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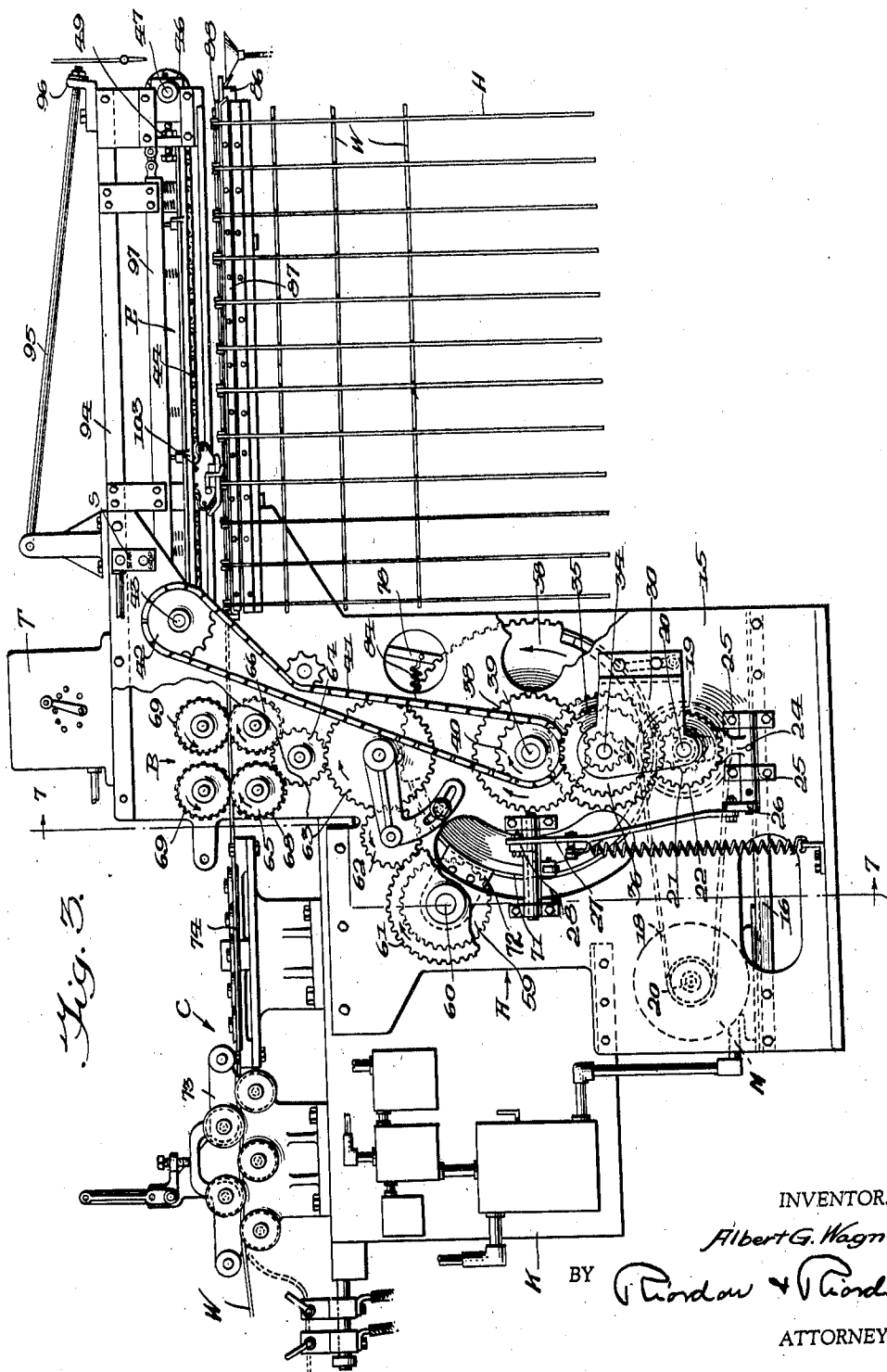
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METHOD AND APPARATUS FOR FABRICATING METALLIC STRUCTURES

Filed July 13, 1935

5 Sheets-Sheet 2



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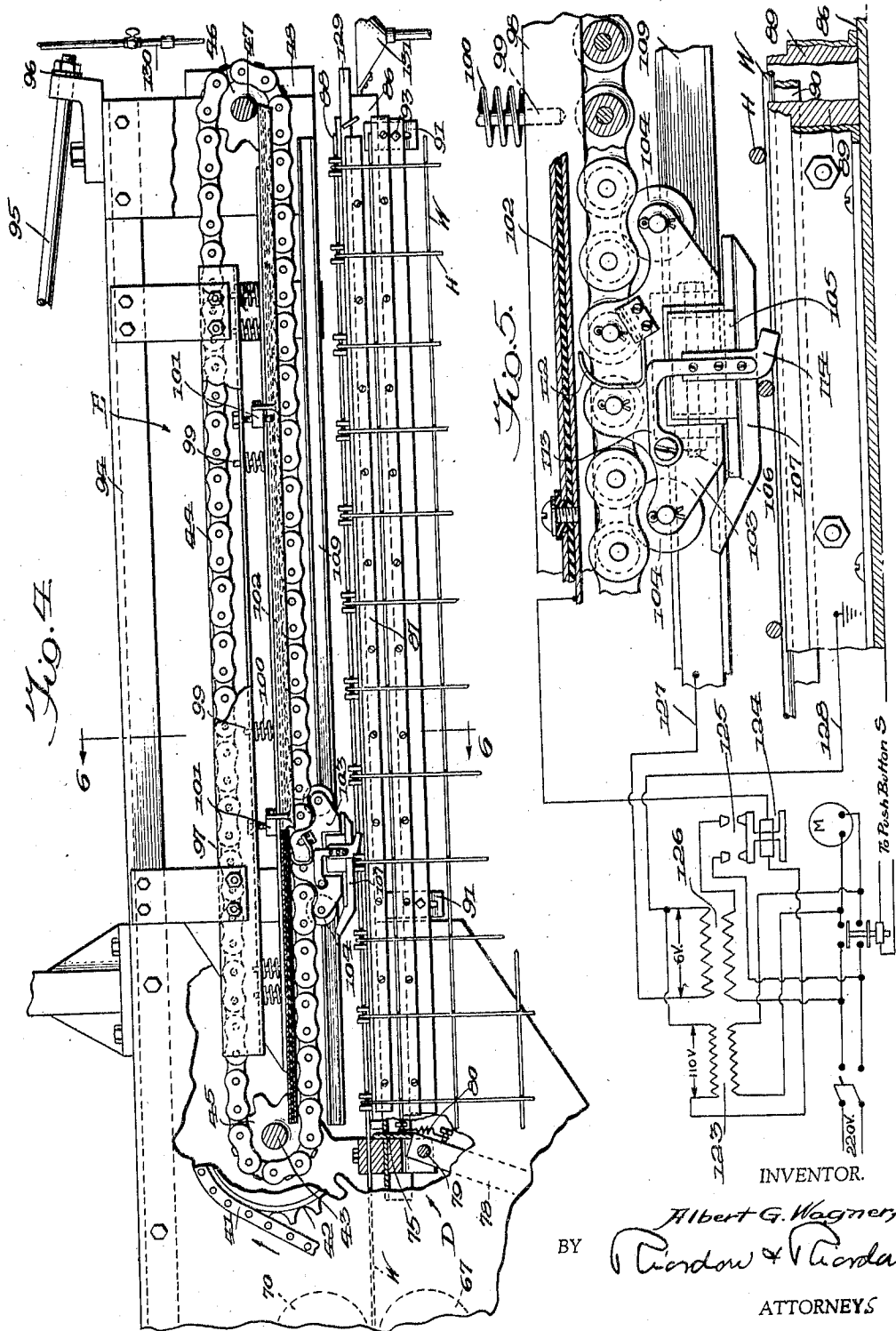
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METHOD AND APPARATUS FOR FABRICATING METALLIC STRUCTURES

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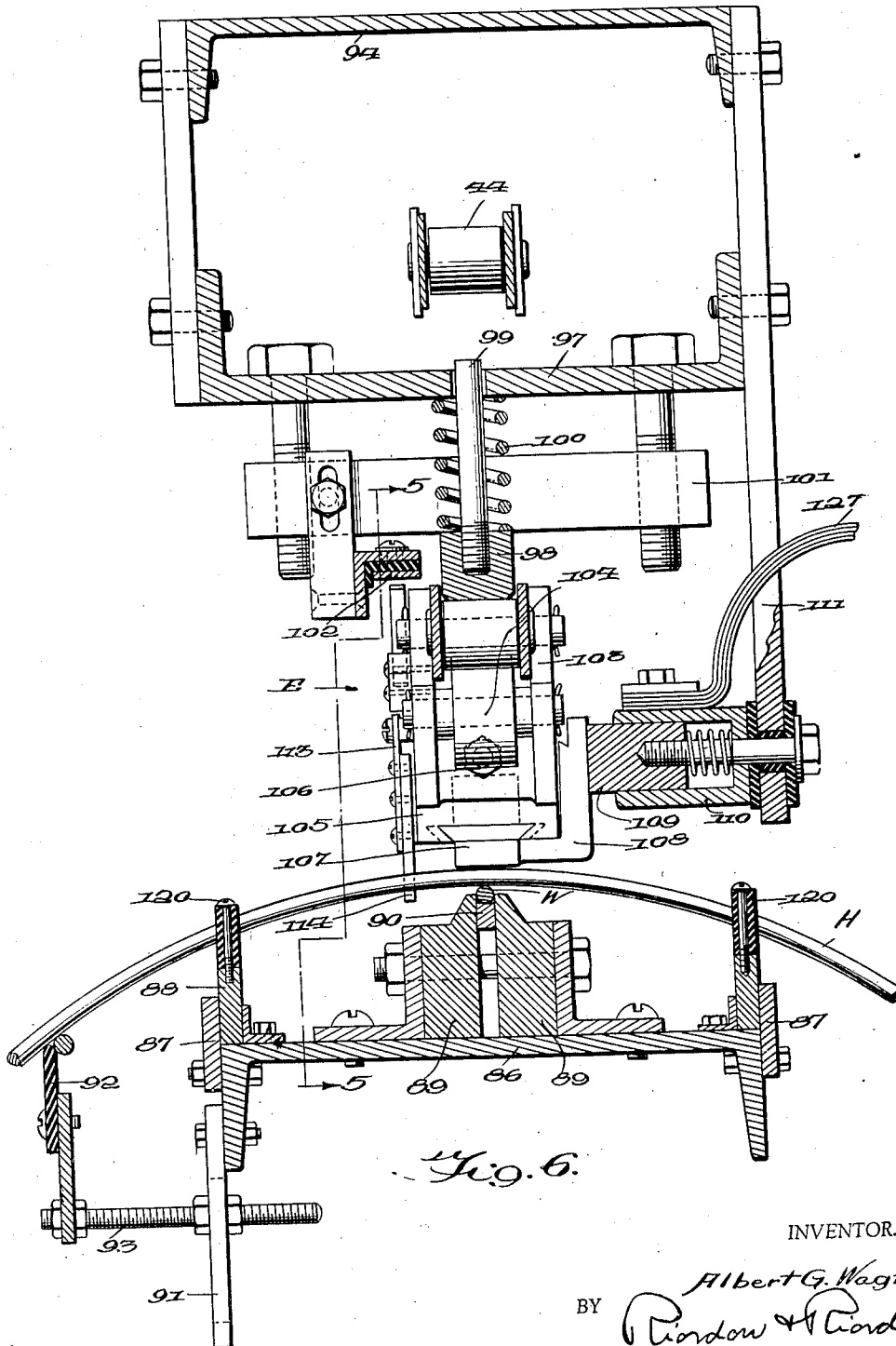
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METHOD AND APPARATUS FOR FABRICATING METALLIC STRUCTURES

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5 Sheets-Sheet 4



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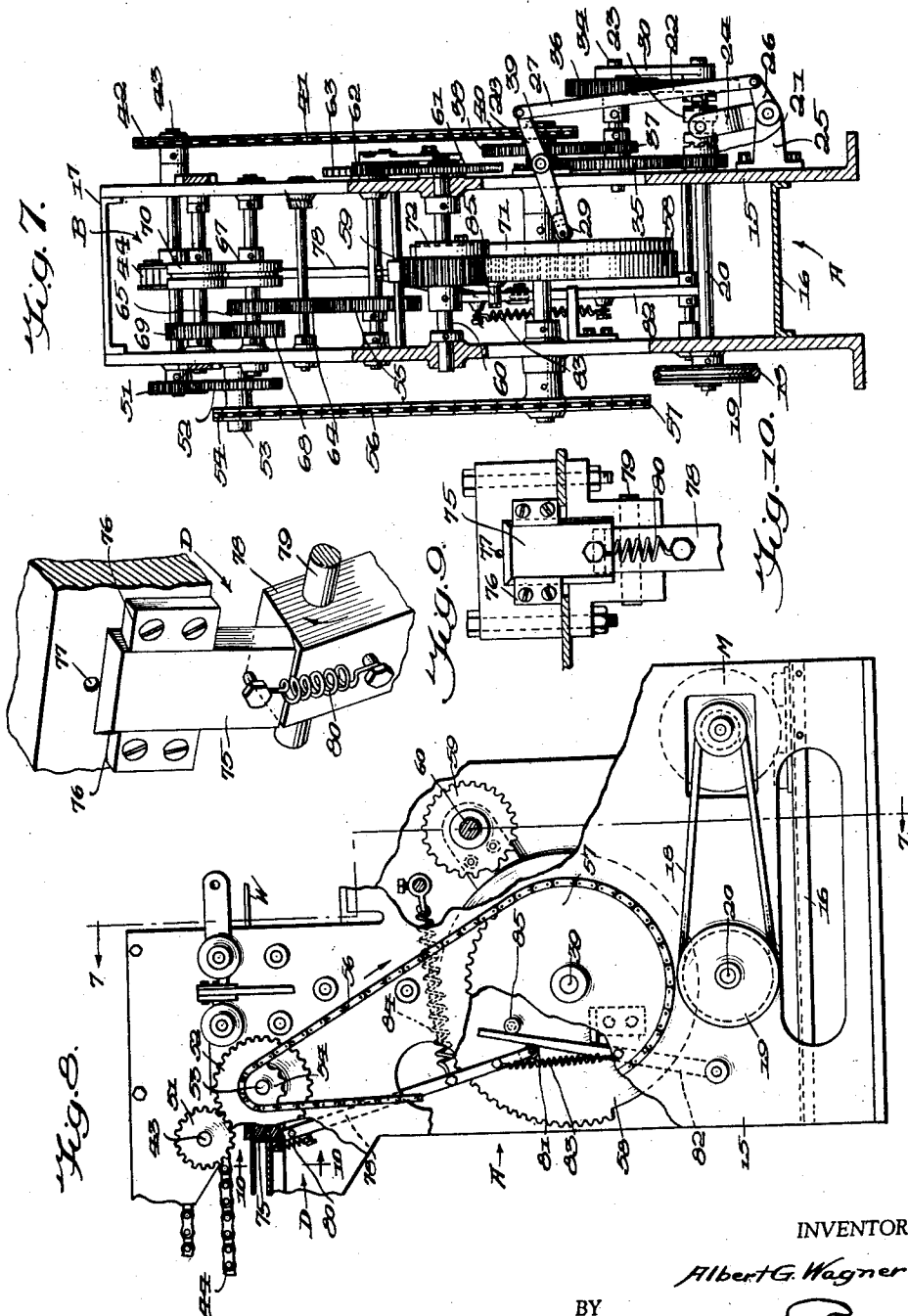
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METHOD AND APPARATUS FOR FABRICATING METALLIC STRUCTURES

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5 Sheets-Sheet 5



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2,040,349

METHOD AND APPARATUS FOR FABRICATING METALLIC STRUCTURE

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Application July 13, 1935, Serial No. 31,254

26 Claims. (Cl. 219—4)

The present invention relates to a method and apparatus for fabricating metallic structures and more particularly for producing fabricated cages, sheets and the like for concrete reinforcement, from cold drawn steel wire stock.

Specifically it is an important object of the present invention to produce from wire stock, fabricated steel cages for the reinforcement of concrete pipe, or flat fabricated sheets, such as road mesh for the reinforcement of concrete roads, flooring and walls.

Cages may be formed of a continuous spiral, the coils of which are maintained in predetermined spaced relation by struts welded to the convolutions thereof, or may be made by assembling a series of independent hoops, which may be held in place by struts extending thereacross.

Flat structures when completed will have a plurality of lengths of wire arranged in substantially parallel relation, and with predetermined spacing, the said lengths being held in place by cross wires, welded at each crossing; or may be formed of a continuous length of wire arranged in zigzag formation and held in such formation by strips extending thereacross.

In fact, fabricated sheets may be formed, and when completed, rolled and secured, to produce cages.

The present invention contemplates the assemblage of one set of wires, and the application thereto of the cross wires or struts.

It is also an object of the present invention to provide in a single machine, a mechanism which is supplied with stock material and which turns out the finished product therefrom, rapidly, inexpensively and with practically no attention from an operator, other than to ensure adequate supply of material to the machine and to start and stop the operation thereof.

While the invention is subject to such adaptation as may be necessary to the accomplishment of the several objects, a preferred embodiment herein described is designed for the production of fabricated cages of steel wire, used in the reinforcing of concrete pipe, from a series of preformed, butt welded wire hoops which are held in position by cross or transverse steel wires welded at each crossing to the hoops.

To this end the apparatus consists in the main of an electric welding machine having means for drawing a length of wire from a supply roll of stock material, means being provided for straightening the wire so drawn, for measuring off a predetermined length thereof, for sever-

ing such predetermined length, and for welding the severed length to a series of hoops mounted on a rack adjacent a movable welding electrode, with a continuous rapid movement of such welding electrode, means also being provided, as an adjunct to the machine, to support the hoops in predetermined relation to the severed pieces.

Other objects include means to synchronize operation of the welding transformer and the main motor of the machine, such that the one will not operate if the other has stopped; to provide means for adequately cooling the welding electrode thereby preventing overheating; to insure a travel of the welding electrode at a satisfactory operating speed during welding and a return to its original position at a higher rate of speed, thereby avoiding waste of time; and to insure accomplishment of the foregoing automatically and without special adjustment on the part of an operator.

To the attainment of the foregoing and other objects which will appear as the description proceeds, reference may be made to the accompanying drawings, in which:—

Fig. 1 is a side elevation of the assembled apparatus illustrating a completed cage, and the beginning of operations on a new cage;

Fig. 2 is a section along the line 2—2 of Fig. 1;

Fig. 3 is a side elevation, slightly enlarged, of the machine proper showing a partly completed cage and details of the driving mechanism;

Fig. 4 is an enlarged view of the welding head with parts broken away to show relation of the cutting or severing device;

Fig. 5 is a further enlarged elevation of the welding electrode and carriage therefor including diagrammatically, the wiring scheme;

Fig. 6 is a section along the line 6—6 of Fig. 4;

Fig. 7 is a section along the line 7—7 of Figs. 3 and 8;

Fig. 8 is a fragmentary elevation from the side of the machine opposite that of Figs. 1 and 3 illustrating details of the driving mechanism and also the operation of the cutting or severing device;

Fig. 9 is a detail in perspective of the cutting or severing device;

Fig. 10 is an enlarged section on the line 10—10 of Fig. 8;

The apparatus can best be described by regarding it as a series of cooperative work stations, or units, each of which has its own special function, and all of which are co-related and synchronized to each other through the medium of a common driving mechanism.

Referring now more specifically to the drawings in which like reference numerals designate like parts, and particularly considering Figs. 1, 3 and 4, there is illustrated a mechanism or unit A which functions as the driving and control unit for the entire apparatus, and the frame of which serves to mount the various operating units. These units include a wire feeding mechanism or unit B, the wire straightening mechanism or unit C located operatively in advance of the feeding device, and a wire severing mechanism or unit D being located operatively beyond the feeding unit B.

The feeding mechanism B is arranged to pull a strip of wire W from a source of supply and feed a length thereof, predetermined in extent by the unit A, to a welding station E, where it will be severed by the mechanism D during the process of welding, after having been straightened during its passage past the station or mechanism C.

The welding head or station E is carried by the frame of the unit A, in such a location with respect to the aforementioned units as to receive the straightened, measured length of wire stock ready for fabrication into a cage.

Mounted adjacent to the welding station or unit E is a turn table G adapted to support a plurality of slidable cage racks, one of which will be supplied with a series of preformed hoops H while another is presenting a series of such hoops to the welding station. Upon complete formation of a cage, the turn table may be rotated and the finished cage removed from its rack which will then be ready to receive a new supply of hoops, in the meantime the rack which has just been supplied will be presented to the welding station.

This turn table, while not an essential component of the apparatus, nevertheless is an important adjunct, facilitating operations and functioning as a real time saver.

From this organization it will be evident that a strip or length of wire W, pulled by feed rolls in the mechanism B, through straightening rolls in the unit C, will be fed to a work support in the welding unit E, and severed by a knife in the unit D whereupon a travelling electrode in the unit E may be brought into operation to weld the severed strip to the hoops H carried by the rack. The rack will have been removed from the turn table G to position on the work support of the welding station.

Driving and control mechanism

The driving and control unit A comprises a frame or housing 15, the side walls of which are connected at the bottom by a platform 16 upon which is mounted a motor M. The motor M serves as a source of power for all mechanically driven elements of the apparatus. The side walls of the frame or housing 15 are connected at the top by a platform 17 which serves to support a transformer T. The motor M is connected by a driving belt 18 to a pulley 19 on one side of the frame, keyed to a shaft 20. The shaft 20 extends entirely through the frame, projecting on the opposite side from the pulley, and serves to support a combined gear and clutch element 21 which is freely rotatable on the shaft. Also mounted for free rotation on the shaft, and in spaced relation to the element 21 is a second gear and clutch element 22. Splined to the shaft 20 between the oppositely facing clutch elements 21 and 22 is a slidable clutch member 23, operable by a yoke 24. The yoke 24 is carried by brackets 25 secured to the frame 15 adjacent the shaft 20, and

is integral with a bell crank 26 which is pivoted to a link 27, in turn pivoted to one end of a rocker arm 28 fulcrumed on the side of the frame 15. The rocker arm 28 extends through an opening in the frame 15, and carries on its inner end a cam roll 29 by means of which the arm is actuated in a manner hereinafter described.

An offset plate 30 adjustably secured to the side of the frame 15 serves to provide bearings for the outer end of the shaft 20 and for the outer end of a stub shaft 34, the inner end of which is journaled in the frame. The stub shaft 34 carries gears 35 and 36, meshing with the gears 21 and 22 respectively, and a gear 37, which in turn meshes with a gear 38 rotatable on the end of a shaft 39 journaled in the side walls of the frame 15 and extending completely through the frame, with the ends thereof projecting from opposite sides.

The gearing thus far described comprises a two speed, reduction gearing from the motor, and it will be evident that as the clutch member 23 is shifted by the yoke 24 into engagement with one or the other of the gear and clutch elements 21 or 22, that the gear 38 will be driven at one or another of two speeds, for a constant speed of the motor.

A sprocket 40, on the shaft 39, is secured to or integral with the gear 38, and drives a sprocket chain 41, in turn actuating a second sprocket 42 carried by shaft 43, for driving the movable electrode. The movable electrode is mounted upon an endless carrier chain 44 which passes over a sprocket 45 (Fig. 4) on the shaft 43, and over another sprocket 46 carried by a stub shaft 47 in the welding unit E, whereupon rotation of the shaft 43 by the sprocket chain 41 will produce a movement of the electrode carrier 44.

On the end of the shaft 43 at the opposite side of the machine from the sprocket 42 is a gear 51 in mesh with a gear 52, keyed to a shaft 53. Also carried by the shaft 53, is a sprocket 54 which is effective to drive a sprocket chain 56, which chain drives a sprocket 57 keyed to the shaft 39. By this arrangement of gearing the shaft 39 is driven in synchronism with the shaft 43, which drives the movable electrode.

Wire stock feeding mechanism

Keyed to the shaft 39, within the housing 15 is a mutilated gear 58, illustrated in the present embodiment as having teeth over one-third of its circumference.

The purpose of this gear is to drive feeding rolls of the unit B, which draw the wire stock from its source of supply and feed it through the apparatus, in synchronism with movements of the electrode, and it is effective to feed a predetermined length of wire stock to the welding mechanism or unit E automatically.

The gear 58 also controls the change speed yoke 24, and other elements of the apparatus. The side of the gear adjacent the root of the teeth is slightly higher than the remainder of the gear, whereby as the cam roll 29 rides upon the high surface, the machine will operate at slow speed, but when the cam roll is traversing the remaining two-thirds of the gear the machine will operate at higher speed.

The teeth of the mutilated gear are arranged to mesh with a gear 59 mounted on a shaft 60, which shaft also carries a gear 61. This gear 61 operates through gears 62 and 63 to drive a gear 64 (Fig. 7), in mesh with a feed roll driving gear 64. Gear 64 in turn actuates a pair of gears 65

65—66 on the respective feed roll shafts thereby rotating the lower, grooved feed or draw rolls 67. The feed roll shafts also carry gears 68—69 in mesh with gears 69—69 to drive the upper feed or draw rolls 70.

The upper set of rolls 70 are adjustable with respect to the lower set, for accommodating different diameters of wire stock, and for supplying the proper pressure, necessary to draw the wire from its supply and feed same through the machine.

The mutilated gear 58 is provided with an annular surface 71 adjacent to and concentric with the teeth of the gear, but the periphery of which is below the root of such teeth, and a projection 72 having a concaved end shaped to mate with the periphery of surface 71 is formed on the side of the gear 59. The gears 58 and 59 and the parts 71 and 72 are so proportioned and related that as the gear 58 completes one third of a revolution the teeth thereon will have caused the gear 59 to complete a revolution, at which time the member 72 will come into contact with the surface 71 and act to lock the gear 59 against further accidental rotation until such time as the teeth of the gear 58 come into engagement therewith. This ensures an accurate feeding of the wire stock a predetermined distance for an operative cycle of the machine. In order to obtain a variation in the length of stock which will be fed, it will be necessary to change the size of the gear 61, and in this connection it will be noted that the gear 62 is carried by an adjustable bracket, permitting a take-up of clearance.

Wire straightening mechanism

Mounted in advance of the feed rolls on the upper portion of a sub-housing on the frame 15 is a wire straightening mechanism C which comprises one set of grooved rolls 73 arranged such that a wire resting in the groove of one roll will also rest in the groove of an adjacent disaligned roll, and a second similar set of rolls 74, the axes of the rolls in one set being located in a plane at substantially right angles to the plane of the axes of the other set. It will be quite evident from Figs. 1 and 3 that as the wire is drawn by the feed mechanism B from a supply roll (not shown) it will be unrolled, unkinked and straightened prior to its movement into welding position.

Wire severing mechanism

Referring now particularly to Figs. 8 and 9, the mechanism for severing a strip of wire (the length of which is predetermined by the mutilated gear 58) from the main supply, is illustrated. This mechanism consists of a knife or shearing blade 75 slidable in suitable guides 76 which are located adjacent the guide opening 77 in the frame, through which the wire protrudes.

An arm 78 is fulcrumed adjacent the shear 75, in the frame 15, through the medium of offset trunnions 79 and while separate from the shear 75, is resiliently mounted in constant engagement therewith by means of a spring 80. This arm terminates at its lower end in a roller 81 positioned to engage a second arm or lever 82 which is pivoted in the frame, a spring 83 serving to maintain a yielding contact between the roller 81 and the lever 82. An additional spring 84 hooked at one end to the frame 15 and at the other end to the lever 78 also serves to maintain the parts in a predetermined operation relation.

Mounted on the side of the mutilated gear 58 is an abutment roller 85, located in such a relation

to the axis of the gear and to the end of the lever 82 as to engage the lever at a predetermined point in the rotary movement of the gear 58, and to slide off the end thereof as the gear continues its travel. When first engaging the lever 82, the roller 85 will have the effect of swinging the lever against the action of the springs 83 and 84, and thereby moving the lever or arm 78 about its fulcrum with the result that the upper end of the lever 78 will raise the shear, which, by cooperation with the edges of the die opening 77, severs the stock extending therethrough. The timing is such that no severing will occur until after the welding operation is started, in order that the measured length of wire may be held firmly during the remaining welding operation.

Welding mechanism

The welding mechanism of unit E comprises generally a welding head or bracket projecting 20 from the frame in the direction of feed of the wire stock, and an elongated work supporting table therebelow, extending parallel thereto.

The table is formed with a base 86 illustrated herein as an inverted channel iron rigidly secured 25 to the frame 15. Any desired form or shape of table may be used, depending on the nature of the work, e. g., with flat work, a wider base may be required. Extending along the base 86 are guides 87 for the reception of side rails of a slidable work holding rack 88, these rails being connected across one end.

Removably mounted, stationary electrodes 89—89, run along the base 86, between the guides, clamping between them a removable 35 contact strip 90. The contact strip 90 is set slightly below the surface of the electrodes 89 to form with the upper portions thereof, a groove or track for the reception of the measured strip of wire W.

Depending from the base 86 are brackets 91 40 for the support of a guide, rail or work stop 92. The brackets 91 are slotted for the reception of an adjusting screw 93 by means of which the rail 92 may be adjusted in various directions, as desired.

The welding head or bracket comprises a projecting arm or beam 94 secured at one end to the upper part of the frame 15 and braced at its outer end by means of a strut or tie rod 95 secured thereto by an adjustable connection 96, by 50 virtue of which the arm 94 may be adjusted for overhang. A sub-arm 97 is rigidly secured to the arm 94 and also to the frame 15, and serves, not only to reinforce and stiffen the welding head, but to directly support other elements thereof.

An adjustable, slidable bearing block 48, carried by the outer end of the arm 94, serves to support the sprocket shaft 47, this block being 60 actuatable by an adjusting device 49, whereupon the carrier chain 44 may be adjusted as desired. The carrier chain 44 is mounted with the upper run thereof passing between the arms 94 and 97, and with the lower run thereof passing between the electrodes 89 and the arm 97.

A pressure bar 98 rests upon the lower run of the chain 44, between the side links thereof, and mounts studs 99 which extend upwardly from the bar into perforations of the sub-arm 97 70 serving to guide the bar and maintain it in operating position. Compression springs 100 encircle the studs 99 between the bar and the lower face of the sub-arm 97, to maintain a pressure between the bar and the lower run of the chain at 75

all times. Cross bars 101, depending at spaced intervals from the arm 97, serve to limit upward movement of the pressure bar, and also function to support a contact rail 102 adjacent the lower run of the chain.

The movable or welding electrode itself is best illustrated in Figs. 4, 5 and 6, and as shown comprises a carriage or housing 103 suitably connected to the carrier chain 44 and fitted with rollers 104 to ensure even distribution of pressure from the pressure bar 98. Assembled within the housing 103 is a removable metal body 105, preferably of copper, insulated from the housing and secured therein by a draw bolt 106. This block is provided with a dove-tail slot to receive a contact shoe 107 which is removably fitted into said slot. The ends of the shoe 107 are bevelled upwardly from an elongated flat bottom, effective to maintain contact with the work over a period sufficient to produce a proper weld. A wing 108 integral with the contact shoe extends partially outside of the housing 103 to a point where it may establish contact with spring pressed contact rail or brush bar 109. This brush bar is mounted in guides 110 supported from the welding head by brackets 111 and suitably insulated therefrom.

The housing 103 also carries a contact spring terminal 112 which is located adjacent to, but normally out of contact with the contact rail 102, the purpose thereof being to make and break a circuit from the rail, through the movable electrode. In order to actuate this spring terminal, an elbow 113 is pivoted to the side of the cage and this elbow terminates in a trigger or shoe 114 of insulating material, designed to engage the work during travel of the movable electrode, and as it crosses raised portions thereof, e. g., the hoops H, the elbow will be forced upwardly into engagement with the contact spring 112, pushing same into contact with the rail 102.

Turn table unit

An important adjunct to the apparatus is found in the turn table unit G, which is used as a temporary support for work entering and leaving the welding station. This unit comprises a standard 115 swivelled at 116 in a base 117. Arms 118 extend in T fashion across the top of the standard, as many arms as is necessary being provided, two being illustrated in the herein described embodiment. Guides 119 similar to the guides 87 in the welding unit extend along the arms 118, to receive slidable racks 88.

These racks, as stated above, are formed of a pair of rails connected across one end and are provided with a series of pairs of upstanding insulated pins 120 for receiving and spacing hoops H, or the like, to which the length of wire W is to be welded.

In the usual installation of the machine, pits 121 may be provided beneath the transversely extending arms 118, for the accommodation of large sized hoops and finished cages, and these pits may be covered over with floor boards 122 when not required.

The wiring diagram is shown in Fig. 5, and comprises a 220 volt input circuit to the motor M, and including a circuit maker and breaker controlled by push buttons S. Tapped into this circuit is a 110 volt circuit through a magnetic circuit breaker, the circuit being completed through the contact rail 102, and a ground to the machine. The 6 volt welding circuit shown,

is completed through the brush bar 109 and electrodes 89.

The electric wiring, and usual paraphernalia such as transformers, circuit makers and breakers, and the like are carried by a sub-frame K mounted in the main frame 15, and to which sub-frame are secured conventional insulating conduits, outlet boxes, etc.

Having thus described my improved apparatus, the use thereof and method of forming fabricated structures will be readily apparent. A rack 88 on an arm 118 of the turn table, remote from the welding mechanism, may be supplied with a series of preformed hoops H, (which may be formed individually, or by coiling a single length of wire into the form of a spiral) the individual hoops or convolutions of the spiral being placed between the respective pairs of pins 120 to temporarily hold the hoops or convolutions in a predetermined spaced relation. The turn table will then be swung until the filled rack is in alignment with the guides 87 on the work table, whereupon the rack may be transferred to the work table, beneath the welding head, and locked thereon in any convenient manner, for example by a lock pin 129. As soon as the rack is properly in position beneath the welding head, the machine may be started in operation by pushing the starter button at S, to close the circuit through motor M. The end of the wire W will of course, have been previously threaded through the straightening rolls of the mechanism C until they are gripped by the feed rolls B.

The motor M will immediately start the driving mechanism of unit A operating, to actuate the wire feed and severing units in synchronism with the carrier chain for the movable electrode. The operations thus far described will be at relatively high speed.

The mutilated gear 58 has just enough teeth to move gear 59 one complete revolution which drives shaft 60. This, in turn, drives gear 61 determining the proper length of wire. As soon as this length of wire stock W, has been fed to the work table, the mutilated gear will be in such position as to prevent further feeding of the wire, and the contact shoe 107 will start its lower run.

At this point in the cycle of operations the yoke 24 will shift from high speed to low speed, through engagement of the shifting lever 28, with the high surface at the side of the teeth on gear 58, and welding of the measured straight length of wire W, to the hoops or spiral H will begin.

As the electrode begins its travel, the contact shoe 107 will ride smoothly across, and in engagement with the hoops H and the insulated shoe or trigger 114, which has a length permitting it to extend below the hoops will be intermittently raised by abutment against individual hoops to establish a circuit. The circuit will be established through the spring terminal 112, and the contact strip 102, through the 110 volt line, (Fig. 5) to which the contact strip 102 is connected. A potential transformer 123 is located in this circuit, and has one leg grounded to the machine. This transformer furnishes sufficient current only to operate a lifting or magnetic coil 124, which acts to operate a circuit maker and breaker 125, in the 220 volt circuit. When this occurs, the transformer 126 in that circuit operates to energize the 6 volt welding circuit, connected through a bus 127 to the brush bar 109,

and deliver a heavy current to the wires which are to be welded to each other, these wires resting on the electrodes 89 of the welding circuit.

The transformer 123 has its 220 volt terminals connected to one side of the motor circuit, so that if the motor M should stop, the potential transformer 123 is not in circuit. The transformer 126 in the 220 v.-6 v. line is a welding transformer preferably of 33 k. v. a. intermittent duty, and has a series of tabs on the 220 V. side to furnish different voltages for welding. The circuit through the brush bar 109 is completed by a heavy bus 128 to the electrodes 89 on the work support.

It will thus be seen that the entire operation of the apparatus is controlled through the single circuit maker and breaker controlled by push buttons S, all operations, both electrical and mechanical being automatic.

After crossing a hoop, the elbow and trigger 113-114 will drop down under pressure of the spring terminal 112, but pressure will remain on the welded joint by the shoe 107 which is influenced by the pressure bar 98, until just before it reaches the next hoop to be welded. After part of the welding operation has taken place, the roller 85 will actuate the severing mechanism. As soon as a complete length of wire has been properly welded to all of the hoops or spiral convolutions, the electrode will begin its up-travel to the upper run, the operator may shift the cage, if no automatic shifting mechanism is provided, by rotating the welded work until the welded length comes adjacent to the insulated guide bar 92. During the upper run of the electrode, the draw-rolls are in operation; thus a new wire is pushed out so that the welding operation may be repeated as soon as the electrode has completed its upper travel.

In the meantime the support 118 on the turntable which is remote from the machine is being supplied with hoops. As soon as a cage is completed by the welding of the various longitudinal strips, the rack 88 will be returned to the aligned arm 118, and the turn-table rotated to remove the finished cage and bring a fresh supply of hoops into the welding mechanism.

If found necessary to prevent overheating, any convenient arrangement for water cooling the movable electrode may be utilized. As illustrative a nozzle 130 is located adjacent the end of the welding head, in position to drip cold water on the movable electrode as it begins its operative, lower run movement. A drain 131 may be positioned therebeneath to carry off the waste water.

The method and apparatus herein described, are effective to produce fabricated cages, sheets and the like with great rapidity, and accuracy, yet with a minimum of labor, and it will be obvious, that very little modification is required to change from one type of work to another. Hence it will be understood, that the embodiments herein described are intended as illustrative and not as limiting, other than as defined in the appended claims.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. An apparatus of the class described comprising a frame, a work support projecting therefrom, a welding head extending in substantially parallel, spaced relation thereto, an endless carrier chain mounted on said head for movement along said support, an electrode carried by said chain, means to actuate said chain whereby said elec-

trode will travel from one end of the work support to the other, and return, and means to increase the rate of travel of said electrode in one direction and to return the rate of travel to normal in the other direction.

2. An apparatus of the class described, comprising a frame, a work support projecting therefrom, a welding head extending in substantially parallel spaced relation thereto, electrode driving means mounted on said head for movement along said support, an electrode driven by said means, means to actuate said electrode driving means whereby said electrode will travel from one end of the work support to the other, and return, and means to increase the rate of travel of said electrode in one direction and to return the rate of travel to normal in the other direction.

3. An apparatus of the class described, comprising a frame, a work support projecting therefrom, means on said frame to feed a strip of metal to said work support, means on said support to guide the strip as it is fed and to hold same in welding position, comprising an elevated, extended base electrode defining a work receiving and positioning channel, a welding head extending in substantially parallel, spaced relation to the work support, an electrode mounted in said head, for movement along the work support, and means to move said electrode along the head in operative welding relation to the metal strip on the work support.

4. An apparatus of the class described, comprising a frame, a work support projecting therefrom, means on said frame to feed a strip of metal to said work support, means on said support to guide the strip as it is fed and to hold same in welding position, comprising an elevated, extended base electrode defining a work receiving and positioning channel, a welding head extending in substantially parallel spaced relation to the work support, an electrode mounted in said head for movement along the work support, means to move said electrode along the head in operative welding relation to the metal strip on the work support, and detachable means on said electrode to receive and deliver a welding current during its travel from one end of the work support to the other.

5. An apparatus of the class described comprising a frame, a work support projecting therefrom, means to feed a predetermined length of wire stock to said work support, means on said support to guide the strip as it is fed and to hold same in welding position, comprising an elevated, extended base electrode defining a work receiving and positioning channel, means to sever such predetermined length, a welding head extending in substantially, parallel spaced relation to said work support, an electrode carried by said head, and means to move said electrode along the head in operative welding relation to the length of wire stock on the work support.

6. An apparatus of the class described comprising a frame, a work support projecting therefrom, means to feed a predetermined length of wire stock to said work support, means on said support to guide the strip as it is fed and to hold same in welding position, comprising an elevated, extended base electrode defining a work receiving and positioning channel, means to sever such predetermined length, a welding head extending in substantially, parallel spaced relation to said work support, an electrode carried by said head, means to move said electrode along the head in operative welding relation to the length of wire

stock on the work support, and detachable means on said electrode to receive and deliver a welding current during its travel from one end of the work support to the other.

5 7. An apparatus of the class described, comprising a frame, a main work support projecting therefrom, welding mechanism associated with said support, an auxiliary work support positioned immediately adjacent said first work support, means mounting said auxiliary work support for
10 movement relative to said main work support, whereby work on said auxiliary work support may be aligned with said main work support and transferred thereto.

15 8. An apparatus of the class described, comprising a frame, a main work support projecting therefrom, welding mechanism associated with said support, an auxiliary work support positioned immediately adjacent said first work support, means mounting said auxiliary work support for
20 movement from its adjacent position onto said main work support, whereby work on said auxiliary work support may be first aligned with said main work support and thereafter transferred to said main work support.

25 9. An apparatus of the class described, comprising a frame, a main work support projecting therefrom, welding mechanism associated with said support, an auxiliary work support, means mounting said auxiliary work support for movement from a position remote from said main
30 work support to a position immediately adjacent said main work support, and for movement onto said main work support, whereby work may be placed on said auxiliary work support, transferred to said main work support, removed from
35 said main work support, and removed from the scene of operations.

40 10. An apparatus of the class described, comprising a frame, a main work support projecting therefrom, welding mechanism associated with said support, an auxiliary work supporting rack, means mounting said rack for movement from a
45 position remote from said main work support to a position immediately adjacent said main work support, and for movement onto said main work support, comprising a rotary turret having a guide slidably receiving said rack whereby work
50 may be placed on said rack, at a point remote from the main work support, moved to a position adjacent said main work support, transferred to said main work support, and thereafter be removed from said main work support in reverse order.

55 11. A wire fabricating apparatus comprising a frame, work supporting means extending therefrom, means to withdraw wire stock from its source of supply and feed a predetermined length thereof to said work supporting means, said feed
60 means including a mutilated gear, the teeth of which are predetermined in number to accord with the desired length of stock to be fed, a traveling welding electrode effective to operate on said length of wire stock, and means including
65 said gear to vary the rate of travel of said electrode.

70 12. A wire fabricating apparatus comprising a frame, work supporting means extending therefrom, means to withdraw wire stock from its source of supply and feed a predetermined length thereof to said work supporting means, said feed
75 means including a mutilated gear, the teeth of which are predetermined in number to accord with the desired length of stock to be fed, and means actuable by said gear for severing the

predetermined length of stock, a travelling welding electrode effective to operate on said length of wire stock, and means including said gear to vary the rate of travel of said electrode.

13. A wire fabricating apparatus comprising a frame, work supporting means extending therefrom, welding means associated with said work supporting means, means to withdraw wire stock from its source of supply and feed a predetermined length thereof to said work supporting means, said feed means including a mutilated gear, the teeth of which are predetermined in number to accord with the desired length of stock to be fed, means to move said welding means along the work, and to successively produce a series of spot welds, and means including said gear to control the rate of travel of said welding means.

14. In a welding apparatus, a movable electrode comprising a housing mounted to travel along the work, a contact shoe removably assembled in said electrode housing, adapted to supply welding current to the work, and a movable work engaging terminal, on said housing effective to intermittently establish a circuit through the electrode in accordance with demands of the work, said work engaging terminal being positioned to establish the circuit after engagement of the contact shoe with the work and to break the circuit before the pressure is released by said removable contact.

15. The method of fabricating metal structures which comprises assembling and supporting a plurality of wires in a predetermined spaced relation, as a unit, positioning said unit of supported wires along an extended welding electrode, feeding an additional length of wire transversely across said unit, and along said extended welding electrode, and severing and welding a predetermined length of said additional wire to each of the supported wires thereby securing said supported wires in unitary relation.

16. The method of fabricating metal structures which comprises forming a plurality of independent metal hoops, assembling and supporting said hoops in a predetermined spaced relation as a unit, positioning said unit of supported hoops along an extended welding electrode, feeding a length of wire transversely across the hoops of said unit, and along said extended welding electrode, and severing and welding a predetermined length of said wire to each of the hoops thereby securing said hoops in their unitary predetermined spaced relation.

17. The method of fabricating metal structures, which comprises forming a plurality of metal coils, arranging and supporting said coils in predetermined spaced relation, positioning said coils along an extended fixed welding electrode, such that each coil contacts the electrode, feeding a length of wire transversely across said coils and along said extended welding electrode, and severing and welding a predetermined length of said wire to each of the coils successively and as a continuous operation, thereby securing said hoops in their predetermined spaced relation.

18. The method of fabricating metal structures, which comprises assembling and supporting a plurality of wires in a predetermined spaced relation, as a unit, positioning said unit of supported wires along an extended welding electrode, feeding an additional length of wire transversely across said unit, and along said extended welding electrode, then passing a movable electrode along said unit and in contact with said

unit at points of crossing between said predetermined length and said spaced wires, whereby to weld said predetermined length to each of the spaced wires.

19. The method of fabricating metal structures, which comprises forming a plurality of independent metal hoops, assembling and supporting said hoops in a predetermined spaced relation as a unit, positioning said unit of supported hoops along an extended welding electrode, feeding a length of wire transversely across the hoops of said unit, and along said extended welding electrode, then passing a movable electrode along said unit and in contact with said unit at points of crossing between said predetermined length and said spaced hoops, whereby to weld said predetermined length to each of the spaced hoops, and maintain said hoops in their spaced relation.

20. The method of fabricating metal structures, which comprises forming a plurality of metal coils, arranging and supporting said coils in predetermined spaced relation, positioning said coils along an extended fixed welding electrode, such that each coil contacts the electrode, feeding a length of wire transversely across said coils and along said extended welding electrode, then passing a movable electrode along said length of wire and in contact with the supported coils whereby to weld said length of wire to each of the supported coils successively and as a continuous operation and to maintain said coils in their predetermined spaced and supported relation.

21. An apparatus of the class described, comprising a frame, a work support projecting therefrom, an electrode support extending in substantially parallel, spaced relation thereto, an electrode carried by said support, means to move said electrode from one end of its support to the other, in operative contact with work on the work support, and intermittently operating, work engaging means carried by said electrode effective to close a welding circuit after the electrode has applied pressure to the parts to be welded, and to break the welding circuit before the electrode releases the pressure from the parts to be welded.

22. An apparatus of the class described, comprising a frame, a work support projecting therefrom, an electrode support extending in substantially parallel, spaced relation thereto, an endless carrier chain mounted on said electrode support for movement along the work support, an electrode carried by said chain, means to actuate said chain whereby said electrode will travel from one end of the work support to the other, in operative contact with work on the work support, and return, detachable means on said electrode to receive and deliver a welding

current during its travel over the work support, and intermittently operating work engaging means carried by said electrode effective to close a welding circuit after the electrode has applied pressure to the parts to be welded, and to break the welding circuit before the electrode releases the pressure from the parts to be welded.

23. An apparatus of the class described, comprising a frame, a work support projecting therefrom, means on said frame to feed a strip of metal to said work support, means on said support to guide the strip as it is fed and to hold same in welding position, a welding head extending in substantially parallel, spaced relation to the work support, an electrode mounted in said head, for movement along the work support, means to move said electrode along the head in operative welding relation to the metal strip on the work support, and intermittently operating, work engaging means carried by said electrode and effective to close a welding circuit after the electrode has applied pressure to the parts to be welded and to break the welding circuit before the electrode releases the pressure from the parts to be welded.

24. In a welding apparatus, a work support, a traveling carrier, a welding electrode secured to said carrier for movement therewith over said work support, and pressure means effective to press the carrier and electrode toward said work support, said electrode having roller means engageable with said carrier in opposition to said pressure means, effective to hold said electrode against tilting as it engages the work.

25. In a welding apparatus, a work support, an endless carrier chain, a welding electrode secured to one run of said chain for movement therewith over said work support, a pressure bar extending over a major portion of said run of the chain, on the opposite side thereof from the electrode, and effective to press said chain and electrode toward the work support, said electrode having rollers positioned to engage said chain at a plurality of points, in opposition to said pressure bar, whereby to hold the electrode against tilting as it engages the work and in a position parallel to the work support as it travels over the work.

26. The method of fabricating metal structures, which comprises forming a plurality of metal coils, arranging and supporting said coils in predetermined spaced relation, positioning said coils along an extended, fixed welding electrode, feeding a length of wire beneath said coils and along said extended welding electrode, and severing and welding a predetermined length of said wire to each of the coils successively and as a continuous operation, thereby securing said hoops in their predetermined spaced relation.

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