Sept. 20, 1932. C. COSGROVE ET AL 1,878,760

METHOD OF AND APPARATUS FOR USE IN THE MANUFACTURE OF METALLIC MESHING, NETTING, AND LIKE FABRIC

Filed Dec. 13, 1928 4 Sheets-Sheet 1

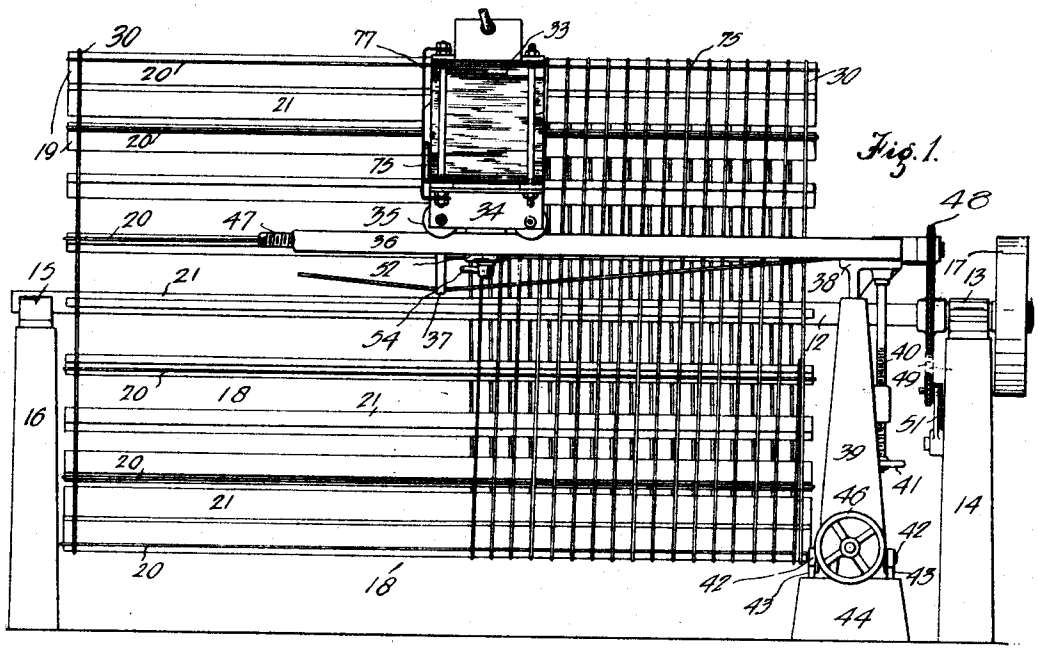


Fig. 1.

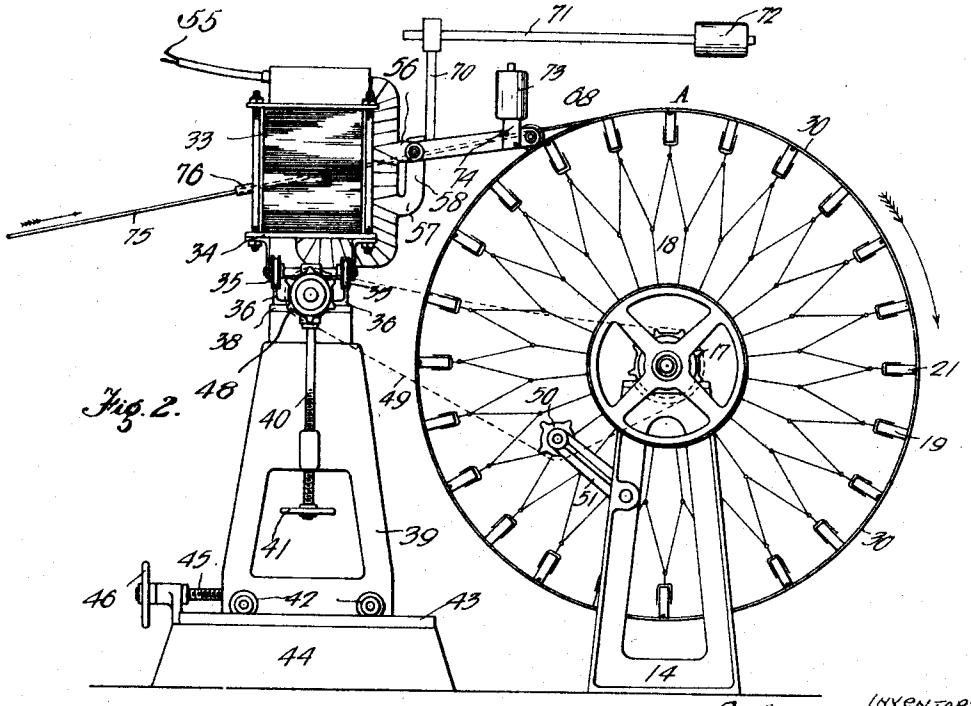


Fig. 2.

INVENTORS:
C. Cosgrove and
A. E. Chadwick
By: Marks & Clerk
Attys.

Sept. 20, 1932. C. COSGROVE ET AL 1,878,760

METHOD OF AND APPARATUS FOR USE IN THE MANUFACTURE OF METALLIC MESHING, NETTING, AND LIKE FABRIC

Filed Dec. 13, 1928 4 Sheets-Sheet 2

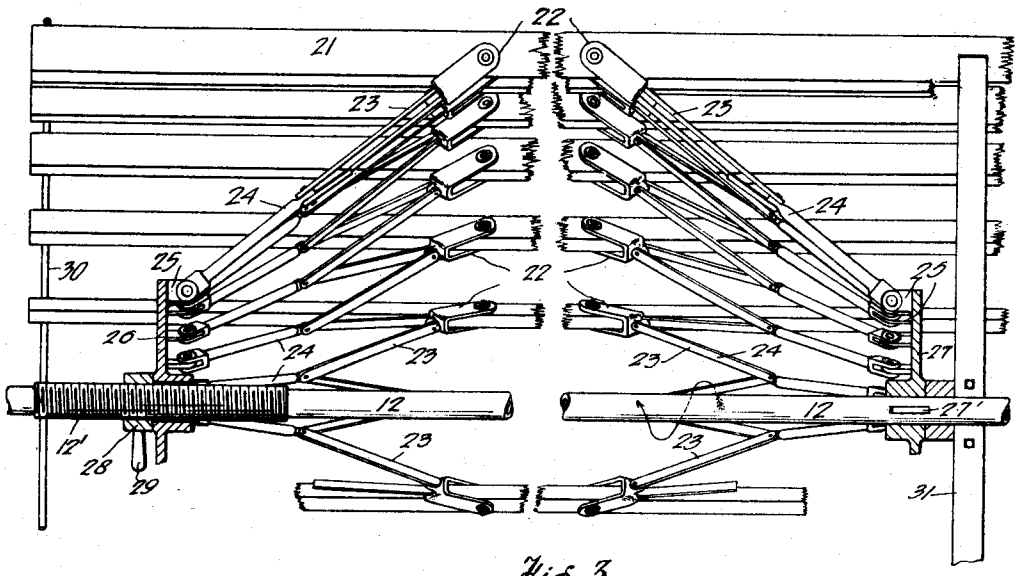


Fig. 3.

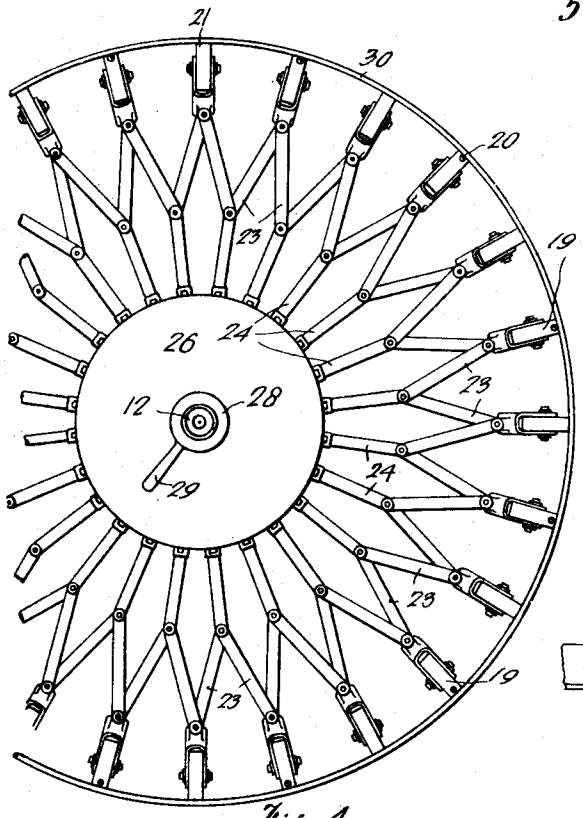


Fig. 4.

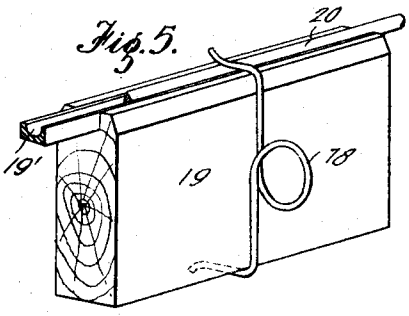


Fig. 5.

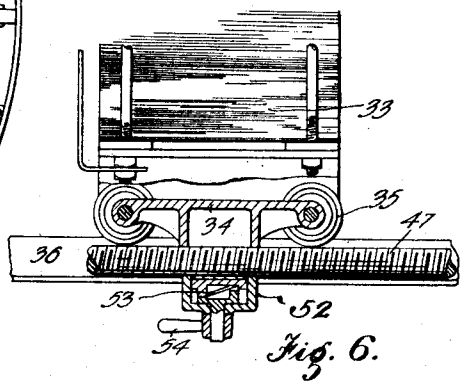


Fig. 6.

INVENTORS

C. Cosgrove &
A. E. Chadwick

By: Marlow Clerk
Attys

Sept. 20, 1932. C. COSGROVE ET AL 1,878,760

METHOD OF AND APPARATUS FOR USE IN THE MANUFACTURE OF METALLIC MESHING, NETTING, AND LIKE FABRIC

Filed Dec. 13, 1928 4 Sheets-Sheet 3

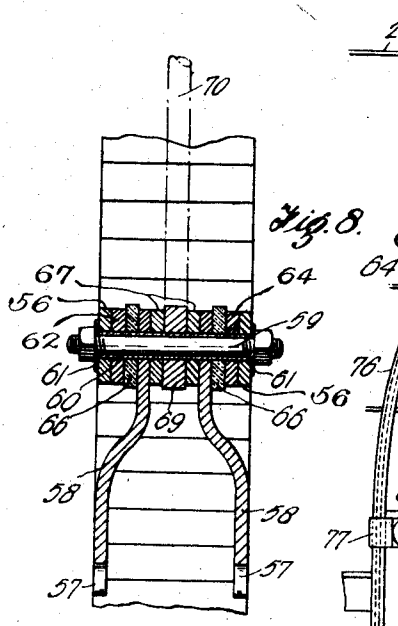


Fig. 8.

Fig. 7.

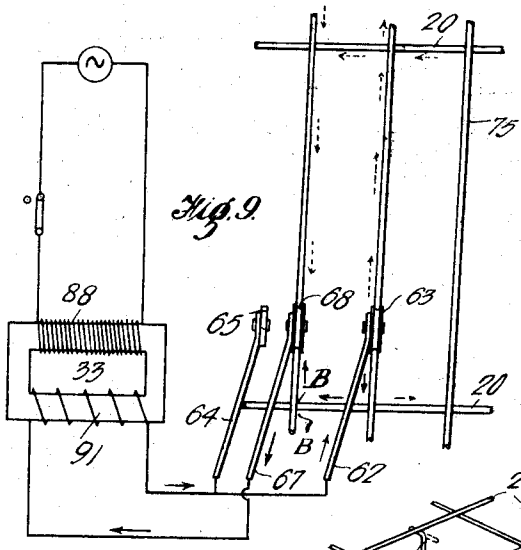


Fig. 9.

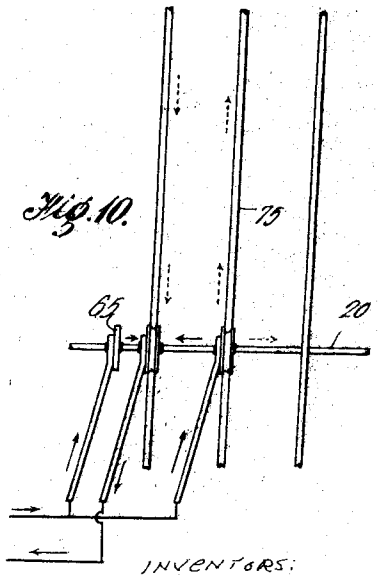


Fig. 10.

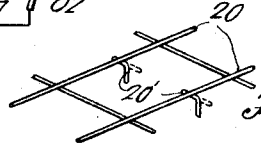


Fig. 15.

INVENTORS:
C. Cosgrove
A. E. Chadwick
By: Marks & Clark
Attys.

Sept. 20, 1932. C. COSGROVE ET AL 1,878,760

METHOD OF AND APPARATUS FOR USE IN THE MANUFACTURE OF METALLIC MESHING, NETTING, AND LIKE FABRIC

Filed Dec. 13, 1928 4 Sheets-Sheet 4

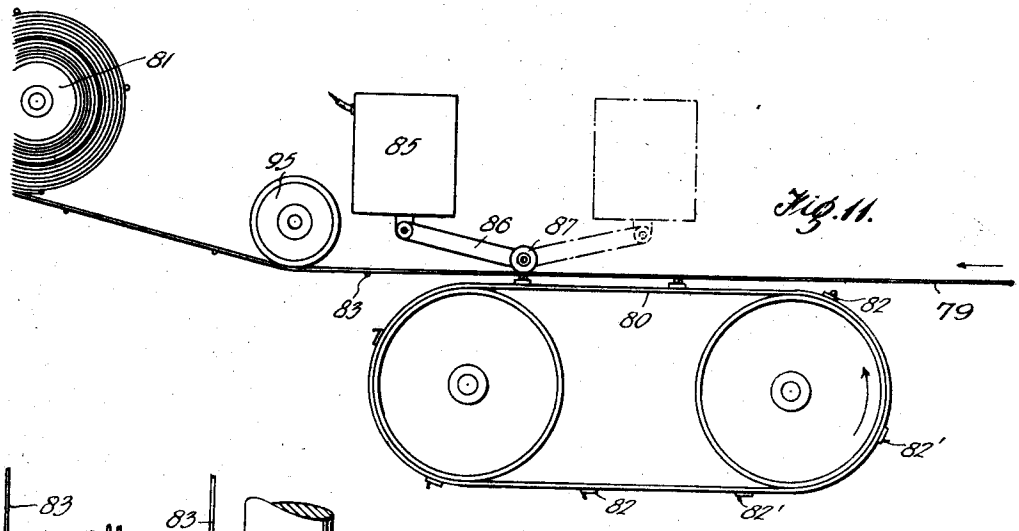


Fig. 11.

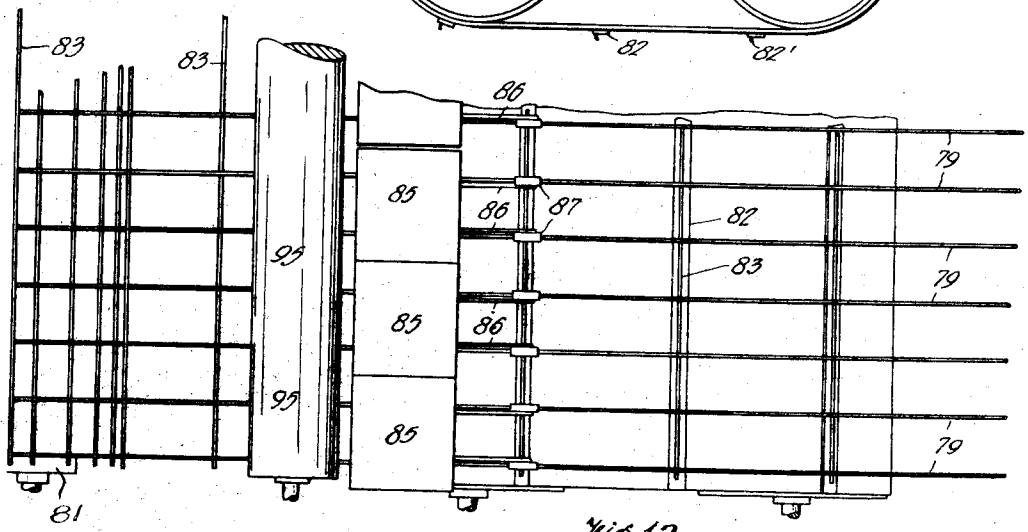


Fig. 12.

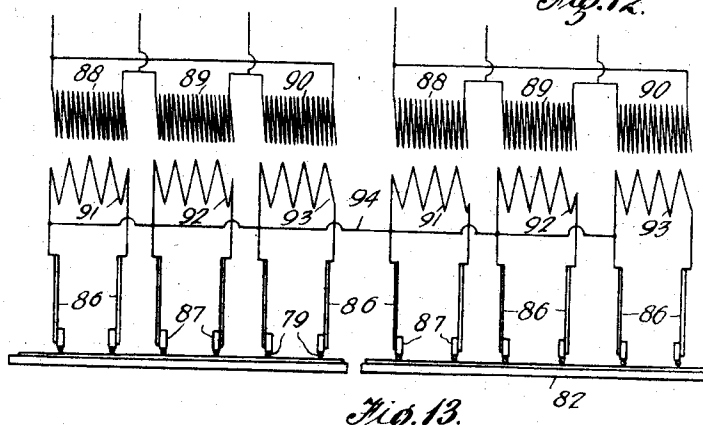


Fig. 13.

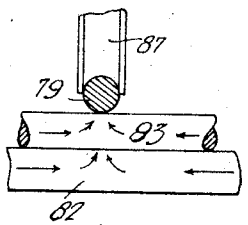


Fig. 14.

INVENTORS

C. Cosgrove &
A. E. Chadwick

By: Marks & Clark
Attys.

Patented Sept. 20, 1932 1,878,760

UNITED STATES PATENT OFFICE

CLAUDE COSGROVE, OF MIDDLE PARK, AND ALBERT EDWARD CHADWICK, OF NORFORD GROVE, KOOYONG, AUSTRALIA, ASSIGNORS TO HUME STEEL LIMITED, OF MELBOURNE, AUSTRALIA

METHOD OF AND APPARATUS FOR USE IN THE MANUFACTURE OF METALLIC MESHING, NETTING, AND LIKE FABRIC

Application filed December 13, 1928, Serial No. 325,765, and in Australia December 19, 1927.

This invention relates to an improved method of and apparatus for use in the manufacture of metallic meshing, netting and like fabric, and refers especially to metallic fabric consisting of a plurality of superposed rods, arranged in angularly disposed relationship and used for reinforcing concrete as in road building, pipe and like constructions, and in the construction of fences and for other purposes.

The invention is directed particularly to the provision of simple and efficient means for assembling longitudinal and transverse rods, so as to form tubular or flat lengths of fabric and for fusing or welding the rods, of the fabric at their points of contact or junction.

We accomplish the above-mentioned object by uniformly moving the junctions of angularly disposed rods in succession past one or more welding heads connected to convenient sources of electrical current.

The formation of tubular fabric or mesh reinforcements for pipes according to the present invention is accomplished by supporting a series of rods longitudinally on the periphery of a drum having means for effecting a continuous rotation of the same and in winding one or more rods, helically thereabout and progressively welding the convolutions of the helical coils to the longitudinal members by welding units, the electrodes of which are adapted to contact with the upper surfaces of the rods adapted to form the metal fabric.

The welding unit may embody three constantly energized electrodes, two of which are adapted to bear upon adjacent convolutions of the helically wound member, the remaining electrode being arranged to wipe or brush against each of the longitudinal members in turn as the drum revolves.

The formation of lengths of metal fabric or mesh for reinforcing concrete roads or pavements, or for fencing or like purposes according to the present invention is accomplished by winding parallel longitudinal members on a continuously revolving drum or otherwise continuously feeding the longitudinal members over a conveying member adapted to support spaced transverse members whereby they may be welded correctly on to the longitudinal members by a series of welding units of approved type.

The electrodes may be of any approved length and are provided with welding heads of approved construction, and means for forcing the same firmly against the rods adapted to form the fabric.

A salient feature of the invention resides in the provision of means for preheating the junctions of the rods, prior to the welding operation.

The method of operation embodied in the invention will be readily understood from the following description to be read in conjunction with the accompanying drawings, wherein:

Figure 1 is a view in elevation of an apparatus for manufacturing tubular metallic fabric in accordance with the present invention.

Figure 2 is a view in end elevation of the apparatus shown in Figure 1.

Figure 3 is a view in sectional elevation of portion of the collapsible drum forming part of the apparatus, and is drawn to a larger scale than the previous figures.

Figure 4 is a view in end elevation of the drum.

Figure 5 is a perspective view showing means for temporarily retaining the longitudinal rods on the drum.

Figure 6 is a view in elevation partly in section of portion of the transformer showing the traversing mechanism.

Figure 7 is a view in plan of portion of the mechanism shown in Figure 1 and is drawn to a larger scale.

Figure 8 is a view in sectional elevation taken on the line 8—8 of Figure 7.

Figures 9 and 10 are diagrammatic views showing stages in the welding operation.

Figure 11 is a view in side elevation showing diagrammatically an apparatus for forming lengths of metal mesh.

Figure 12 is a view in plan of portion of the apparatus shown in Figure 11.

Figure 13 is a view indicating diagrammatically the electrical connections for the welding heads in Figures 11 and 12.

Figure 14 is a fragmentary view illustrating a detail of the invention; and

Figure 15 is a perspective view of portion of the fabric showing supporting legs welded thereto.

In the various figures of the drawings, like reference characters are employed to designate the same or corresponding parts and the numeral 12 indicates a spindle rotatively supported at one end by a bearing 13 fitted to the upper end of a suitable standard 14. The opposite end of the spindle is mounted in a forked bearing 15 secured to a standard 16 resting on the foundation and capable of being removed when desired as hereinafter described.

A pulley 17 is fitted to the spindle 12 adjacent to the standard 14 and motion is transmitted thereto from any suitable source.

The spindle 12 supports a collapsible drum 18 comprising a plurality of longitudinally disposed battens 19 adapted to act as bearers to support the longitudinal rods 20 of the mesh and intermediately disposed battens 21. These battens 19 and 21 are somewhat longer than the tubular reinforcements to be formed thereon, and forks 22 are pivotally connected thereto on each side of the centre, as shown in Figure 3 of the drawings. These forks 22 are each connected by means of a pair of links 23 to inclined arms 24 pivoted to lugs 25 formed on discs 26 and 27 mounted on the shaft 12.

The disc 27 is retained in position on the shaft by means of a key 27′ or by other approved means, whilst the disc 26 can be adjusted therealong by means of a nut 28 engaging a screwed portion 12′ of the spindle. The nut 28 is provided with one or more grips 29 whereby it can be manually rotated to displace the plate 26 axially on the spindle 12.

It will be apparent that, when this plate 26 is moved towards the opposing plate 27, the links supporting the battens become inclined at a greater angle to the shaft, thus forcing the battens radially outwards; at the same time the links 23 maintain the said battens at equal intervals apart.

A guide ring 30 is placed over each end of the drum and the same serves to limit the radial displacement of the battens 19 and 21, thus ensuring the formation of accurately dimensioned tubular reinforcements as hereinafter described.

If preferred, any other approved construction of drum may be employed for supporting the longitudinal members 20 in lieu of that above-described.

Motion is imparted to the drum by means of the discs 26 and 27 and associated links, and, if desired, an auxiliary driving member, such as a driving arm 31 may be clamped rigidly to the shaft 12 and arranged to bear against any pair of opposed battens 19 or 21. The auxiliary driving member may, if desired, comprise a plurality of radially disposed arms corresponding in number to the battens forming the drum.

A step-down transformer 33 is mounted on a suitable frame 34 fitted with rollers 35 adapted to engage rails 36 consisting of oppositely disposed bars of angle cross section. These rails which are suitably reinforced as at 37 are supported at opposite ends by slides 38 mounted on adjustable standards 39.

The slides 38 are capable of vertical adjustment by means of adjusting screws 40 fitted with hand wheels 41 and the standards 39 are provided at the lower ends with flanged rollers 42 adapted to engage rails 43 fitted to foundation blocks 44.

Adjusting screws 45 fitted with hand wheels 46 are provided for effecting the displacement of the standards 39 and the transformer 33 carried thereby to and from the drum 18. It will thus be seen that the transformer is capable of both vertical and lateral adjustment to suit various sizes of tubular reinforcements. In an alternative construction, the contact members carried by the transformer may be arranged to bear on the drum at the point A thus obviating the need for lateral adjustment of the transformer.

A lead screw 47 is rotatively mounted in bearings formed on or fitted to the slides 38 and a sprocket 48 on one end thereof is connected by means of an endless chain 49 to a sprocket on the main spindle 12 of the apparatus.

A tension sprocket 50 is mounted on an adjustable arm 51 provided with a device (not shown) for permitting of the adjustment of the lead screw 47 in the manner above described.

The undercarriage of the transformer is provided with a casing 52 supporting an adjustable half nut 53 adapted to be placed into or out of engagement with the lead screw by means of a hand lever 54 so as to effect the longitudinal displacement of the transformer when desired.

Current is led to the primary of the transformer by means of conductors 55. One end of the secondary of the transformer is connected to two upper laterally projecting arms 56, whilst a pair of lower laterally projecting arms 57 provided with upwardly turned ends 58 are electrically associated with the opposite end of the secondary.

A laterally disposed bolt 59 passes through the upper ends of the members 58 and through the outer ends of the arms 56. This bolt 59 is provided with a bush 60 of insulating material and washers 61 of insulating material are arranged in contact with the arms 56 in order to insulate the bolt therefrom. An electrode 62 of suitable conducting metal is pivotally mounted on the bush 60 and is electrically connected to one of the arms 56, and the outer end thereof is fitted with a contact

member preferably in the form of a grooved disc 68 adapted to bear against one of the convolutions of the tubular reinforcement.

Likewise an electrode 64 pivotally mounted on the opposite end of the bush 60 is in electrical contact with the opposite arm 56 and its outer end carries a roller 65 adapted to successively engage the longitudinal members of the tubular reinforcement as subsequently described.

Insulation blocks 66 separate the electrodes 62 and 64 from the vertical conductors 58 between which is mounted a pair of electrodes 67 carrying at their outer end a welding head 68 constituting a grooved disc adapted to bear against the convolutions of the tubular reinforcement.

The electrodes 67 are spaced at their inner ends by means of a member 69 fitted rigidly thereto and provided with a vertical rod 70 having at its upper end a sleeve supporting a horizontal lever 71.

The outer end of this lever is fitted with an adjustable weight 72 by means of which a downward pressure is exerted on the welding head 68. Downward pressure is maintained on the contact members 63 and 65 by means of suitable weights 73 fitted to brackets 74 secured to the respective electrodes and adjacent to their outer ends.

A rod 75 which may be fed from a spool is adapted to be wound helically on the drum and is supported in correct position by means of a guide tube 76 secured to the transformer by means of clamps 77.

In operation the drum is adjusted to correct diameter by means of the link mechanism previously described after guide rings 30 of correct diameter have been placed on the opposite ends thereof to determine the size of the finished reinforcing and to prevent displacement of the parts of the apparatus when in operation.

The longitudinal rods 20 of the reinforcement are then placed in position in grooves 19′ formed in the battens 19 of the drum as clearly indicated in Figures 1, 4 and 5 of the drawings. These rods 20 are retained correctly in position at opposite ends by being passed underneath the guide rings 30 and the same are temporarily supported intermediate their ends by means of spring clips, such as 78 (see Figure 5). These spring clips are removed during the operation of the apparatus.

It will be understood that the intermediate battens 21 are provided in order to maintain the curvature of the reinforcement between the longitudinal members 20 thereof and that, if desired, each of the battens may be adapted to receive such longitudinal members.

The transformer 33 an electrodes carried thereby are then arrange at the starting end of the drum and the rod 75 is passed through the guide tube an temporarily secured to one of the battens 19 or 21.

The drum is then rotated in the direction shown by the arrow in Figure 2, thus causing the rod 75 to be wound thereon from a suitable spool; at the same time, movement imparted to the lead screw through the endless chain 49 causes a longitudinal displacement of the guide tube 76 and electrodes.

It will be apparent that the velocity of the lead screw determines the pitch of the convolutions of the reinforcement and, if desired, sprockets of various sizes may be employed for obtaining any desired pitch.

When one complete convolution is formed on the drum, the grooved contact member 62 and welding head 68 are placed on the adjacent convolutions as clearly shown in Figures 7, 9 and 10 of the drawings. These members 62 and 68 may, if desired, be rotatively mounted on their respective electrodes, but it is preferred to fix, the same rigidly thereto.

One advantage of mounting the welding head in this manner is that, as it passes over the surface of the members, it will remove any dirt, scale or like material therefrom. As previously explained, the contact members 63 and 65 are of the same polarity, whilst the welding head 68 disposed therebetween is of opposite polarity.

Whilst the welding head is disposed intermediate the longitudinal rods 20, the contact member 65 is inoperative, as clearly shown in Figure 9, as it does not make contact with any part of the reinforcement.

It will be seen from the arrows, however, that a current flows between the grooved contact member 63 and the welding head 68, and the current through the junction B to be welded becomes relatively great as the welding heads approach the respective longitudinal rod 20.

The dotted arrows in this and the following figure are intended to indicate the relatively small current which passes around the mesh in the opposite direction and which does not pass through the junction B. This action of the grooved welding heads causes the junction B, because of its resistance, to become preheated prior to the contact member 65 brushing the longitudinal 20 as indicated in Figure 10.

When this takes place, current flows from the respective electrode 64, through junction B to the welding head, thus serving to "boost" the current through the junction and complete the welding thereof.

The preheating of the junctions B permits of the drum rotating at a relatively higher speed as the said junctions may be raised to a welding temperature before actually registering with the welding head, thus considerably increasing the output of the plant.

It will be apparent that the size and shape of the contact members and the peripheral

speed of the drum determine the period of time during which the welding current is passing through the junctions.

If preferred, the battens 19 may be provided with grooved metallic strips 19′ preferably of copper, adapted to accommodate the longitudinal rods 20, in order to provide a path of low resistance for the current, and, at the same time, ensure the welding current passing substantially vertically through the junction B.

It will be understood that the weights previously described serve to maintain a predetermined pressure between the welding head and the junction B to ensure a satisfactory weld.

When the transformer and electrodes thereon reach the opposite end of the drum—that is, after every junction of the longitudinals with the helical member 75 has been welded, the rod 75 is cut off and the electrodes lifted clear of the reinforcement.

The standard 16 and forked bearing thereon are then removed and, after the drum has been collapsed and the guide rings 30 have been removed therefrom, the tubular reinforcement is removed axially from the drum.

In order to facilitate the removal of the reinforcement, the end of the shaft 12 is preferably adapted to be fitted with a suitable extension by means of which the weight is supported when the standard 16 is removed.

In one construction, switching means may be provided for connecting each of the copper strips 19′ successively to a source of electrical potential whilst a welding head carried by a traversing carriage and bearing on the helical wire 75 may be arranged to complete the circuit as it is progressively disposed over each junction of the mesh.

It will be obvious that two or more rods may be simultaneously wound helically around the drum in which case a corresponding number of welding units may be employed to successively weld them to the longitudinals as hereinbefore described.

It will be understood that the electrode 65 may be dispensed with if the current passing through the junction between electrodes 62 and 67 is sufficiently large at the welding position, the duration of the welding operation being increased if necessary by reducing the speed of the drum.

Figures 11 and 12 of the drawings illustrate apparatus for manufacturing lengths of metal fabric. In this construction longitudinal rods 79 are drawn from separate spools (not shown) across the upper face of an endless conveyor 80 by means of a drum 81. The endless conveyor 80 is provided with a plurality of transverse metal strips 82 preferably of copper which are grooved to accommodate transverse rods 83 adapted to be placed thereon either mechanically or by hand at the feed end thereof. These copper strips are fitted with clips 82′ to retain the transverse rods in correct position. A plurality of transformers 85 is mounted above the conveyor by means not shown in the drawings, and the same are provided with electrodes 86 fitted at their outer ends with grooved contact members 87 adapted to engage the longitudinal rods 79.

Any approved means may be employed for maintaining the necessary pressure between the contact members 87 and the rods adapted to form the metal fabric.

In the construction shown in the drawings, three-phase transformers are employed as diagrammatically illustrated in Figure 13, where the primary coils 88, 89 and 90 are connected to a suitable source of current, and the secondaries 91, 92 and 93 are connected at opposite ends to adjacent electrodes 86.

The secondaries of the transformers are preferably connected in star as by a conductor 94 in order that a potential difference will exist between any adjacent pair of electrodes 86 across the whole width of the mesh being formed.

As the electrodes are constantly energized, currents are flowing through the mesh irrespective of whether or not a transverse rod is disposed directly below the welding heads 87.

In this way the junctions B to be welded are preheated prior to their reaching the welding position owing to the fact that the current therethrough becomes relatively great as the transverse rods approach the welding heads when the resistance is a minimum and conversely the current is a maximum.

By preheating the junctions in this manner, the welding operation is facilitated thereby permitting the conveyor to be actuated at a higher speed than would be possible if apparatus were employed to switch on the current only when the junctions reached the welding positions.

This action of the copper strip 82 is illustrated in Figure 14 of the drawings where it will be seen that the current passing between adjacent longitudinals is conveyed mainly by the copper strip in such manner that the current passes substantially vertically through the junction between the longitudinal and transverse rods.

When the welding operation is completed, the mesh passes over a guide roller 95 and is wound on to the drum 81 as above mentioned. It will be obvious, of course, that other forms of conveyors may be employed and that the welding heads may be arranged to operate from single or two phase alternating current if preferred.

When the mesh or fabric is to be used for reinforcing concrete roads, pavements or the walls or floors of buildings and the like, a series of short rods 20′ can be welded onto the longitudinal members 20 or the transverse

members (see Figure 15) whereby one of their ends can be turned downward or upward to form supporting legs for retaining the mesh at a correct distance from the bed of the road or forms for moulding the structure being erected.

The supporting rods may be welded to the members of the mesh or fabric prior to or while the same are being assembled.

In practice one end of the supporting rods can be secured in desired positions on the fabric by electric welding and the free ends of the said rods are arranged to lie in the plane of the fabric whereby it may be rolled up compactly.

Prior to placing the fabric in position, the free ends of the supporting members are bent at an angle to the plane of the mesh to act as supporting legs to maintain the reinforcement in a correct position above the road bed or in moulds for the structure being erected.

The free ends of the supporting members can be left straight, kinked or looped to form rests or stops for preventing their sinking too deeply into a road bed or soft ground upon which concrete is to be spread to form a roadway, pavement or the like.

Throughout the specification wherever the terms drum, battens and rods have been used it is to be understood that they are intended to include mandrel, bearers and bars or wires respectively.

Whilst preferred forms of the invention have been described herein, it will be obvious that modifications may be made therein without departing from the spirit and scope of the invention, and we, therefore, do not wish to be understood as limiting ourselves by the positive terms employed herein.

We claim:—

1. A method of welding rods in the manufacture of metallic mesh, consisting in successively moving the junctions between the rods to a welding position and in passing a preheating current through the said junctions as same are approaching the said welding position.

2. A method of forming metallic mesh consisting in successively forming junctions between angularly disposed rods, successively moving the junctions into a welding position and preheating the junctions by passing a current therethrough as same are approaching the welding position.

3. In a method of forming metallic mesh according to claim 1, passing a boosting current through the successive junctions at the welding position.

In witness whereof we hereunto affix our signatures.

CLAUDE COSGROVE.
ALBERT EDWARD CHADWICK.