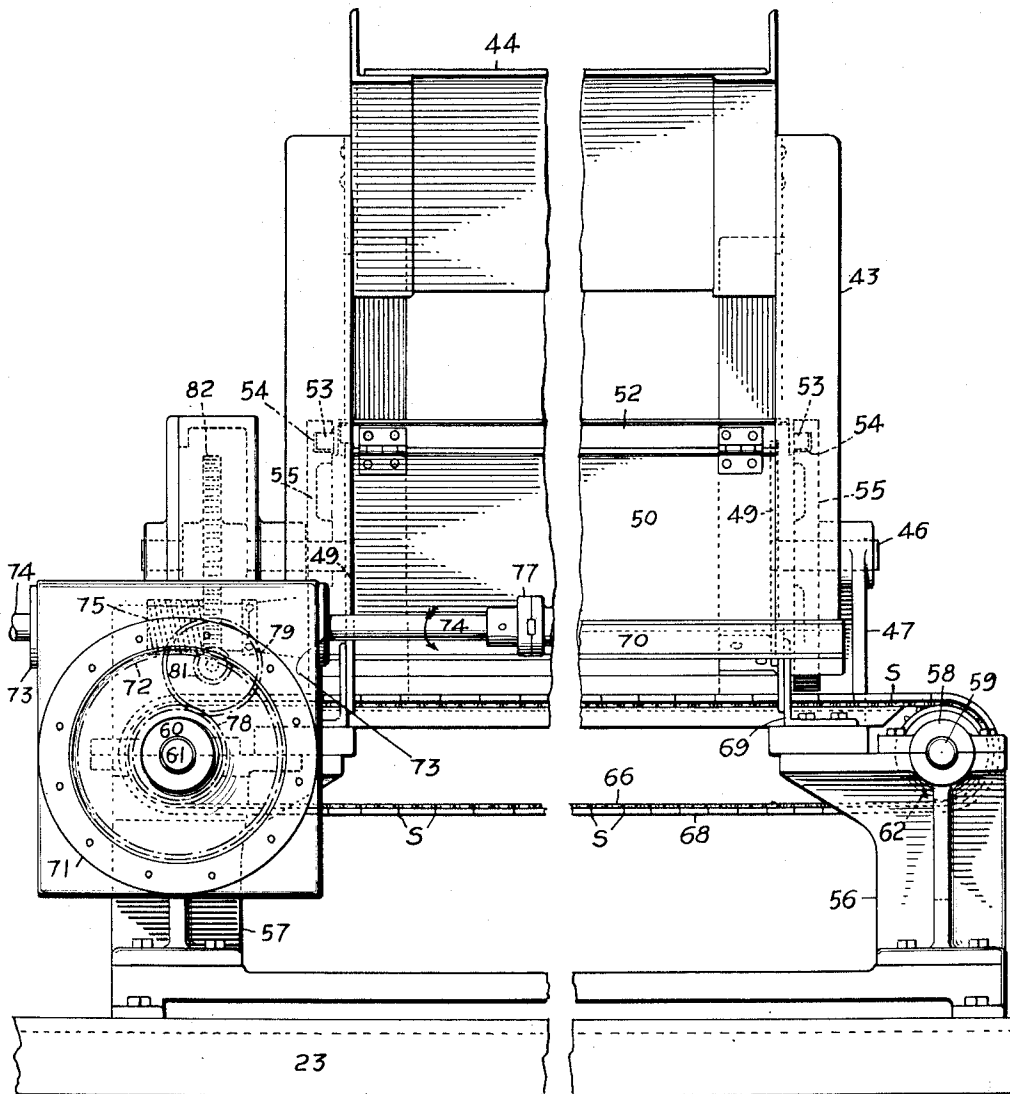


FIG. 6.

INVENTOR.

GILBERT E. SEIL,

BY

Arthur Nielsen

ATTORNEY.

Jan. 25, 1938.

G. E. SEIL

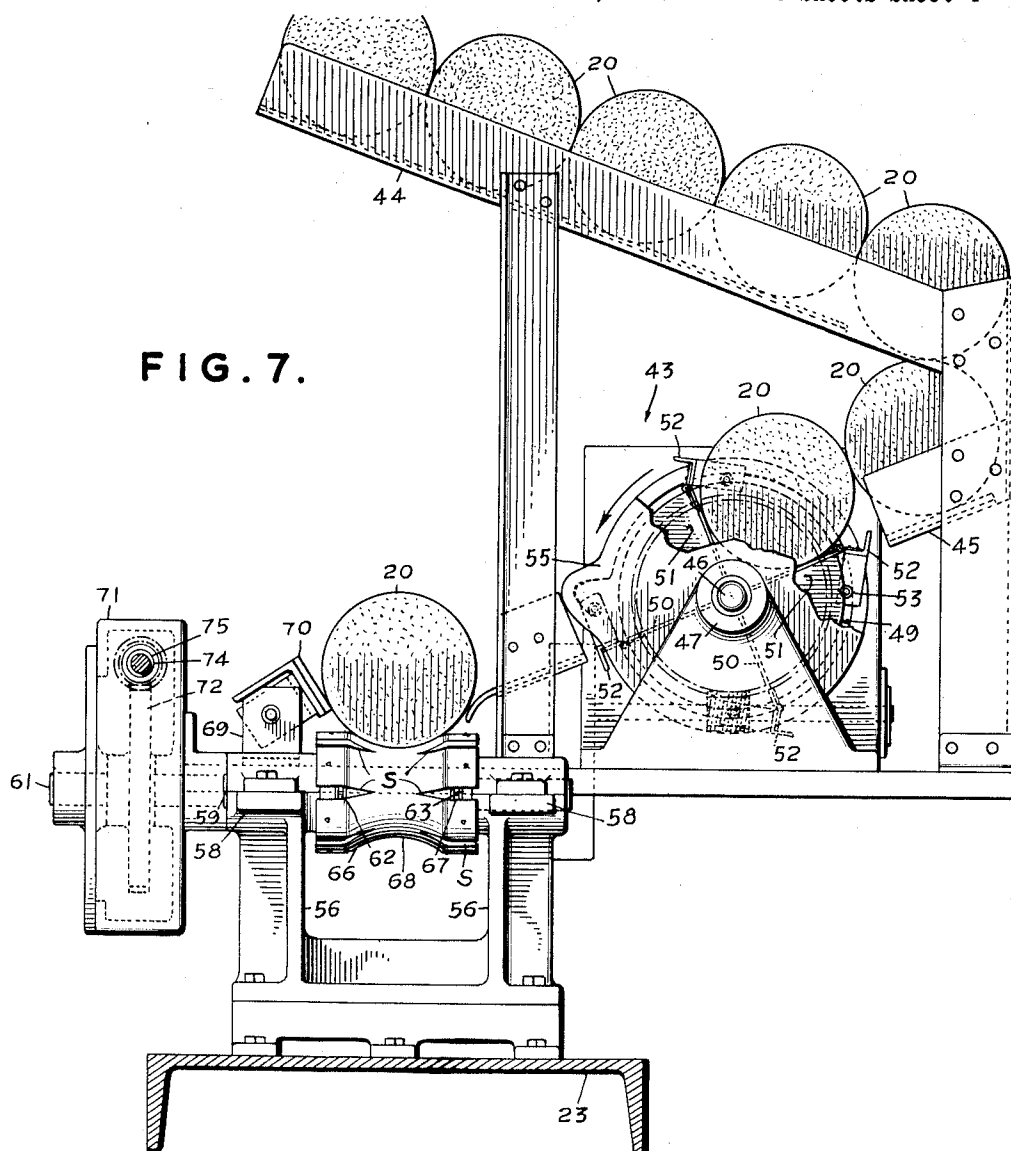
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FIG. 7.



INVENTOR.

GILBERT E. SEIL,

BY

Arthur Nielsen

ATTORNEY.

Jan. 25, 1938.

G. E. SEIL

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CONVEYER MECHANISM FOR ELECTRIC FURNACES

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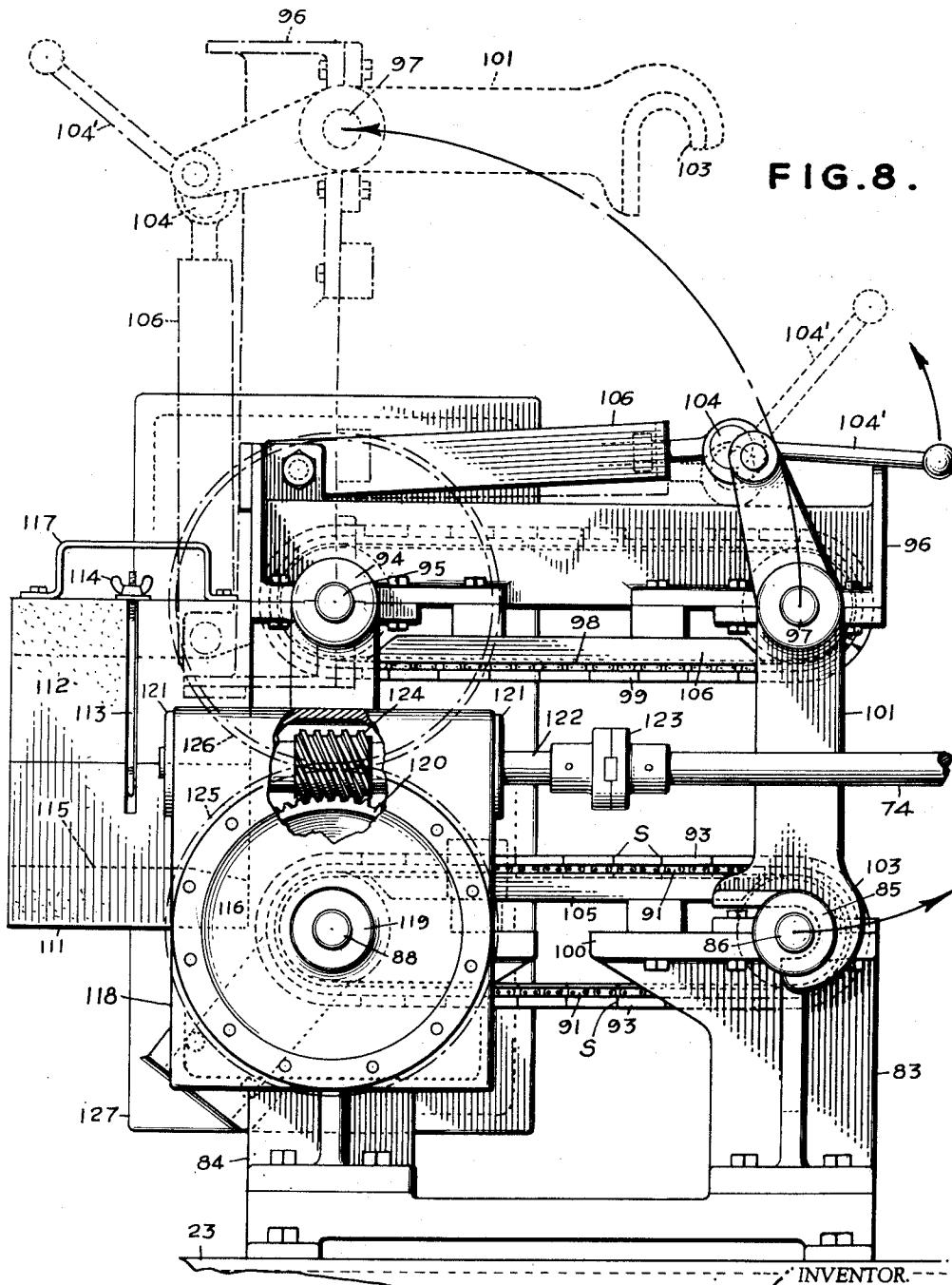


FIG. 8.

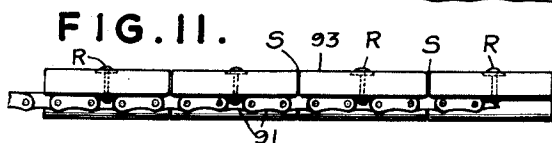


FIG. 11.

INVENTOR.
GILBERT E. SEIL,
BY *Arthur H. Seil*
ATTORNEY.

Jan. 25, 1938.

G. E. SEIL

2,106,469

CONVEYER MECHANISM FOR ELECTRIC FURNACES

Filed March 18, 1936

6 Sheets-Sheet 6

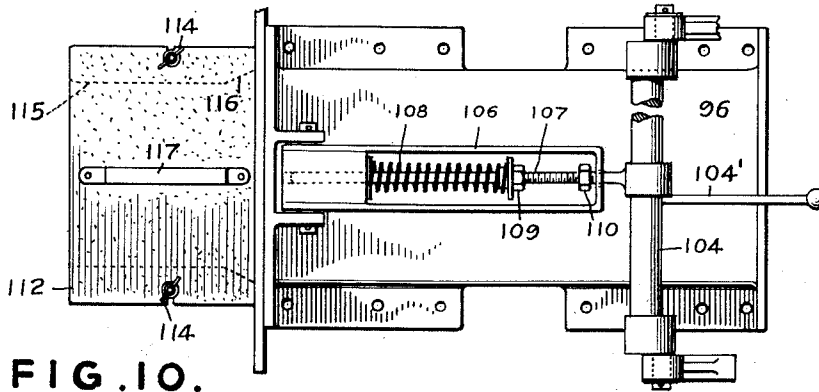


FIG. 10.

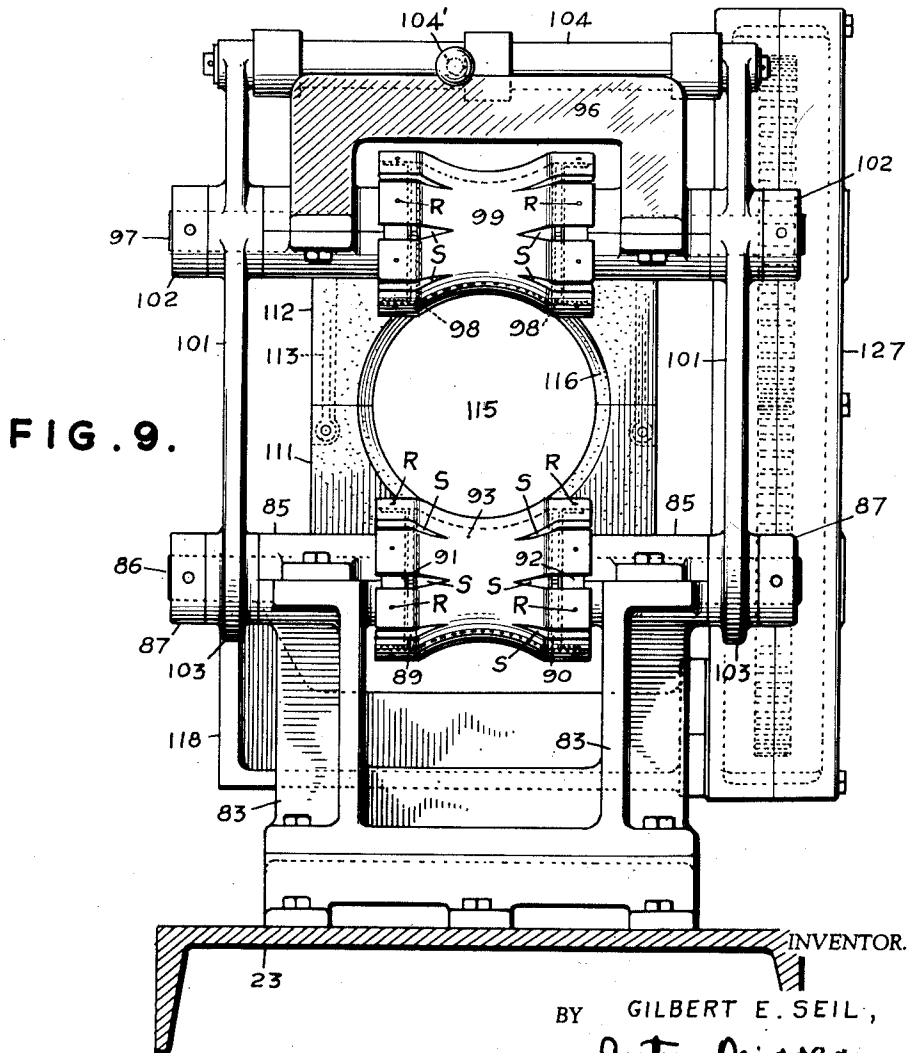


FIG. 9.

INVENTOR.

BY GILBERT E. SEIL,

Arthur Missions

ATTORNEY.

UNITED STATES PATENT OFFICE

2,106,469

CONVEYER MECHANISM FOR ELECTRIC FURNACES

Gilbert E. Sell, Cynwyd, Pa., assignor, by mesne assignments, to Buffalo Electric Furnace Corporation, Buffalo, N. Y., a corporation of New York

Application March 18, 1936, Serial No. 69,450

3 Claims. (Cl. 214—21)

This present invention relates to electric furnaces of the type equipped with one or more hollow electrodes through which an oxidizing reagent for the material to be treated in the furnace is fed thereto by being impelled through the bore of the hollow electrode in the form of briquettes, or more often in the form of cylindrical cores, and relates more particularly to an improved conveying and propelling means for positively feeding the cylindrical cores through the bore of the hollow electrode.

In an electric furnace with which this present invention is adapted to cooperate, there is carried out the refining of ferro-alloys or other alloys and especially alloys containing chromium, and wherein the refining of the alloys is carried out by forming in a heated zone in the hollow electrode, under reducing conditions, a highly concentrated oxidizing reagent comprising essentially a reduced metal carrying therein a metal oxide. Such a reagent, when in liquefied condition and mixed with a molten bath of a metal mixture to be refined, exerts its oxidizing action on oxidizable impurities in the bath, such as carbon, thereby to reduce the content thereof in the bath. Since there is effected in the heated zone of the electrode a liquefying of the refining materials, fed thereto in core form, the speed of the cores to and through the bore of the electrode must be carefully controlled, as well as the positiveness of the force used to impel the cores fed thereto and therethrough.

It is an object of my present invention to provide for such furnaces simple, effective and dependable mechanisms for containing a supply of cores; for discharging cores from such source of supply in an orderly manner as they are required, and delivering the same to a positive feeding means; to a means for receiving the cores and positively feeding the same to and through the bore of the electrode in a continuous stream as required, and at a rate of speed which is carefully controllable in accordance with the speed of the reducing process being carried out within the furnace; and particularly to a feeding means for the cores which will permit relative movement of the feeding means with respect to the cores should the cores be stopped in their movement through the electrodes.

Other objects are that the assembly of the various instrumentalities for carrying out the above objects shall have proper cooperating relationship; shall have provision to allow for variations in the dimensions of the individual cores; and shall permit of ready access to all of the operat-

ing parts, in case of need. And a still further object is that said instrumentalities shall carry out adequately the functions for which they were designed.

For the realization of these objects, the invention revolves about the various components of core reservoir, discharging, conveying and feeding means for an electric furnace of the hollow electrode type wherein the hollow electrode thereof is both rotatable and reciprocable. The manner of carrying out the invention generally is to mount the hollow electrode on an automatically reciprocable carriage provided also with means for rotating the electrode. A container or reservoir for a supply of the cores is provided and equipped with a discharging mechanism arranged to prevent jamming of the cores in the reservoir, or as they are discharged therefrom into a conveying mechanism.

The conveying mechanism coacts with a core feeding mechanism and delivers thereto a plurality of cores in succession, and arranged in axial alignment, and said core feeding mechanism subjects each core as received to a gripping or pinching action which prevents relative movement of the cores with respect to the feeding mechanism or to each other, and positively propels such cores in succession into the bore of the electrode with the operative force necessary to positively propel the same through the bore. These various mechanisms derive their motivating power from the motor or motors used for reciprocating the electrode supporting carriage and for rotating the electrode.

Accordingly, with these and other objects, as well as features of advantage, one embodiment of my invention will be hereinafter described for illustrative purposes, because obviously the invention is capable of a number of embodiments. The form of the invention chosen to be described is illustrated in the accompanying drawings in which:

Fig. 1 is a side elevation, partly in section, of a furnace chamber equipped with diametrically opposed hollow electrodes, and with my present invention shown interposed between the core magazine or reservoir and the hollow electrodes;

Fig. 2 is a partial view of Fig. 1;

Fig. 3 is a side elevation, in skeleton form, of the driving mechanism for the material charging devices, and the rotating means for the hollow electrodes;

Fig. 4 is a plan view of the instrumentalities shown in Fig. 3;

Fig. 5 is a section, taken on the line 4—4 of Fig. 4;

Fig. 6 is an elevation, on an enlarged scale, of the right hand end of Fig. 1, showing the core magazine in side elevation, and the core receiving conveyor at the discharge end thereof;

Fig. 7 is an end view of Fig. 6;

Fig. 8 is a side elevation, on an enlarged scale, of the positive feeding means for the cores, and located between the discharge end of the core conveyor and the entrance end of the hollow electrode;

Fig. 9 is an end elevation of Fig. 8;

Fig. 10 is a plan view of Fig. 9, and

Fig. 11 is a detail illustrating the construction of the conveyor belt employed in structure shown in Figs. 8 and 9.

Referring to the drawings, and particularly to Fig. 1, there is shown a type of electric furnace to which the present invention has been applied. Such furnace comprises essentially a chamber 10, into which, and from the opposite sides thereof, extend tubular or hollow open ended electrodes 11 and 12. The chamber 10 is usually a metal casing or shell lined with a suitable refractory material 14, and supported on suitable base members, such as the base member 16. Within the chamber 10 is a hearth 17 arranged to receive a bath of metal 18 normally covered with a layer of slag 19. Oxidizing reagent material 20, in liquid form, drops onto the layer of slag 19 from hollow electrodes through the arc 21 formed in the gap 22 between the spaced ends of the electrodes 11 and 12. The reagent material 20 is obtained from cores fed through the hollow electrodes 11 and 12 and reduced to liquid form in the arc 21.

The reagent forming material 20, in the form of cores or briquettes, as will be apparent from an inspection of Fig. 7, is fed into the entrance end of the hollow electrodes 11 and 12, or the end remote from the gap 22, and is liquefied within the electrode. Due to the great heat generated by the arc 21, and the consequent liquefaction of the reagent material in the electrode, there is a tendency toward derangement of the normal and continuous movement of the cores or briquettes 20 through the bore of the electrodes 11 and 12 and the flow of liquefied reagent therefrom. This invention therefore provides for the positive and uninterrupted movement of cores or briquettes through the bore of the electrodes regardless of any disturbing conditions that may exist therein.

Each electrode 11 and 12 has its own independent operating means for rotating the same, moving the same axially to compensate for the inevitable erosion due to the maintenance of the arc 21, and means for receiving cores or briquettes from a magazine or reservoir and positively feeding the same through the bore of the electrode. These operating means are identical in character and construction and therefore a description of but one is necessary. Such independent operating may be so controlled as to operate in synchronism with each other, or may be interconnected, either by mechanical or electrical means, so as to operate as a unit. Also, each electrode is preferably slightly inclined downwardly toward the furnace, as clearly shown in Fig. 1, the degree of inclination from the horizontal being approximately three degrees, in the preferred form of construction.

Each operating unit is mounted on a framework or carriage 23 provided with wheels 23a which track on spaced channel irons 24 and 25, and which constrain the carriage 23 to move

toward and from the furnace 10 in a fixed path whereby the length of the arc may be varied as desired. Such channel irons 24 and 25 are supported, relative to the furnace 10, on a framework 26 of structural shapes.

Mounted on a frame 118, suspended from the carriage 23, is a motor 119. This motor has a drive shaft 120 which extends outwardly from each end of the motor, and on each end is secured a pinion 121. Secured to the channels 24 and 25, and extending for a distance commensurate with the desired length of travel of the carriage 23, are racks 122, with which the pinions 121 mesh. The motor 119, being fixed to the carriage 23, the rotation of the shaft 120, of the motor will cause a movement of the carriage 23, along the channels 24 and 25, toward and from the furnace 10, it being assumed that the motor 119, is of the reversible type, and that control means is provided, not only for accomplishing this result, but also for controlling the speed of travel of the carriage 23, in accordance with the rate of erosion of the electrode 11 or due to the maintenance of the desired extent of arc 21.

The framework or carriage 23 is provided at the end adjacent the furnace 10, with spaced bearings 27, in which is rotatably mounted a sleeve 28. This sleeve is provided at one end with a flange 29, for removable attachment to the entrance end of the hollow electrode 11, and at the other end with a gear 30. Attached to the sleeve 28, is a slip ring 31, with which engages a brush 32, that is connected to a suitable source of power for supplying power or current to the electrode 11. The bearings 27, and the slip ring 31, are so constructed as to permit the flange 29 to be removed whenever it is necessary to remove or replace the electrode 11.

At the end of the framework or carriage 23, remote from the bearings 27, is a support or platform 33, on which is mounted an electric motor or other suitable prime mover 34. The electric motor 34, is directly connected to a speed reduction device 35, the output shaft 36, of which is connected to the drive shaft 37, of a transmission or speed changing device 38. This speed changing or transmission device is mounted on supports 39, secured to the framework or carriage 23.

Connected to the train of gearing of the speed changing or transmission device 38, is a shaft 40, rotatably mounted in bearings secured to the carriage 23. This shaft 40, extends toward the electrode 11, and has mounted on its end a pinion 41, which meshes with and drives the gear 30, secured to the sleeve 28. To prevent leakage of power from the brushes 32, the shaft 40, is made in sections connected by means of insulating couplings, such as the coupling 42.

The cores or briquettes 20, of reagent forming material are stored in a magazine or reservoir 43, shown in Figs. 6 and 7, and mounted on the carriage 23, adjacent to the motor 34. The magazine 43, includes an upper inclined platform 44, and a lower disposed oppositely inclined platform or support 45. The cores or briquettes 20, travel down the inclined platform 44, by gravity and are deposited on the inclined support 45, from whence they are delivered to a discharging device.

Such discharging device is located adjacent to the discharge end of the inclined support 45, and is mounted on a shaft 46, rotatably mounted in spaced aligned bearings 47, secured to the framework of the magazine 43. Secured to the shaft

46, adjacent to the bearings 47, are circular discs 49. Equally spaced around the shaft 46, between the discs 49, and extending radially outward from such shaft 46, are plates 50, forming angular pockets or receptacles 51, into which the cores or briquettes 20, successively drop from the inclined support 45, as the shaft 46, is rotated.

Each plate 50 has hingedly mounted at its outer edge an angularly shaped member 52, which acts as a gate to retain the cores or briquettes 20 in the receptacles 51, when in one position, and allows such cores or briquettes 20, to drop out of the receptacles 51, when in another position.

The various positions of the members 52, are obtained by means of the following instrumentalities: at each end of each hingedly mounted member 52, is rotatably mounted a cam roller 53, which engages in a cam race 54 formed in a cam plate 55, fixed to the bearing members 47. The cam race 54, is so designed as to oscillate the angular gate members 52, in their mounting from the position shown in the upper right hand portion of Fig. 7, where they act as means for retaining the core or briquette 20, in the receptacle 51, into which the core has dropped by gravity from the inclined support 45; to the position diametrically opposite, where it will be seen that the angular gate member 52, is positioned to permit the free passage of the core 20, through the exit passage of the magazine 43, by gravity onto the conveying mechanism. The shaft 46, is rotated in timed relation to the other parts of the mechanism in a manner to be hereinafter described.

The conveying mechanism above referred to is shown in Figs. 6 and 7, and is mounted on spaced uprights 56 and 57 secured to the carriage 23. In the uprights 56 are spaced bearings 58, in which is rotatably mounted an idler shaft 59, while in the uprights 57, are spaced bearings 60, in which is rotatably mounted a drive shaft 61.

On the shaft 59, are secured parallelly arranged spaced sprockets 62 and 63, which are in alignment respectively with spaced sprockets 64 and 65, secured to the shaft 61. Over the sprockets 62 and 63, runs a chain 66, while over the sprockets 63 and 65, runs a chain 67. Secured to these chains in straddling or bridging position is a conveyer belt 68 of any suitable material, but preferably of a fabric and rubber composition. The conveyer belt 68, is slit at intervals S inwardly from each edge toward the center at equally spaced points along its edges, and the belt material is secured to the chains 66 and 67, by rivets R between adjacent slits to each alternate link in said chains. The upper reach of the conveyer 68, lies adjacent to and slightly below the exit end of the magazine 43, and moves transversely to the movement of the cores 20, as they drop from the receptacles 51. Mounted on the bracket 69, on the upright 56, is a stop 70, against which the cores engage as they drop from the receptacles 51, and which positions such cores on the conveyer belt 68.

Secured to one of the pair of uprights 57, is a casing 71, through which one end of the shaft 61 extends, and in which the said end of the shaft 61, is rotatably mounted. Within the casing 71, and secured to the shaft 61, is a worm wheel 72. Formed in the casing 71, are aligned bearings 73, in which is rotatably mounted a shaft 74. Secured to the shaft 74, is a worm 75, which meshes with and drives the worm wheel

72, and therefore the shaft 61. One end of the shaft 74, extends toward the transmission 38, and is connected to a drive shaft 76, of such transmission by an insulating coupling 77.

The end of the shaft 61, remote from the casing 71, extends outwardly beyond the upright 57, and has secured thereto a gear 78, which meshes with and drives a gear 79, secured to a shaft 80. The shaft 80 has secured thereto a worm 81, which meshes with and drives a worm wheel 82, which in turn is secured to the shaft 46, on which is mounted the core discharging mechanism shown in Figs. 6 and 7, and above described. It will be seen therefore that the discharge mechanism and the conveyer just described operate in synchronism with each other, and at speeds predetermined in accordance with desired or necessary speed of travel of the cores 20, into and through the bore of the tubular electrodes 11.

The cores 20, when on the conveyer 68, are free and unrestrained, and in order that such cores may be positively fed into and through the bore of the tubular electrode 11, it is necessary to transfer them to a device adapted for this purpose. Such device forms the specific object of my present invention, and is shown in detail in Figs. 8, 9 and 10. Referring to said figures the device is shown as comprising spaced uprights 83 and 84, secured to the carriage 23, between the conveyer 68, and the entrance end of the bore of the tubular electrode 11. At the upper end of the uprights 83, are formed aligned bearings 85, in which is rotatably mounted a shaft 86. The ends of the shaft 86 extend outwardly beyond the bearings 85, and secured to such ends are collars 87, spaced from the bearings 85, for a purpose to be hereinafter described.

On the upright 84, and lying in the same horizontal plane as the bearings 85, are aligned bearings in which is rotatably mounted, parallel to the shaft 86, a shaft 88. On the shaft 86, are secured sprockets 89 and 90 spaced apart from each other. Secured to the shaft 88, are similar sprockets, in alignment with the sprockets 89 and 90 respectively. Over such sprockets run chains 91 and 92 respectively. Carried by these chains 91 and 92 and bridging them is a conveyer belt 93, which is secured along the edges thereof at every alternate link thereof by means of rivets R or other fasteners. This conveyer belt is slitted at intervals inwardly along each edge thereof such as at S thereby permitting a ready flexing or concaving of such conveyer belt as shown in Figs. 7 and 9 to permit the conveyer to take around or grip the cores coacting to cause movement thereof. This arrangement of conveyer belt has a certain resilience which is useful in avoiding breaking of the cores 20, in exerting a pinching or gripping action on such cores when a core is held between the two superposed conveyers 99 and 93, between which cores 20, are gripped (Fig. 9), and in permitting a slipping movement of the conveyers 99 and 93 should the motion of the cores be arrested for any reason.

The conveyer belts 93 and 99, being of resilient material, and so connected to their respective chains as to permit a ready flexing or concaving of their cooperating reaches to thereby exert a pinching or gripping action on the cores, have also the important function of permitting the cooperating reaches to slip relative to the cores when, for any reason, the force required to feed the cores forward is greater than the pinching or gripping action of the conveyer belts.

It may sometime happen that a refractory piece of metal becomes lodged in the space between the opposed electrodes 11 and 12 in such a manner as to temporarily prevent further feeding movement of the cores through the electrodes. Due to the resilient character of the conveyers 93 and 99, the cooperating reaches thereof will slip or slide relatively to the cores being fed, and such slipping or sliding movement will continue until such time as the piece of refractory metal has been reduced, usually until such metal has been brought into proper position with respect to the arc 21 by rotation of the electrodes.

On the upright 84, above the bearings in which rotate the shaft 88, are arranged aligned bearings 94. In these bearings 94, is rotatably mounted a shaft 95 parallel to the shafts 88 and 86. Mounted on the shaft 95 is a framework 96, such framework being rotatable on the shaft 95 from the full line position shown in Fig. 8 to the dot and dash position in such figure.

Rotatably mounted on the framework 96, at the end remote from the shaft 95, and directly above the shaft 86 in the bearings 85, is a shaft 97. Secured to the shafts 95 and 97, are spaced and aligned sprockets, similar to the sprockets on the shafts 86 and 88, and over these sprockets run sprocket chains 98, to which is secured a conveyer belt 99. This conveyer belt 99, is similar in all respects to the conveyer belt 93.

The upper reach of the conveyer belt 93, lies in substantially the same horizontal plane as the upper reach of the conveyer 68, leading from the magazine 43, and above described. The upper reach of the conveyer belt 93, lies substantially parallel to but spaced apart from the lower reach of the upper conveyer belt 99, and together the two reaches define a passage in which rests the cores 20, as they are fed from the conveyer 68, to the entrance end of the electrode 11.

In the superposed flexible conveyer belts 93 and 99, the coating reaches thereof have a tendency to move away from each other as the cores 20, are positioned therebetween, therefore there is provided means for limiting such movement. Such means comprises a plate 105, located adjacent to the inner surface of the upper reach of the conveyer belt 93, this plate being secured to an extension 100 of the uprights 83, while the means associated with the conveyer belt comprises a plate 96, located adjacent the upper surface of the lower reach of such conveyer belt 99, the plate being secured to the framework 96.

The space between the coating reaches of the conveyer belts 93 and 99, is slightly less than the average diameter of the cores 20, with the result that such conveyer belts exert a pinching or gripping action on the cores, which are therefore positively fed toward and into the entrance end of the tubular electrode 11.

In order to maintain the conveyer 99, in operative relation to the conveyer 93, as well as to permit access to the entrance end of the hollow tubular electrode 11, or for any other purpose, I have provided the following instrumentalities: the shaft 97, extends outwardly beyond the limits of the bearings therefor in the frame 96, and on such extended ends are placed the combined lever and spacing arms 101. Such combined lever and spacing arms are rotatably mounted on the shaft 97, intermediate their ends, and collars 102, secured to the shaft 97, retain them in position.

The arms 101, extend normally downward from the shaft 97, as viewed in Figs. 8 and 9, and at

their lower end have formed the hook members 103, which partially encircle the shaft 86, between the bearings 85, and the collars 87. With the lower ends of the arms 101, in this position, the conveyer 99 has its lower reach maintained substantially parallel to the upper reach of the conveyer 93.

There is provided a means for locking the arms 101, in the position above noted. This means comprises an eccentric shaft 104, rotatably mounted in the upper ends of the arms 101. Secured to the eccentric shaft 104 and extending radially outward therefrom is a handle 104', by means of which the eccentric shaft 104, is rotated from the locking position shown in full lines in Fig. 8 to the open position shown therein in dot and dash lines.

Pivotally mounted on the frame 96, adjacent to the shaft 95 is a hollow frame 106. Such frame 106, extends toward the eccentric shaft 104, and has its closed end perforated to allow free sliding movement therethrough of the threaded bar or rod 107, the outwardly extending end of such bar or rod being rotatably mounted on the eccentric shaft 104. Within the hollow frame 106, and surrounding the rod 107, is a coil spring 108 held compressed between one end of the hollow frame and a nut 109 on the threaded rod 107, 110 indicates a stop. Downward movement of the handle 104' rotates the eccentric shaft 104 so as to move the threaded rod 107, to compress further the spring 108, there will be a tendency to rotate the arms 101, so as to move the hook members 103, more firmly into engagement with the shaft 86. Continued rotary movement of the eccentric shaft 104, brings the handle 104' to the full line position shown in Fig. 8, where it will be noted that the center of the eccentric portion of the shaft 104, is above the center of rotation of such shaft. The arms 101 are therefore, locked in engaging position with shaft 86.

Attached to one end of the upright 84 is a casing 118 in which is a bearing 119, in which turns the shaft 88. Secured to the shaft 84, within the casing 118, is a worm wheel 120. Formed in the casing 118 are bearings 121 in which is rotatably mounted one end of a shaft 122, this shaft being connected by the insulating coupling 123, to the shaft 74, driven from the transmission 38. On the shaft 122, between the bearings 121, is secured a worm 124 which meshes with and drives the worm wheel 120, and therefore the shaft 88.

Secured to the other end of the shaft 88 is a gear 125, which meshes with and drives a similar gear 126, secured to the shaft 95. The gears 125 and 126 are housed in a casing 127, secured to the upright 84.

By means of the gears 125 and 126 and the worm and worm wheel 124 and 120 respectively, opposing reaches of the conveyer belts 91 and 98 are driven in the same direction at the same speed, and in timed relation to the speed of the conveyer belt 68, by the power transmitted through the transmission 38.

Should it be desired to obtain access to the conveyer 93, or to the entrance end of the electrode 11, or to any structure interposed between the superposed conveyers 93 and 99 and the entrance end of the electrode 11, the shaft 104 is moved in a counter-clockwise or upward direction, as viewed in Fig. 8, to relieve the tension on the spring 108. This permits the arms 101 to be released from the shaft 86, whereupon the

frame 96 may be rotated about the shaft 95 as a center into the dash position shown in Fig. 8, thus allowing access to the conveyor 93, or to adjacent parts of the mechanism.

5 Preferably the entrance end of the bore of the electrode 11 is spaced apart from the discharge end of the superposed conveyers 93 and 99. To bridge the gap thus formed there is preferably provided a guide and support for the
10 cores 20 in their passage from the conveyers 93 and 99 to the bore of the electrodes 11. Such guide and support is composed of some heat resistance material like "Alberene" and is made in two parts, a lower part 111 and an upper part 112. Rods 113, pivotally mounted on opposite
15 sides of the lower part 111 rest in vertical grooves in the sides of the upper part 112, and are threaded to receive wing nuts 114 for maintaining the parts in operative relation with each
20 other. Acting as a unit, the parts 111 and 112 are provided with a bore 115 in alignment with the bore of the electrode 11. This bore 115 is chamfered at the end adjacent the conveyers 93 and 99, as indicated by the reference numeral
25 116. The upper part is provided with a handle 117.

With the apparatus constructed and arranged as above described, and assuming the bath 18, of molten metal, to be refined, to be located within the furnace 10 and covered with a layer of
30 slag 19, the operation will be as follows: the hollow electrodes 11 and 12, have one end thereof inserted into the furnace 10, and are attached, at their other end, to the sleeve 28, by means of
35 the flange 29. Power is applied from a suitable source to the electrodes through the slip ring 31, and brush 32, to the electrodes 11 and 12, to form the arc 21, in the gap 22, between adjacent ends of such electrodes.

40 A supply of cores 20, is placed in the magazine 43 and power is then turned into the motor 34, and also into the motor 119. The speed of the motor 119, is controlled to provide for the proper reciprocating longitudinal movement of the electrodes 11 and 12, to maintain the proper
45 width of gap 22, therebetween. The speed of the motor 34, is controlled so as to maintain the proper slow speed of rotation of the electrodes and also the proper rate of delivery of the cores 20, from the magazine 43, into and through the
50 bore of the electrodes to bring the same into the influence of the heat generated by the arc 21, wherein they are reduced to liquid form, and drop onto the slag bed 19, to refine the metal bath 18. The interconnection of the various
55 instrumentalities on the carriage 23, and operated by the motor 34, is such that all such instrumentalities operate in synchronism with each other and at the proper speeds, such speeds being predetermined in accordance with the
60 speed of liquefaction of the cores in the arc 21.

The cores 21, are delivered in groups from the magazine 43, at timed intervals by the mechanism operated from the shaft 46, onto the conveyor 68,
65 and from thence delivered in succession to the positive conveying and feeding device shown in Figs. 8 and 9. This conveying and feeding device exerts a pinching and gripping action on each core 20, individually and therefore such cores are fed
70 positively into and through the bore of the electrodes.

The action of the apparatus is continuous and may continue without interruption until the carriage 23, reaches the limit of its travel on the
75 channels 24 and 25, or until some mechanical

fault or breakdown necessitates the replacement of some part or parts of the apparatus, or the removal of the electrodes. Should such breakdown occur to the positive conveying and feeding means forming the subject matter of my present invention, access to such conveying and feeding means is easily and readily obtained by rotating the frame 96, and parts carried thereby, about the shaft 95, as an axis, and into the dot and dash position, as clearly shown in Fig. 8.

10 The process which the electric furnace of this invention can be used to carry out is described in my co-pending patent applications, Serial Numbers 724,024; 59,690; 59,691; and 59,692, and comprises essentially feeding to the hollow electrodes
15 charges of reagent forming materials in briquetted comminuted form. The arc between the two electrodes causes a zone of the electrode to become heated to a sufficiently high temperature whereby a reducing reaction takes place between different reactant materials in the charge
20 or burden in the electrode as well as a liquefying action so that there issues from the arc end of the electrodes a liquid oxidizing reagent comprising a liquid reduced metal having a metal-oxide
25 carried thereby and therein. This reagent formed in the electrode drops onto the molten metal bath on the furnace hearth and through the slag thereon, by virtue of which the impurities or
30 undesirable oxidizable constituents of the bath of metal on the hearth which is to be refined, are oxidized and removed therefrom.

For preventing localization of erosion at the arc ends of the electrodes, they are caused to be rotated during operation of the furnace, and in
35 order to control the desired length of the arc (and thereby the heat generated by the arc) the electrodes are reciprocated toward and away from each other. For this double purpose, each electrode is mounted on a reciprocable carriage which
40 is also equipped with driven mechanism for rotating the electrode. Also mounted on the propelled carriage and reciprocating therewith as a unit, are the various components of this invention, including the hollow electrode, means for rotating
45 it, the core magazine, the core conveyor, the core discharger, and the core feeding means, all heretofore described both as to structure and operation.

I claim:

50 1. A core feeding means for electric furnaces comprising, a frame, a second frame, pivotally mounted at one end on said first frame, endless flexible conveyor belts mounted in said frames
55 and having coacting faces thereof arranged parallel to and spaced apart from each other, means for driving said flexible conveyor belts simultaneously and at the same speed, and with the coacting faces movable in the same direction, and means
60 for locking said second frame relative to the said first frame, whereby to maintain the coacting faces of the endless conveyor belts parallel to each other.

2. A core feeding means for electric furnaces comprising, a frame, a second frame, pivotally
65 mounted at one end on said first frame, endless flexible conveyor belts mounted in said frames and having coacting faces thereof arranged parallel to and spaced apart from each other, means for driving said flexible conveyor belts simultaneously
70 and at the same speed, and with the coacting faces movable in the same direction, means for locking said second frame relative to the said first frame, whereby to maintain the coacting faces of the endless conveyor belts parallel to
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each other, and means permitting swinging movement of the second frame about its pivot to move the flexible conveyer belts out of operative relation to each other.

- 5 3. An improved core feeding means for an electric furnace equipped with a bored electrode through which cores of material to be treated are to be passed, comprising, as one operative com-

ponent thereof, a pair of endless propellable flexible elements arranged parallel to and spaced apart from each other, and an endless flexible belt carried thereby having slits extending thereinto from the edges thereof and terminating at 5 a point adjacent to the medial portion of the belt.

GILBERT E. SEIL.