May 30, 1933. C. C. WICKWIRE 1,911,541

WIRE FABRIC MACHINE

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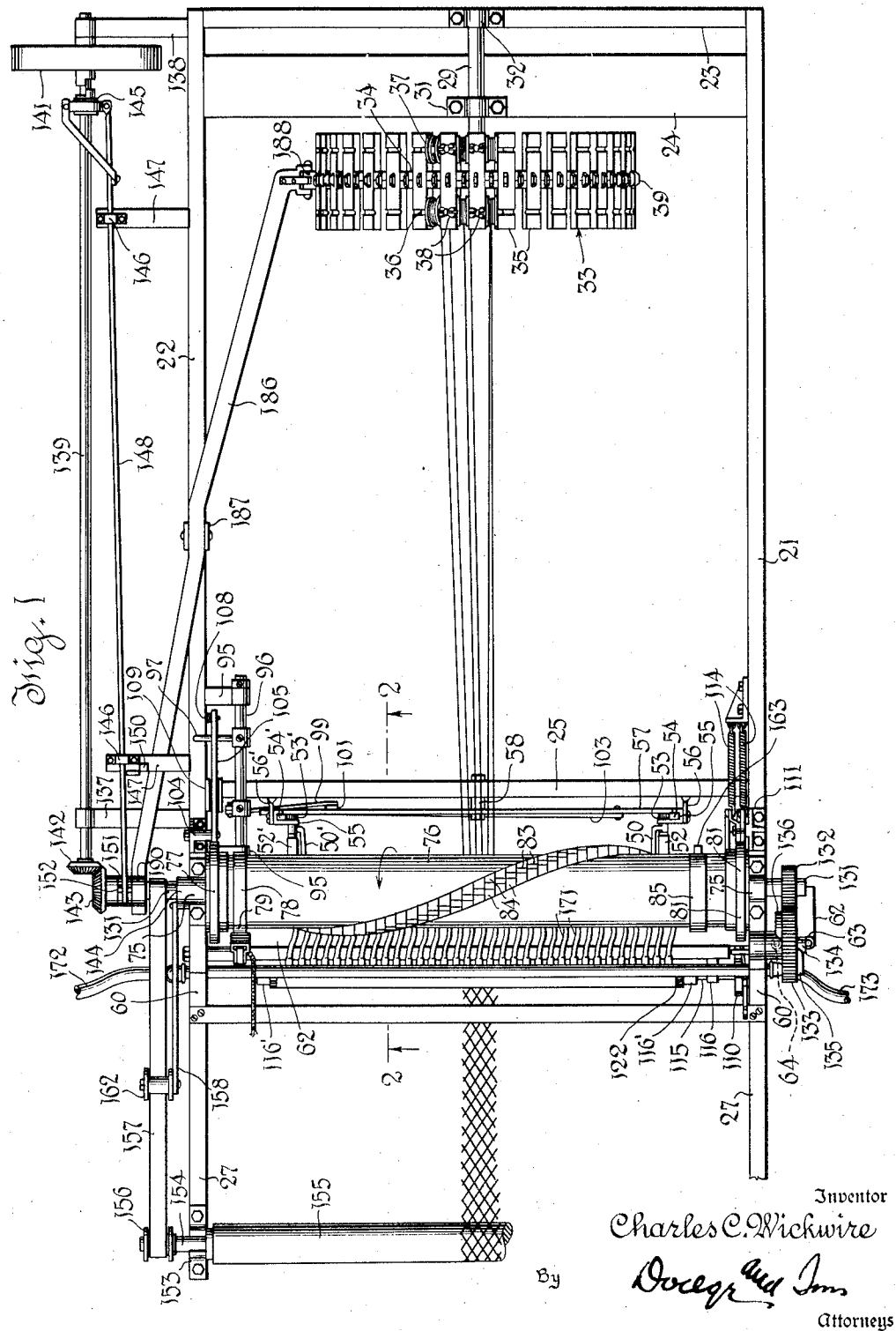


Fig. 1

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WIRE FABRIC MACHINE

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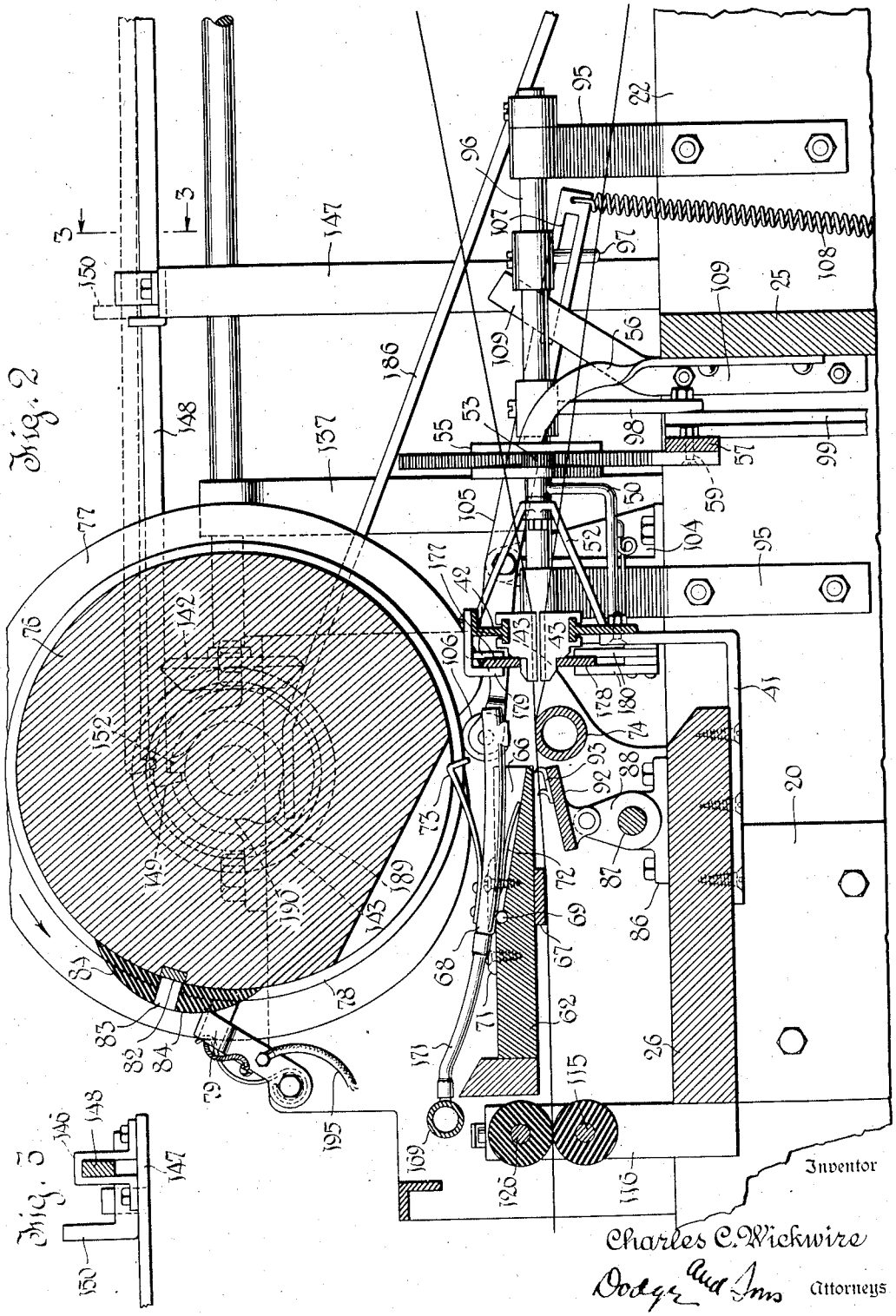


Fig. 2

Fig. 3

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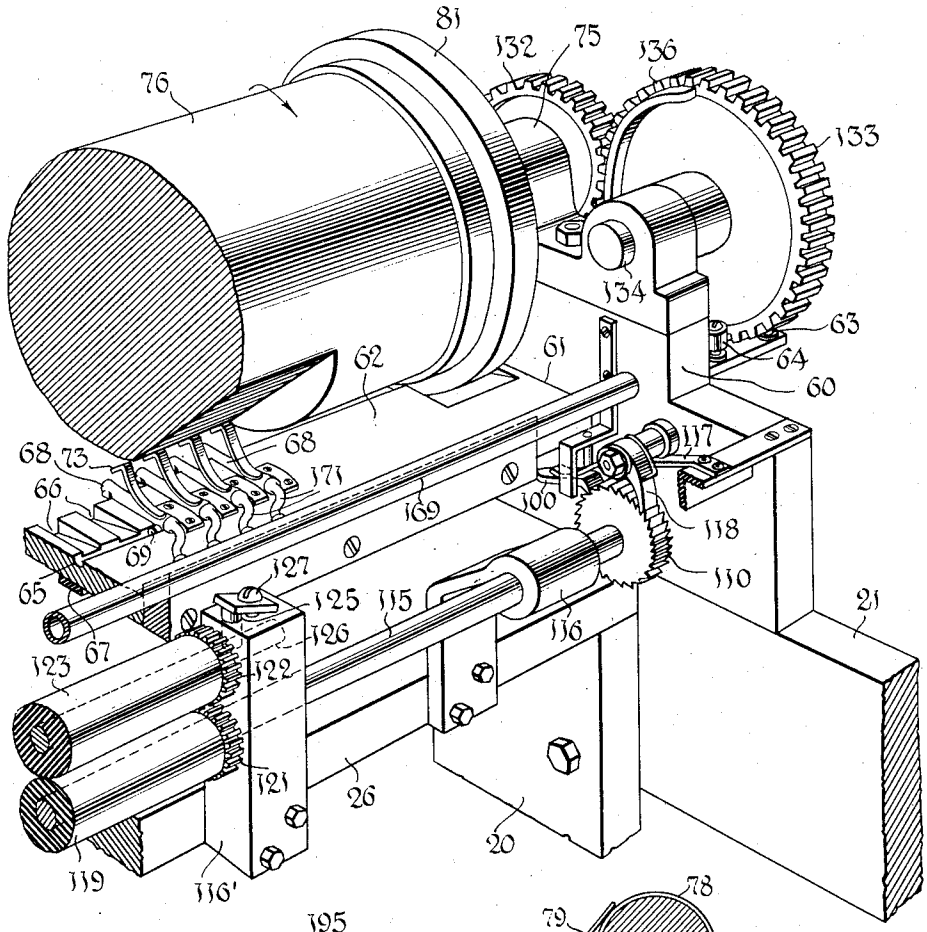
Dodge and Sons Attorneys

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WIRE FABRIC MACHINE

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Fig. 4



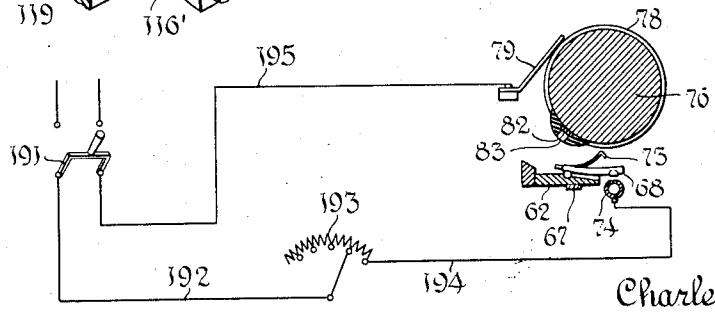


Fig. 5

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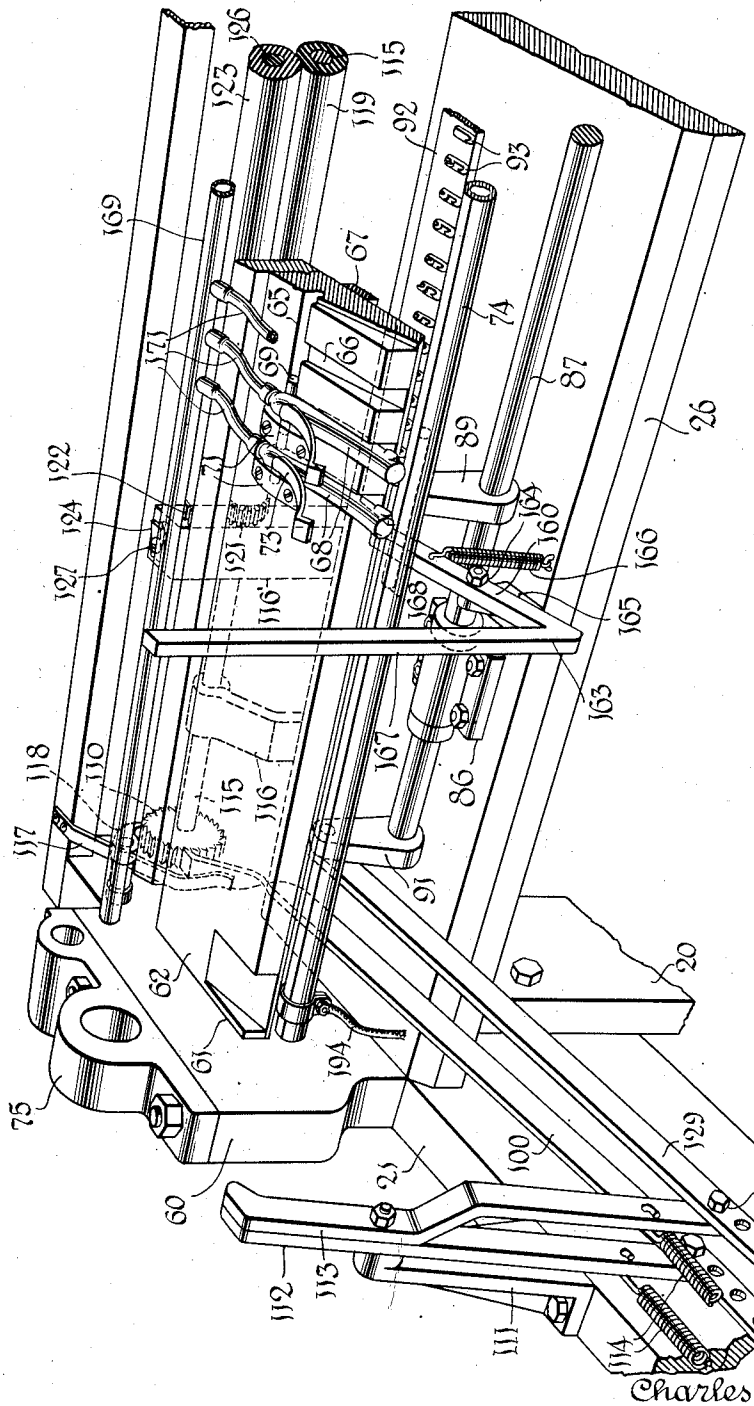
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WIRE FABRIC MACHINE

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Fig. 6



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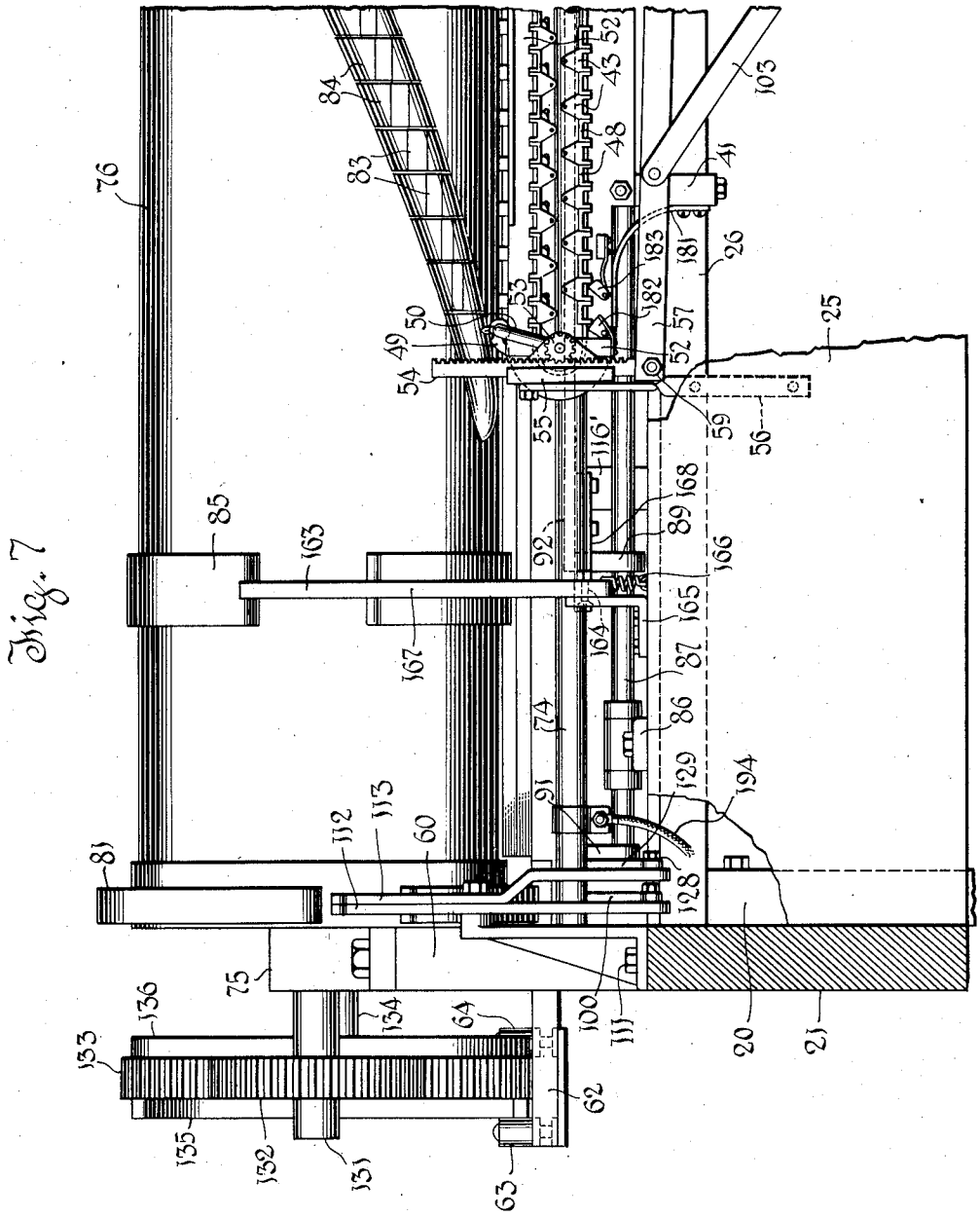


Fig. 7

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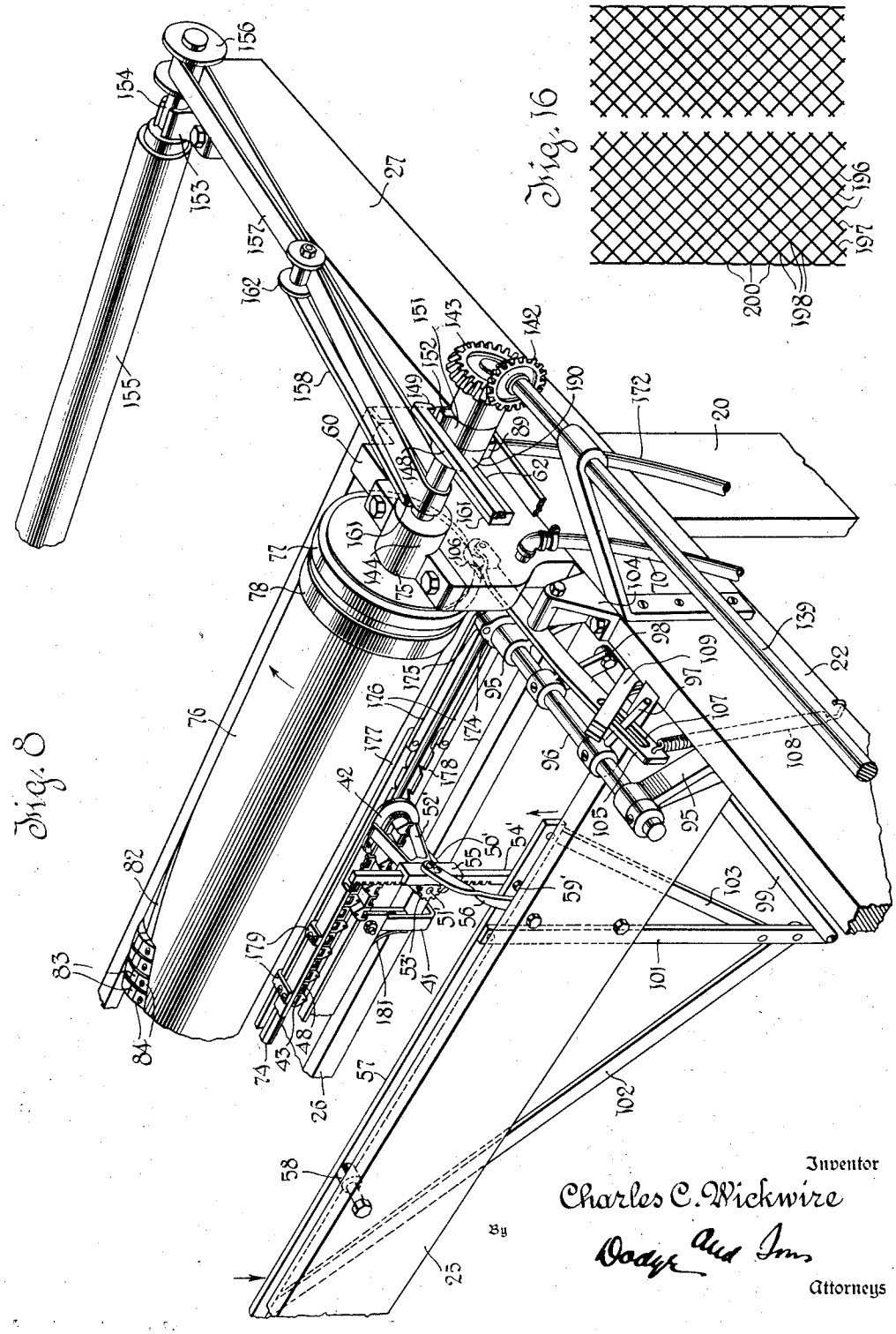


Fig. 8

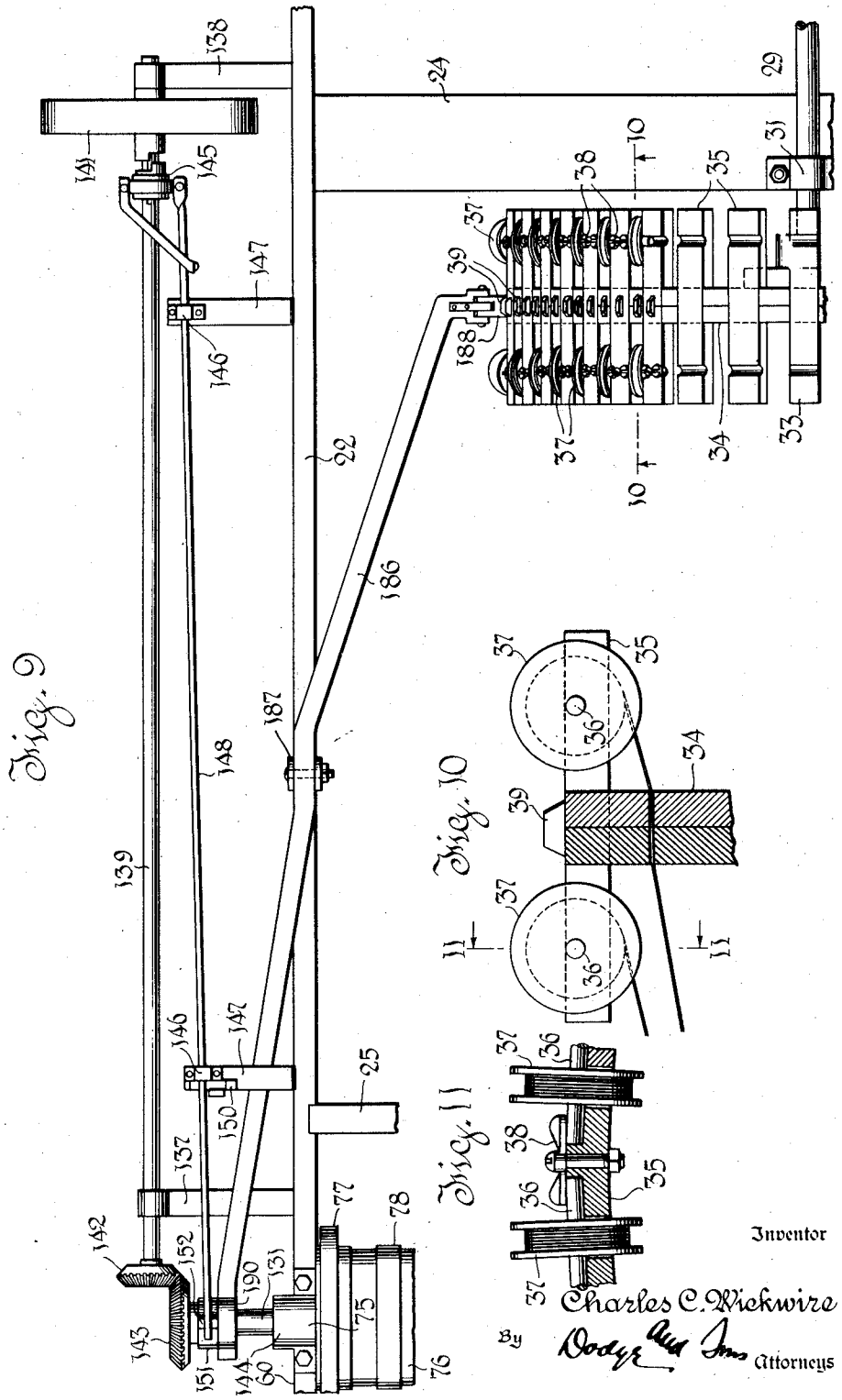
Fig. 16

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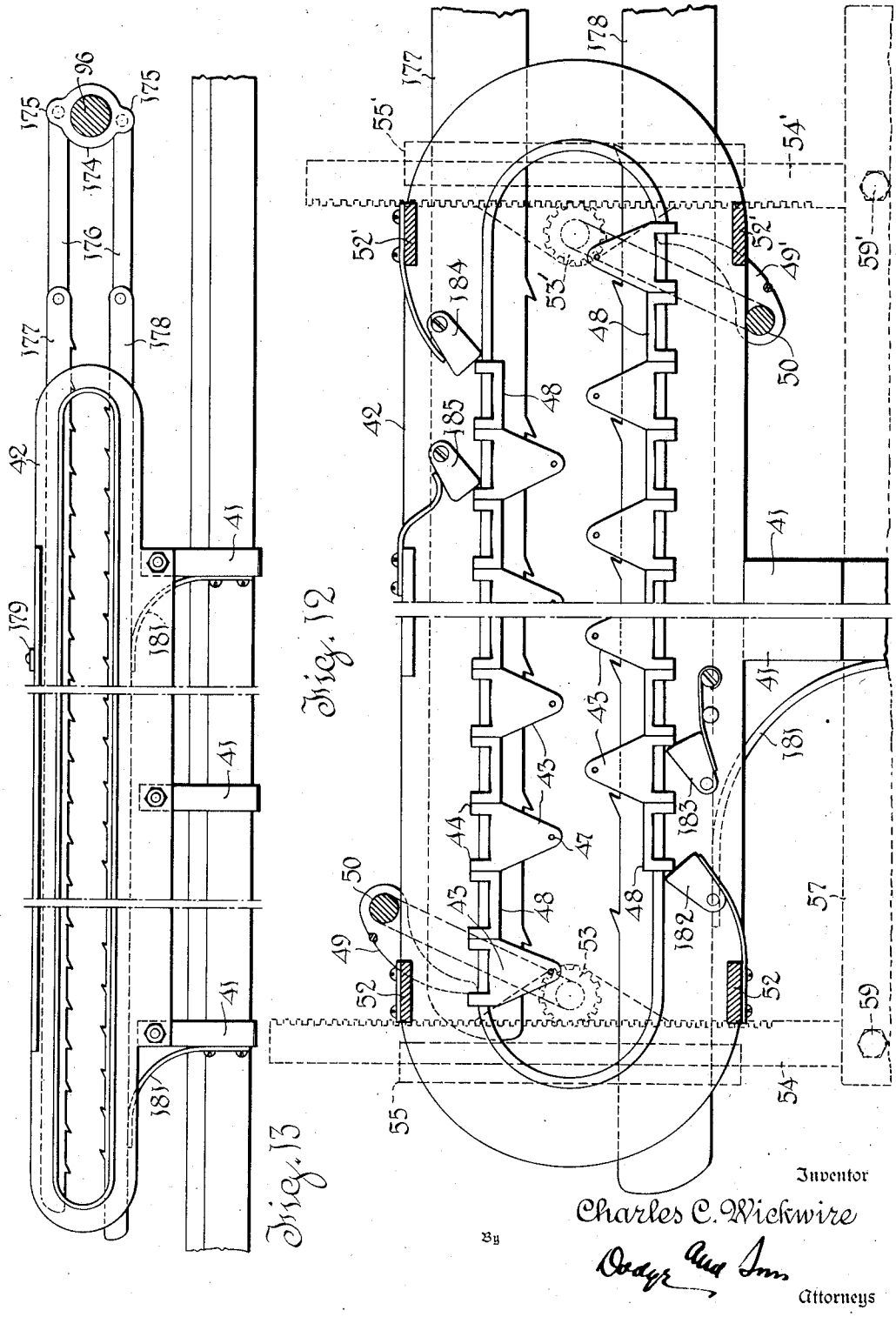


Fig. 12

Fig. 13

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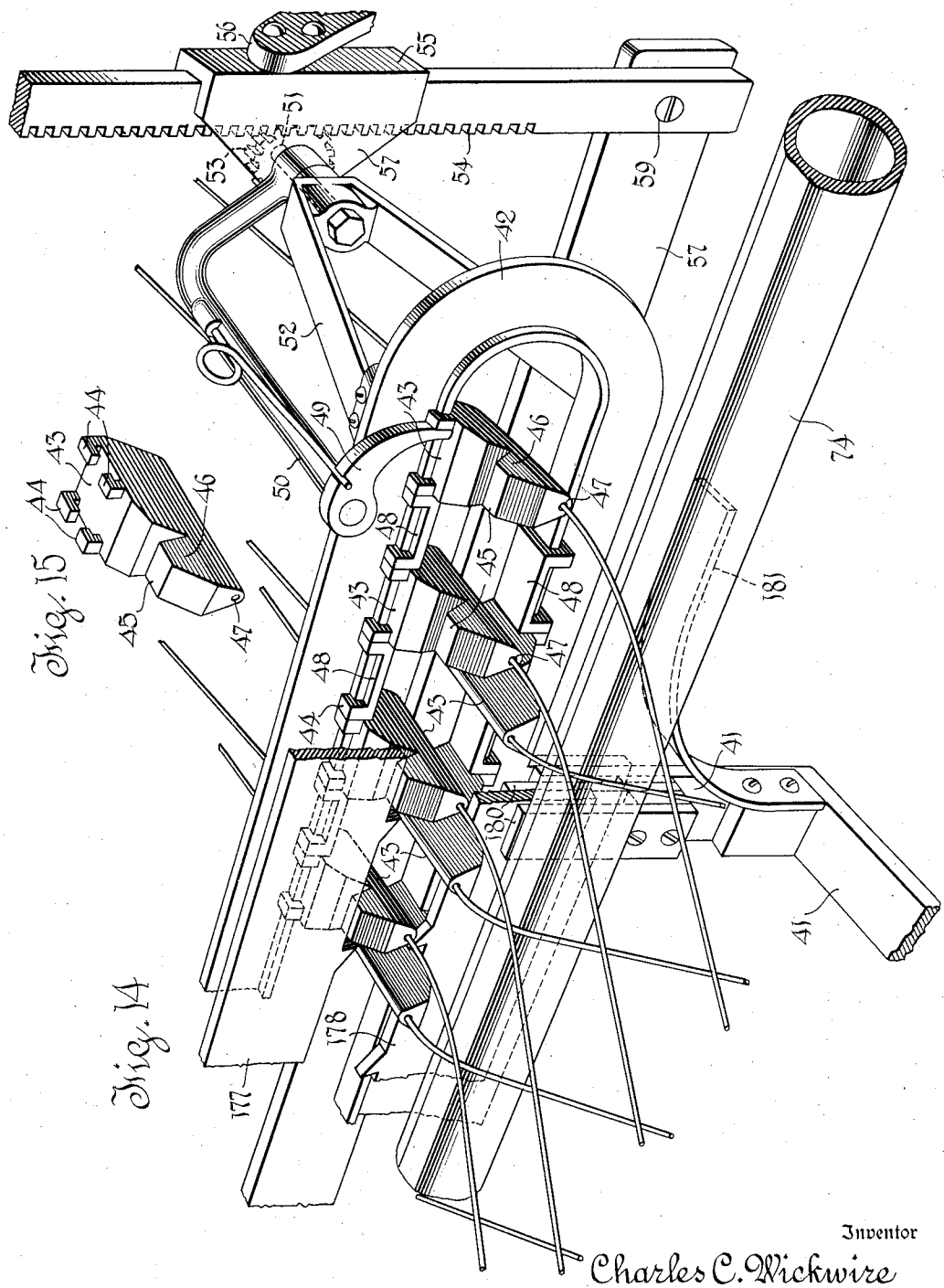


Fig. 15

Fig. 14

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Patented May 30, 1933 1,911,541

UNITED STATES PATENT OFFICE

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WIRE FABRIC MACHINE

Application filed October 4, 1930. Serial No. 486,467.

This invention relates to machines for manufacturing welded wire fabrics of the type in which the strands pass diagonally with reference to the length of the fabric producing a diamond mesh. In the preferred form, the two sets of strands cross each other at right angles, so that the openings are squares (set diagonally) rather than rhombs, but the angle of crossing is a function of the rates of lineal and cross feed and is subject to variation. The strands are not interwoven, but all of one oblique set overlie the strands of the other set.

Such a fabric may be regarded as in effect made up of a cylindrical tube, whose wall comprises parallel progressive spiral strands, flattened on itself, and this fact is availed of in the construction of the machine. The wire is carried on spools or reels from which it is drawn intermittently by intermittent feed of the finished fabric. These reels are mounted on a rotary carrier which rotates intermittently in time with the intermittent drawing off of the wire.

The strands pass directly to individual guides which travel transversely to the length of the fabric intermittently in a closed path. This path is made up of two adjacent parallel straight runs connected at their ends by semicircular arcs. As each guide reaches the end of a straight run, it is transferred around the arc to the beginning of the other straight run, the two positions being substantially opposite each other so that the wires forming the edge strand are laid parallel to the length of the fabric and lie straight, thus producing a non-stretching edge. This edge is composed of the fabric wires and forms a selvage without the use of an additional selvage wire.

The welding electrodes, feed device, take-up rolls, and fabric roll are mounted beyond the guides in the order stated. The welding electrodes are operated seriatim and preferably with slight overlap in their periods of operation, thus limiting the demand for current, promoting economy in operation, and eliminating arcing and burning of the wires by maintaining the welding circuit closed while making a complete row of welds.

Various objects and advantages of the invention will appear in the following specification which is to be taken in connection with the accompanying drawings wherein:

Fig. 1 is a plan view of the machine;

Fig. 2 is an enlarged sectional view of a portion of the machine taken on the line 2—2 of Fig. 1;

Fig. 3 is a detail sectional view of the mechanism for holding the clutch-operating-bar in its inoperative position;

Fig. 4 is a view, in perspective, of a portion of the right hand side of the machine as viewed from the front;

Fig. 5 is a diagrammatic view of the electric welding circuit;

Fig. 6 is a view in perspective of that part of the machine shown in Fig. 4, viewed from the rear with the welding roll removed to expose certain of the parts to view;

Fig. 7 is a view in elevation of the mechanism shown in Fig. 6, looking from the rear with the roll in place. A portion of the wire-carrier elements and related parts are shown.

Fig 8 is a view, in perspective, of the mechanism at the opposite end of the roll from that shown in Fig. 7, and viewed from the rear;

Fig. 9 is a plan view of the clutch and its operating mechanism, and includes also a portion of the drum carrying the wire supply spools and the mechanism for operating it;

Fig. 10 is an enlarged fragmentary section on the line 10—10 of Fig. 9;

Fig. 11 is a section on the line 11—11 of Fig. 10;

Fig. 12 is a rear elevation (partly broken away) showing the trackway and the wire-carrier-elements which move upon it, part of the mechanism for shifting the carrier elements intermittently being indicated in dotted lines;

Fig. 13 is a similar view, on a reduced scale, of the trackway and its supporting means, the wire-carrier-elements being omitted;

Fig. 14 is a view, in perspective, of an end of the trackway and associated mech-

anism, viewed from the front of the machine;

Fig. 15 is a perspective view of one of the wire-carrier-elements; and

Fig. 16 is a plan view (partly broken away) of a strip of the finished fabric.

In the following description, the portion of the machine from which the finished fabric is drawn is designated the front of the machine, and the end at which the wires are introduced as the rear of the machine.

Referring to Fig. 1 of the drawings, the mechanism is mounted upon a rectangular frame consisting of two side members 21, 22 connected at the rear end of the machine by cross members 23, 24 and at the front end of the machine by cross members 25, 26, the frame being carried upon legs 20. The side frames 21, 22 project beyond the front frame member 26 at 27 and are provided at their extremities with bearings in which is mounted a roll upon which the finished fabric is wound.

At the rear of the machine, and mounted upon the rear frame members 23, 24 by means of a shaft 29 journaled in bearings 31, 32 is a rotatable drum 33. This drum is made up of a supporting disk 34 and a plurality of parallel spaced blocks 35 between which the wire-supplying spools are mounted. The blocks 35 are grooved near each end to receive the pintles 36. These support wire spools 37, which are locked in position by thumb latches 38 (see Fig. 11). The drum in the machine illustrated carries sixty-eight wire spools, thirty-four on either side of the disk, but the number is dependent on the number of wires in the fabric to be produced, and is, of course, subject to variation. The drum is provided about its entire circumference with equally spaced teeth 39, corresponding in number to the number of wire spools carried by the drum. These teeth are part of a feed mechanism by which the drum is rotated intermittently.

Mounted upon brackets 41 which are fixed to the cross frame member 26, is an endless track 42 (see Figs. 12 and 13) which supports the wire guiding mechanism. This track may be modified considerably in form, the essential thing being that it define a closed path about which the wire-carrier-elements travel. Preferably, it consists of upper and lower straight arms connected at their ends by semi-circular sections, and is T-shaped in cross section, as shown.

Mounted on the track is a series of wire-carrier-elements or blocks 43 which, as best shown in Figs. 14 and 15, are V-shaped in cross section and provided with four upstanding lugs 44. These lugs straddle the head of the track rail and have inward extensions which engage behind the head of the rail and retain the block in place. Blocks 43 are formed with reduced shoulders 45 and a beveled surface 46 on one side for cooperation with ratchet bars later to be described. These form in effect ratchet teeth by which the blocks are fed intermittently.

At 47 each block is provided with a longitudinally extending guideway through which is threaded one of the wires to be welded. Interposed between successive carrier blocks are spacer blocks 48, mounted on the track in a manner identical with that of the carrier blocks. These alternating carrier blocks and spacer blocks form two series, which move on the upper and lower runs of the track intermittently in opposite directions. During each motion step the leading block of each series is moved around one curved end of the track to position, as the end block of the other series is moved around the other end. For example, during the next step the carrier block at the right hand end of Fig. 14 will be moved down to replace the spacer block 48 in the lower run.

The mechanism for imparting intermittent motion to the two series of blocks comprises two longitudinally reciprocable ratchet bars 177 and 178 (Figs. 12 and 13) oscillated simultaneously in reverse directions by means hereinafter described, and spring urged pawls 182, 183, 184, and 185 mounted on the track 42. The pawls directly engage the last two blocks 43 and 48 of each series to prevent retrograde movement, and the bars are provided with ratchet teeth which in one direction of motion engage and drive the shoulders 45 on the blocks 43 and in the other direction ride over the beveled surfaces 46. The upper bar 177 is supported on shoulders 45, but is free to rise in the guides 179 and is lowered by gravity. The lower bar is free in its guides 180 and is urged upwardly by springs 181 (see Fig. 14).

The mechanism for transferring blocks from one series to the other is substantially duplicated at the two ends of the track 42. It includes a dog 49 (Figs. 12 and 14) to engage the leading block, the dog being pivoted on an offset crank 50 to swing in an arc substantially concentric with the corresponding curved end of track 42. Crank 50 is fast on shaft 51, the shaft being journaled in bearing bracket 52 supported on track 42. Fast on shaft 51 is a pinion 53 which meshes with a rack bar 54, the bar being loosely guided and held in mesh with pinion 53 by guide 55 braced at 56 to frame member 25.

As stated, there are two mechanisms as described in the preceding paragraph, and they are so arranged that when the racks 54 move in reverse directions, the cranks 50 move in the same angular direction. To actuate the racks simultaneously in reverse

directions, there is a rock lever 57 pivotally supported at its middle at 58, and pivoted at 59 to the two rack bars. The angular motion of lever 57 is slight and by the use of free filling guides 55 and rather free meshing with the pinion it becomes feasible to use straight racks as shown.

Connected to side members 21 and 22 are two spaced upstanding frame members 60 which support the welding mechanism. This mechanism includes an electrode carrier which is shiftable transversely of the machine to position the electrodes, to conform to the staggered relation of each successive transverse row of welds in the fabric. This carrier appears at 62 and is guided in openings 61 formed through the frame members 60. At the right hand side of the machine the carrier has two upstanding spaced rollers 63 and 64 (Fig. 7) which straddle a cam, later to be described, and with the cam serve as means to shift the electrode carrier back and forth in timed relation.

The carrier 62 (Fig. 6) has a longitudinal slot 65 which positions the hinge lug of the electrode units, and from this slot extend recesses 66 which provide clearance for the movements of the respective electrode units. On the lower side of the carrier 62 is a longitudinal guide strip 67 which directs the finished mesh into engagement with feed fingers later to be described.

Electrode carrier 62 supports a series of welding electrode arms 68, all being identical in structure. Each arm is hollow and is mounted to swing in a vertical plane on a pintle 69 which is received in the longitudinal groove 65 and held in place by cleats 71. These welding elements are each normally held in their upward positions by springs 72. They are each provided with a curved upstanding metallic spring arm 73 to which downward force is applied to urge the electrode in a work-engaging (downward) direction.

In order to prevent overheating of the electrodes 68, a horizontally disposed pipe or tube 169 may be connected with the interior of each of the hollow electrodes 68 through the medium of flexible hose 171. Pipe 169 is connected by any suitable means, such as a flexible hose 172 (Fig. 1), with a source of water and at its opposite end has a discharge connection 173.

Carried by frame members 60 and disposed directly beneath and in line with the ends of electrodes 68 is a tubular electrode bar 74. By means of a suitable connection 70, water may be circulated through this bar for cooling purposes.

Mounted in bearings 75 on frame member 60 is a roll 76 carrying contact cams which actuate the electrodes 68. At the left end of this roll as viewed from the front of the machine is a cam ring 77. At the same end, roll 76 also carries a slip ring 78 upon which bears a brush 79 secured to the member 60. At its other end, roll 76 carries a second cam ring 81.

Running around roll 76 is a progressive spiral and inset into the roll is a bus bar 82 in the form of a conducting strip of metal, such as copper. This carries, in spaced relation to each other, a plurality of contactor bosses 83, one for each electrode 68. These contactor bosses also serve as cams to force the electrodes toward the work and consequently are confined between inclined insulating blocks 84, which serve to guide the springs 73 on and off the bosses 83. During the welding operation each block 84 on the approach side of the associated boss 83 strikes spring 73 to depress the electrode into contact with the wire before the welding circuit is completed. After the joint is welded and as the boss 83 leaves the spring 73, the block 84 rides over the spring and holds the electrode down against the welded joint long enough to allow it to cool, before the electrode pressure is removed. The roll 76 also carries a cam 85.

Mounted on frame member 26 in bearings 86 is a shaft 87 carrying arms 88, 89, 91. Pivotally carried by arms 88 and 89 is a feed bar 92 provided with a series of feed fingers 93. This bar is moved so that the fingers are brought into and out of the path of travel of the wire fabric, its function being to advance the fabric from the welding bar toward a pair of take-up rolls. As shown, a number of the finger elements at the ends of the bar are double in form, that is, a second finger is provided immediately ahead of the other for the purpose of engaging the fabric, if for any reason the first should fail.

A shaft 96 is journaled in brackets 95 on frame member 22, and fixed to this shaft is a radially extending pin 97. Also fixed to shaft 96 is an arm 98 which is connected by a link 99 to a depending arm 101 on rock liver 57. The arm 101 is braced at 102, 103 to lever 57.

At its forward end shaft 96 carries fixed upon it a hub 174 having oppositely extending crank arms 175. Connected to these arms by links 176 are the two ratchet bars 177, 178 already described.

Pivotally mounted upon a bracket 104 on frame member 22 is an arm 105, one end of which carries a roller 106 which is adapted to ride upon the cam ring 77 carried by roll 76. The other end is slotted at 107 and receives the free end of radial pin 97 which is carried by shaft 96. A tension spring 108 one end of which is attached to arm 105, the other end of which is fast to the frame member 22 (see Fig. 8) exerts a downward pull upon this end of the arm 105 and there-

by moves the roller 106 into engagement with cam ring 77. A forked member 109 is secured to frame member 22 and straddles the slotted end of arm 105 to guide it in its pivotal movement. The cam ring 77 has a low spot which allows the roller 106 to move upward after the last electrode of the series has been actuated and freed. The effect is to lower the arm 105 and by rotating shaft 96 return the actuating ratchet bars 177, 178 to operative position without moving blocks 43 and 48, these being held by pawls 182, 183, 184, and 185.

On the opposite side of the machine and secured to frame member 21, is a bracket 111 to which are pivotally secured two rocker arms 112, 113 having tension springs 114 secured near their lower ends. These springs are also secured to the frame of the machine, as shown in Fig. 1, and exert a constant pull upon the rocker arms to hold their upper ends in contact with the cam ring 81.

Adjustably secured to the lower end of rocker arm 112 is a forwardly extending arm 100 whose end is in engagement with a ratchet wheel 110 carried on shaft 115. Shaft 115 is mounted in brackets 116, 116′ on the cross frame member 26. The end of arm 100 is held in engagement with the ratchet by means of leaf spring 117 mounted on a portion of the machine frame, as shown.

A pawl 118 serves to prevent reverse rotation of ratchet wheel 110. Shaft 115 carries a take-up roll 119 which may be of rubber or any other suitable friction material, and through gears 121 and 122 is in driving engagement with a second and similar take-up roll 123 mounted immediately above the roll 119. Bearing brackets 116′ support both rolls. In order to prevent undesirable rotative movement of rolls 119, 123, each bearing member 116′ is provided at 124 with a braking mechanism which consists of a pin 125 which is pressed against the shaft 126 of roll 123. The pressure exerted by this pin upon shaft 126 may be adjusted by turning the screw 127. See Fig. 4 of the drawings.

Adjustably secured to the lower end of rocker arm 113 at 128 is an arm 129 which at its other end is pivotally secured to the arm 91 carried by shaft 87. As will be recalled, the shaft 87 actuates the feed bar 92.

The spindle 131 of the welding roll 76 extends beyond its bearing 75 and has keyed or otherwise fixed on it a pinion 132. This pinion is in driving engagement with a gear 133 twice its size, said gear being carried on stub shaft 134 journaled in bearing 75. Disposed on either side of the gear 133 are the rollers 63 and 64. Gear 133 is provided on both sides with arcuate cams 135, 136, each one of which extends a little less than one-half the circumference of the gear, as best seen in Figs. 4 and 7, and the gap between these may be seen in Fig. 1. These cams 135, 136 alternately shift the electrode carrier 62 back and forth, the shift occurring when roll 76 has actuated and freed the last electrode of the series. The electrode carrier thus occupies its alternate extreme positions during successive rotations of the roll 76.

Mounted on frame member 22 are two brackets 137 and 138 which carry at their outer ends a drive shaft 139. Swiveled at the rear end of shaft 139 is a pulley 141 which is driven by any suitable source of power. At its front end shaft 139 carries a bevel gear 142 which meshes with a second bevel gear 143 carried on the shaft 131 of the welding roll. A movable clutch element 145 is splined on shaft 139, and has the usual shifting collars. Slidably disposed in guide members 146, carried by brackets 147 on frame member 22, is a clutch actuating rod 148 connected to clutch element 145. At its forward end clutch rod 148 is provided with a downwardly extending finger 149 disposed immediately above shaft 131 which there carries a collar 151 having a tripping lug 152. The finger 149 of rod 148 is held out of the path of travel of the shoulder 152 by a wedge 150 inserted beneath the clutch rod (see Fig. 3). Withdrawal of the wedge causes the clutch to be disengaged, as will be apparent from an inspection of Fig. 9, the clutch normally being biased to engaging position.

Carried at the forward ends of the side frame extensions 27 are two open bearings 153 which receive the spindles 154 of a roll 155 upon which the finished fabric is wound. The spindle 154 also carries a pulley 156 which is driven from the welding roll spindle 131 by a slipping belt 157.

Reference character 158 designates the arm of a belt tightener of usual form, and the arm is pivotally connected at 161 to an extension 144 on bearing 75, and carrying at its opposite end a loose pulley 162 which rides on belt 157.

As shown in Figs. 6 and 7, 163 is an L-shaped lever pivotally mounted at 164 on bracket 165 carried by frame member 26. A tension spring 166 is attached to the forward end of the horizontal leg 160 of this lever and acts to draw this end downward, rocking said lever at its fulcrum 164. The spring holds the vertical leg 167 in engagement with the cam ring 85 on roll 76. The forward end of leg 160 of lever 163 is disposed beneath and engages with a projecting pin 168 which is secured to feed bar 92. This holds the feed bar in its upward normal position. When arm 163 strikes the low point of cam 85, the pin drops while the

feed bar is moving to take a fresh grip on the mesh.

As the wires are moved along the track by the wire carrier blocks 43, it is necessary that the wire spool carrying drum be likewise rotated a short distance in order that each carrier block and the wire spool from which it receives its supply of wire may be kept substantially in line with one another. This is accomplished by an arm 186 pivotally mounted in a bracket 187 secured to the side frame member 22. At one end it carries a spring-pressed dog 188 which engages the teeth 39 of the spool drum, and the other end is adapted to be engaged and depressed by a cam 189 (Fig. 2) formed upon a sleeve 190 fixed upon spindle 131 of the welding roll. Upon each cyclic operation of the machine, therefore, the arm 186 will be rocked, giving the drum a rotative movement equal to the distance between the teeth carried thereby.

Fig. 5 illustrates in diagrammatic form the electrical circuit. Current flowing through switch 191 from a suitable source passes from this source through wire 192, adjustable resistance 193, and wire 194 to the welding bar 74. From bar 74 it passes through the joint to be welded, welding element 68, contact spring 73, contactor finger 83, bus bar 82, slip ring 78, brush 79, and wire 195 back to the source. This circuit is completed whenever roll 76 brings one of the contacts 83 into engagement with an associated spring 73, thereby depressing welding element 68 and completing a circuit through the wires which rest in overlapping relation on bar 74. This circuit is maintained as roll 76 rotates because contact fingers 83 overlap sufficiently to prevent the circuit from being opened when the circuit is shifted from one joint to another.

The operation of the machine is as follows: As shown in the drawings all parts are at rest and in the position they assume at the beginning of a cyclic movement of the machine. At the outset, it will be assumed that a section of fabric has been completed, and the machine then brought to rest with the parts in the positions shown in the drawings. A narrow strip of the completed fabric is shown in Fig. 1 for purposes of illustration.

Upon movement of the clutch element 145 into engagement with the pulley wheel 141 by insertion of wedge 150 under rod 148, driving connection is established between the power source and the shaft 139. This imparts rotative motion in the direction indicated by the arrow, to the welding roll 76 which effects the following results.

At the beginning of the operation of the machine, the roller 106 carried by the arm 105 is in contact with the low point of its cam ring 77. Upon rotation of the welding roll, roller 106 rides upon cam ring 77 which depresses this end of arm 105 and raises its other end, thus moving the pin 97 upwardly (see Fig. 2) and rotating the shaft 96 to actuate the spacer and carrier blocks on the horizontal runs of the track 42. Arm 98 is likewise moved upwardly and, acting through link 99, moves the rock lever 57 about its fulcrum 58 in the direction indicated by arrows in Fig. 8 to cause the transfer of a carrier block from each run of the track 42 to the other.

The details of the operation will be evident from an insepection of Figs. 12 and 14. Pinion 53 which is engaged by the rack bar 54 carried by rock lever 57 will be rotated in a counterclockwise direction. Arm 50 which is fixed relative to pinion 53 and carries the dog 49 will likewise be rotated. The dog 49 being in engagement with wire-carrier-block 43 will move this element around the curved portion of the track into the lower horizontal run thereof, and past the spring-pressed latch member 182 which prevents any movement of the elements 43 in a reverse direction. A second and similar latch member 183 is provided which acts in conjunction with latch 182 and to the same end.

Lever 57 is provided at its other end (the right hand end as seen in Fig. 12) with a second rack bar similar to rack bar 54 and indicated by the numeral 54′ which coacts with pinion 53′ to move the arm 51′ in a counterclockwise direction. Similarly arm 51′ carries a dog 49′ which engages a wire-carrier-block 43 and moves it from the lower horizontal run of the track onto the upper horizontal run, where it is locked against any reverse movement by latches 184, 185. This movement takes place simultaneously with that described in the preceding paragraph.

The rotation of shaft 96, acting through hub 174 and links 176, moves the ratchet bar 177 to the left, as viewed in Figs. 12 and 13, and ratchet bar 178 is moved to the right. These bars being in engagement with the wire-carrier-blocks 43, as shown in Figs. 12 and 14, move the entire series of carrier blocks, except the two which are moved by the dogs 49, 49′, along the track a distance equal to the width of one of the blocks.

It is, of course, to be understood that the spacer elements 48 move with the carrier blocks 43 and are in turn engaged by the dogs 49 and 49′ and moved in the same manner when they reach the end of a horizontal run.

The foregoing is merely illustrative of one form of apparatus which has been found satisfactory in bringing about the desired result and that other means may be employed should be understood, the essential feature being the provision of a series of wire-car-

rier-elements adapted to be moved intermittently about a closed path.

As the wire strands being welded into the fabric all pass over the welding bar 74, as shown in Fig. 14, and as there is one series of wires moving in a direction opposite to that of the other series, obviously these two series of wires will be crossed, their crossing points occurring where they pass over the welding bar. Alternate blocks only, being wire-carrier-blocks, and as these blocks are only shifted a distance equal to the width of one block, the points at which the wires cross will shift back and forth longitudinally of the welding bar a distance equal to the width of one of the blocks.

In consequence of the shifting of the crossing points of the wires, the carrier board 62 which carries the welding electrodes 68 must also be shifted simultaneously and in the same lateral direction of the machine in order to obtain registry of the electrodes 68 with the joints of the fabric.

The apparatus for accomplishing this may be understood by referring to Figs. 4 and 7. Upon the beginning of rotation of the welding roll 76, gear 133 will be rotated by pinion 132. The arcuate cam 136 will engage the roller 64 and thereby move the carrier board 62 toward the right as viewed in Fig. 7 (left as viewed in Fig. 4) a distance equal to the width of the cam which is equal to that of a wire-carrier block. This brings the welding electrodes 68 over the crossing points of the wires in their shifted positions.

The actuation of the wire-carrier blocks 43 and the shifting of the carrier board 62 occur simultaneously, and at the same time the following operation occurs.

The upper ends of arms 112 and 113 are engaged by the cam ring 81, thereby rocking these members about their fulcrums. Arm 100 carried by arm 112 rotates the ratchet wheel 110 and thereby revolves the take-up rolls 119 and 123 between which the fabric passes and which act to prevent the fabric from becoming warped, maintaining it in a flat condition. Pawl 118 prevents the wheel from backward movement.

Arm 113 acting through link 129 rocks the arm 91 to rotate shaft 87. This rocks the arms carrying the feed bar 92 away from the welding bar.

In order that the fingers 93 carried by the bar 92 may be engaged in the wire fabric, the arm 163 is provided and is actuated by the cam 85 on welding roll 76. The arm 163 is thereby rocked about its fulcrum 164. The finger or pin 168 carried by the feed bar 92 and extending beyond it rests upon the horizontal portion of arm 163, thus supporting this edge of the bar 92. It will, therefore, be seen that upon this portion of arm 163 being raised, the edge of the bar 92 which carries the fabric engaging fingers 93 will be raised to bring these fingers into engagement with the fabric as it comes from the welding electrodes. This occurs at the beginning of the rocking movement of the arms 88, 89, and 91; consequently the fabric is drawn along by these fingers on the feed bar toward the front of the machine. To further insure that the fabric will be properly engaged by the fingers 93, it is deflected downwardly by the strip 67 carried by the board 62, as shown in Fig. 2.

Spool 155 is not normally rotated, the belt 157 merely slipping upon pulley 156. Upon the fabric being fed forwardly, however, slack occurs between the take-up rolls 119 and 123 and the spool 155, at which time the driving friction between the belt 157 and pulley 156 is sufficient to rotate the spool and take up this slack.

All parts of the machine are now in position for the welding operation. As the welding roll continues to rotate, the inclined blocks 84 successively engage the spring arms 73 on welding electrodes 68, thereby depressing these electrodes into contact with the fabric wires at their crossing points on the welding bar 74.

The spring arms 73 pass one at a time onto the contactor bosses 83, there being a slight overlap of the time when one is passing onto, and the preceding one is passing off its contactor boss, so as to maintain a closed welding circuit and prevent sparking and possible burning of the wires at these points. Upon being released, the welding electrodes are raised from the welding bar and returned to their normal position by the springs 72.

It may be here stated that the contactor bosses 83 extend far enough longitudinally of the roll to be in a position to contact with the welding electrodes in either of the two positions they may occupy, as a result of the carrier 62 being shifted laterally of the machine. In other words, each boss is of slightly greater length than the distance through which the carrier is shifted.

Upon further rotation of the welding roll, the arms 112, 113, and 163, and the arm 105, all engage the low points of their respective cams and are thereby rocked upon their fulcrums and, with the exception of the shifting of the carrier 62 which does not occur until the beginning of the next cyclic movement, all of the working parts, the operations of which have just been traced, are returned to the positions they occupied at the beginning of these operations. The rock lever 57 acting through the racks and pinions 53, 54, and 53′, 54′, and arms 51, 51′ returns the dogs to their respective positions where they engage another wire-carrier block or spacer block. Arm 163 is rocked by the pull of tension

spring 166, thus allowing the rear edge of the feed bar 92 to drop and disengage the fingers 93 from the fabric. At the same time, and as arms 112, 113 are rocked, arm 100 and link 129 are drawn backwardly, arm 100 engaging ratchet 110 at a new point, and link 129 rocking shaft 87 with its arms 88, 89, 91, and the feed bar 92 back into a position to engage the fabric upon being raised as in the manner described. This completes a single cyclic operation of the machine.

When it is desired to stop the machine, it is necessary only to withdraw the member 150 from beneath the clutch bar 148 which lowers the hooked end of this bar into position to be engaged by the shoulder 152 on sleeve 151. Upon engagement with the hooked end of rod 148, shoulder 152 will pull it forward and disengage the clutch mechanism, thus stopping the machine.

Operation of the machine results in the production of a strip of fabric, having the form shown in Fig. 16. This fabric comprises two sets of diagonally related wires 196 and 197 disposed in parallel planes and welded together at each of their crossing points 198. In this fabric no selvage wires are needed because each wire in passing from one plane to the other is drawn tight and being welded at all crossing points forms a substantially straight inextensible edge.

By reference to Fig. 16, it will be seen that each wire 196 crosses over at the edge of the fabric and becomes wire 197 in the other plane of the fabric. These cross connections at the ends, made up of portions of the diagonal strands, are each welded at their two extremities 200, and cooperate to form a non-stretching edge.

The foregoing description is to be taken as being illustrative of a preferred form of the machine, and one which has been found highly satisfactory in operation. However, it is to be understood that changes may be made as found desirable, and as fall within the scope of the claims without departing from the spirit and scope of my invention.

What is claimed is:

1. In a wire fabric welding machine, the combination with wire supplying means, of a plurality of wire carrier elements; means for moving said elements intermittently about a closed path; a welding bar; a plurality of welding electrodes operatively associated with said bar and mounted in proximity to said wire carrier elements; means for shifting said electrodes laterally of the path of travel of the fabric wires; and means for successively moving said welding electrodes into welding relation with said fabric wires.

2. In a wire fabric machine, the combination with wire supplying means, of a plurality of wire carrying elements; means for moving said elements intermittently about a closed path; a carrier board having welding electrodes movably disposed thereon; means for shifting said board laterally of the path of travel of the fabric wires; and means for moving said welding electrodes into welding relation with said fabric wires.

3. A wire fabric machine comprising wire supplying means; a plurality of wire carrier elements; means for moving said elements intermittently about a closed path; a stationary welding bar; a plurality of movable electrodes disposed above said bar; means for shifting said movable electrodes laterally of the path of travel of the fabric wires; a rotatable welding roll; and means mounted on said roll for moving said movable electrodes into welding relation with the fabric wires on said stationary bar.

4. A wire fabric machine comprising a stationary welding bar; a plurality of wire carrier elements disposed adjacent said bar; means for supplying wires to said wire carrier elements and across said bar; a plurality of pivotally movable welding electrodes disposed above said welding bar; a welding roll rotatably mounted above said movable electrodes; and current conducting means carired by said roll for successively moving said movable electrodes into welding relation with the fabric wires.

5. In a wire fabric machine, a welding roll comprising a rotatable cylinder having a series of overlapping electric current conducting contacts mounted thereon and arranged in the form of a spiral extending completely around said roll.

6. A wire fabric machine comprising a stationary welding bar; a plurality of pivoted welding electrodes disposed above said bar; means for supplying diagonally disposed wires between said bar and said movable electrodes; means for successively bringing said movable electrodes into welding relation with said wires and said bar; means for shifting said movable electrodes laterally of the path of travel of the completed fabric; and means for drawing the fabric away from said electrodes upon the completion of each row of welds.

7. A wire fabric machine comprising a stationary welding bar; a plurality of wire carrier elements disposed in operative relation to said bar; means for moving said elements intermittently about a closed path; means for supplying wire to each of said elements and across said bar; movable electrodes operatively disposed above said welding bar and adapted to contact with crossed wires as they pass over the welding bar; a rotatable welding roll, including current conducting means for welding the crossed wires together, one joint at a time; and means for moving the completed fabric

away from the welding bar as each row of welds is completed.

8. A wire fabric machine comprising a stationary welding bar; a series of pivoted welding electrodes movably disposed above said bar; a rotatable welding roll mounted above said bar; a series of contacts mounted on said roll in the form of a spiral, said contacts being in overlapping relation and adapted to move said electrodes into welding relation with said welding bar; means for supplying diagonally disposed wires between said bar and the movable electrodes by an intermittent motion; means for shifting said movable electrodes laterally of the path of travel of the wires to maintain registry between the movable electrodes and the wire joints as the fabric is completed; and means for intermittently withdrawing the completed fabric from the welding bar.

9. A wire fabric making machine comprising a welding bar; a plurality of welding electrodes arranged to be moved into and out of contact with the welding bar; a welding roll having a series of spaced current conducting contacts mounted on its surface and adapted to force said electrodes successively into welding relation with said welding bar; a source of electric current connected to the welding bar and to the contacts on the roll; and means for supplying crossed wires between said welding bar and said electrodes.

10. A wire fabric machine comprising a welding bar; a series of welding electrodes movable toward and away from said bar; means for supplying crossed wires to welding position on said bar; means associated with said electrodes to move them successively and in overlapping relation into contact with the wire joints, said means comprising a single rotating element extending across the series of movable electrodes and adapted to contact successively therewith; and means for intermittently feeding the finished fabric forward.

11. A wire fabric machine comprising a welding bar; a plurality of welding electrodes movable toward and away from said bar; means for supplying diagonally related wires to said welding bar with the joints resting thereon; a welding roll having a series of electric contacts on its face; means for operating said roll to bring said electrodes against the joints and to weld one joint at a time, the welds being completed successively from one end of the welding bar to the other; means for feeding the fabric forward after the completion of each row of welds; and means for shifting the movable electrodes laterally of the fabric after each row of welds is completed.

12. In a wire fabric machine, a welding mechanism comprising a stationary electrode; a plurality of movable electrodes pivotally mounted above said stationary electrode; a welding roll having a row of current conducting contacts extending spirally therearound and arranged to bring the movable electrodes successively into welding relation with the stationary electrode, the contacts being so related that one movable electrode is always depressed during the welding operation; a source of current connected to the stationary electrode and to the contacts; and means for driving the welding roll.

13. In a wire fabric machine, a welding mechanism comprising a plurality of welding electrodes; means for supplying current to said electrodes; and a rotatable welding roll having a plurality of spirally arranged electrode-depressing and electric current conducting contacts on its surface, said contacts being in overlapping relation and arranged to contact with said electrodes in succession so as to maintain the welding circuit closed during a welding operation.

14. In a wire fabric machine, a supporting frame; a wire drum rotatably mounted in said frame; a plurality of wire carrying spools on said drum; welding mechanism including a rotatable welding roll also carried by said frame; means for driving said welding roll; and means controlled by rotation of said welding roll for intermittently rotating said drum.

15. In a wire fabric machine, a frame; a wire drum rotatably mounted in said frame; welding mechanism mounted on said frame in spaced relation to said drum; said mechanism including a welding roll having electric current conducting contacts on its outer surface; a pair of fabric take-up rolls mounted in front of said welding roll; means for driving said welding and take-up rolls; and means operatively associated with said driving mechanism for rotating said wire drum in timed relation with the rotation of the welding roll.

16. A wire fabric machine comprising a supporting frame; a rotatable welding roll mounted on said frame; an electrode carrier movable laterally of said frame; a stationary welding bar under said carrier; means for supplying diagonally crossed wires between the welding bar and electrodes; means on said welding roll for successively moving said electrodes into welding relation with the wires on said bar; means for driving said welding roll; and means controlled by rotation of said welding roll for shifting the electrode carrier in one direction or the other during each revolution of the roll.

17. A wire fabric machine comprising a frame; welding mechanism including a welding roll mounted on said frame; means for supplying crossed wire strands to said welding mechanism; means for rotating said

welding roll; a pair of take-up rolls; a feed bar carrying a plurality of feed fingers for engagement with the finished fabric to feed the same; and means controlled by the rotation of the welding roll for actuating said feed bar and said take-up rolls to withdraw the finished fabric from the welding mechanism and to hold it taut.

18. A wire fabric machine comprising a frame; welding mechanism including a welding roll mounted on said frame; means for supplying wire strands in crossed relation to said welding mechanism; a feed bar having fabric engaging fingers thereon; a pair of fabric take-up rolls; means for rotating the welding roll; and cam means driven by said welding roll for actuating said take-up rolls and said feed bar to withdraw the finished fabric from the welding mechanism.

19. A wire fabric machine comprising a frame; a wire drum rotatably mounted on said frame and carrying wire spools; welding mechanism including a welding roll mounted on said frame; means for receiving wire strands from said spools and supplying them in crossed diagonal relation to said welding mechanism, said means comprising an endless track mounted transversely on said frame, a plurality of wire carrier elements movable on said track, and ratchet mechanism actuated by movement of the welding roll for intermittently advancing said elements along said track.

20. In a wire fabric machine, a support; a wire drum rotatably mounted on said support; joint welding mechanism including a rotatable welding roll mounted transversely of said support; an endless track mounted between said drum and said roll; a plurality of spaced wire carrier elements movably mounted on said track; means for advancing said elements intermittently to bring the wires from said drum into diagonal relation as they enter the welding mechanism; and means actuated in timed relation with the rotation of said welding roll for withdrawing welded fabric from the welding mechanism.

21. In a wire fabric machine, a wire distributing device comprising an endless track made up of two straight portions and two arcuate portions; a plurality of alternately arranged wire carrier and spacer blocks movable on said track; means comprising movable rack bars for intermittently advancing said blocks along the straight portions of the track; a pair of rotatable dogs for transferring said blocks from one straight portion of the track to the other; and means for actuating said racks and dogs.

22. In a wire fabric machine, a wire drum; welding mechanism; and means for delivering diagonally related wires from said drum to said welding mechanism, said means including an endless track, wire carrier elements movably mounted on and in interengaging relation with said track, and means actuated in timed relation with the operation of the welding mechanism for moving said elements intermittently along said track.

23. In a wire fabric machine, a welding mechanism comprising a stationary electrode; a plurality of movable electrodes pivotally mounted above said stationary electrode; a rotatable welding roll carrying current conducting contacts adapted to move the movable electrodes into operative relation with the stationary electrode; a source of electric current connected to the stationary electrode and to the contacts on the welding roll; and means for rotating said roll.

24. In a wire fabric machine, a welding roll comprising a rotatable cylinder having a series of overlapping electric current conducting contacts mounted thereon, said contacts being arranged in the form of a spiral on the surface of said cylinder.

25. A wire fabric machine comprising a stationary welding bar; a series of pivoted welding electrodes movably disposed above said bar; a rotatable welding roll mounted above said bar; a series of contacts mounted on said roll in the form of a spiral, said contacts being in overlapping relation and adapted to move said electrodes into welding relation with said welding bar; means for supplying diagonally disposed wires between said bar and the movable electrodes by an intermittent motion; and means for shifting said movable electrodes laterally of the path of travel of the wires to maintain registry between the movable electrodes and the wire joints as the fabric is completed.

In testimony whereof I have signed my name to this specification.

CHARLES C. WICKWIRE.