

April 14, 1936.

F. CROSSMAN ET AL

2,037,067

METHOD AND APPARATUS FOR TREATING WOVEN WIRE FABRIC

Filed Jan. 8, 1934

3 Sheets-Sheet 1

FIG. 1

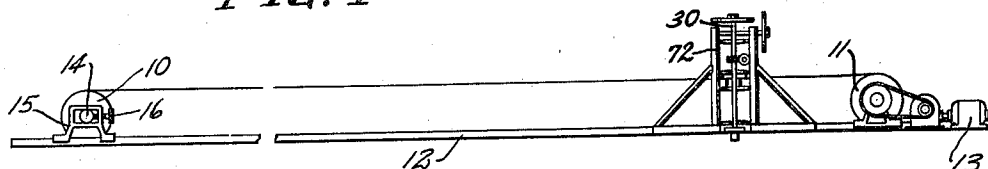


FIG. 2

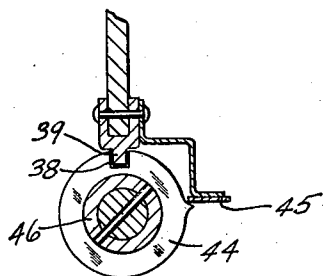
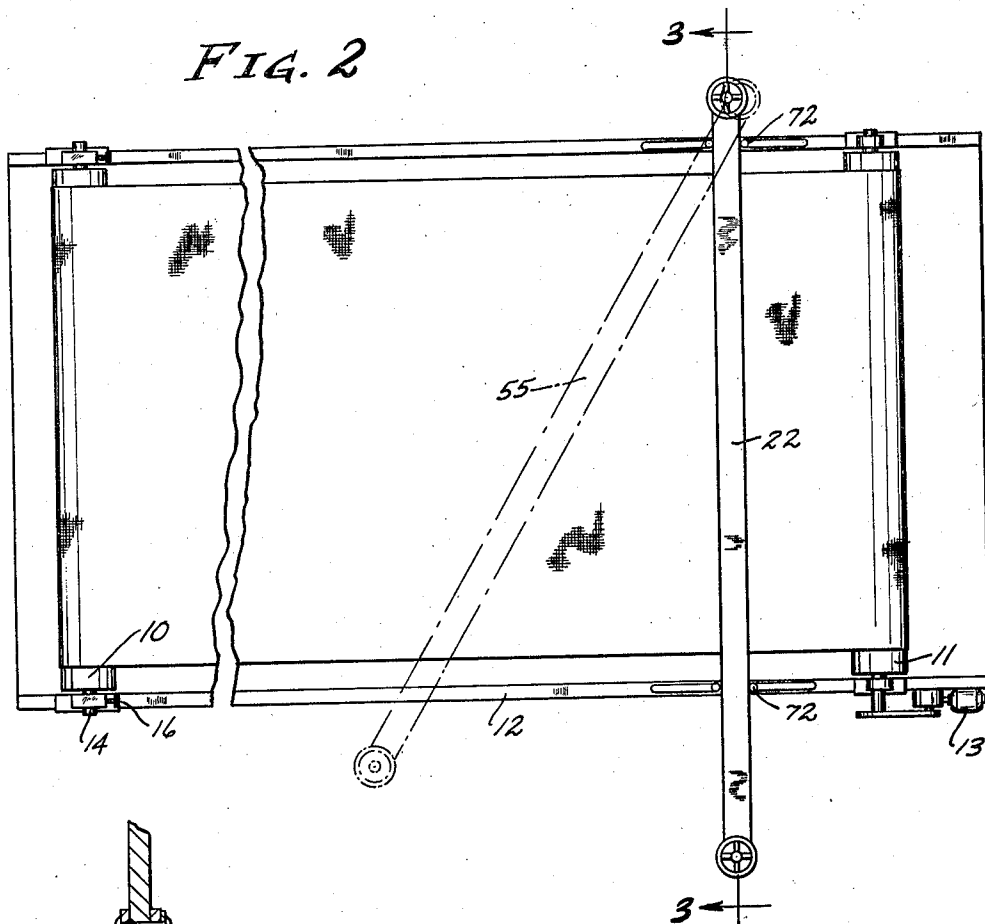


FIG. 8

Inventors

Fred Crossman
Walter C. Sutton

By Bates Golrick & Teare

Attorneys

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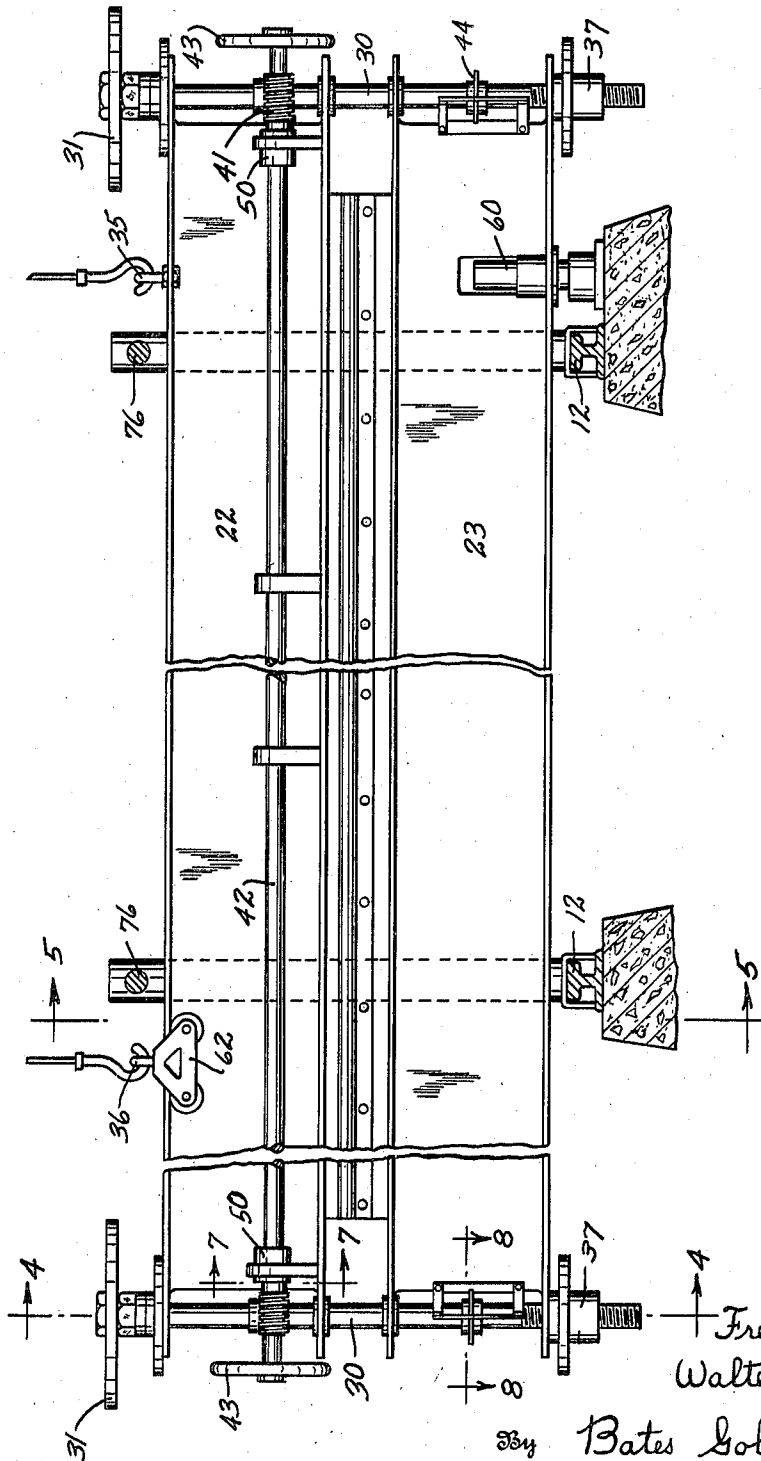


FIG. 3

Inventors

Fred Crossman
Walter C. Sutton

By *Bates Golrick + Teare*
Attorneys

April 14, 1936.

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3 Sheets-Sheet 3

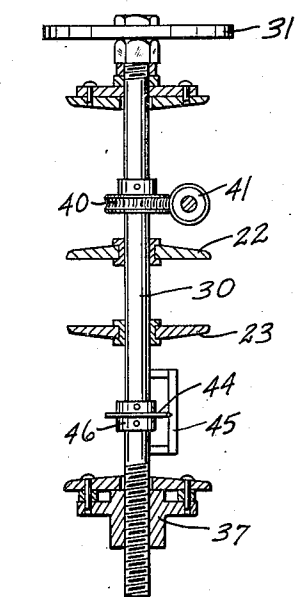


FIG. 4

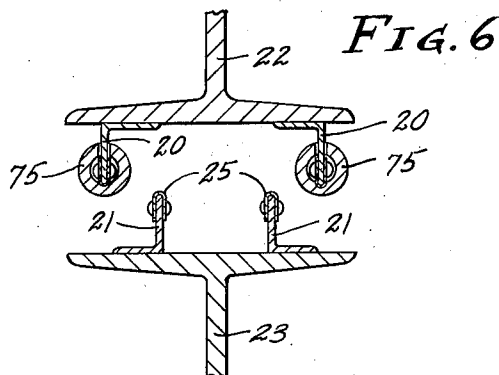


FIG. 6

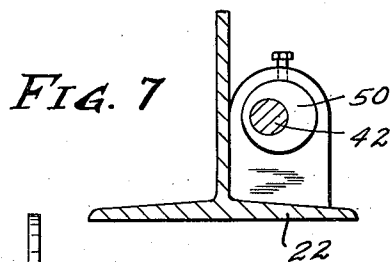


FIG. 7

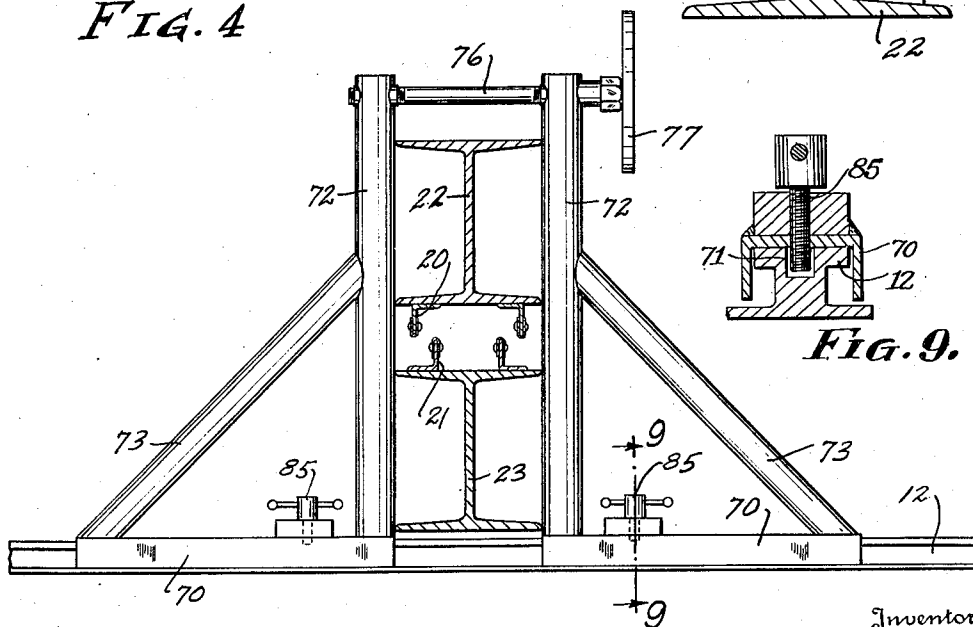


FIG. 5

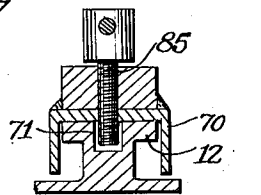


FIG. 9

Inventors
Fred Crossman
Walter C. Sutton

By Bates Golrick & Teare

Attorneys

UNITED STATES PATENT OFFICE

2,037,067

METHOD AND APPARATUS FOR TREATING
WOVEN WIRE FABRIC

Fred Crossman and Walter C. Sutton, Shaker Heights, Ohio, assignors to The Lindsay Wire Weaving Company, Cleveland, Ohio, a corporation of Ohio

Application January 8, 1934, Serial No. 705,764

19 Claims. (Cl. 153—32)

This invention relates to a method and apparatus for straightening a woven wire fabric and particularly that type of fabric which is used for the manufacture of belts on Fourdrinier paper-making machines.

Many difficulties have been experienced in treating woven wire belts so as to make them suitable for use on paper-making machines. For example, as the cloth comes from the loom it has 5 curled edges, which can be removed satisfactorily only by handstroking operation, with relatively small flat strips of wood. At best, this procedure is slow and incapable of producing the desired result in a uniform manner. In addition to the 10 curled edges, the woven fabric frequently has irregularities, such as hollow or tight places, some of which can be removed by passing the belt around a pair of rollers and then operating them to move the belt, and at the same time in- 15 creasing the distance between the rollers so as to stretch the belt.

Minor irregularities can be removed by the stretching operation, but the major ones will not respond to such treatment. Various methods of 20 hand treatment therefore, have been devised, in an effort to eliminate the major irregularities. One method has included the use of long-handled hook-shaped sticks with which the workmen would reach across the belt and endeavor to 25 smooth out the defects by rubbing them. Frequently, it was necessary to suspend a man inside the belt on a plank and to have him work on the underside of the fabric, while another man worked on the upper side. This process was not 30 only slow, but was frequently ineffective to straighten the fabric in a satisfactory manner.

In many cases the seams, or the region adjacent the seams, would be curled either upwardly or downwardly at the end of the stretching operation, and in extreme cases the defect was so pronounced that it was necessary to remove the seam, then to hand stroke the ends of the belt and to install a new seam. Again, after a belt has been 35 completed, it has been frequently damaged accidentally such as by the dropping of a tool or other object upon it, or by shifting of the winding rolls during transit. Whenever this occurred, the belt could only be reconditioned if the extent 40 of the wrinkling or bending was slight. If it covered an appreciable area, however, or if it had sharp creases, the belt was usually rendered useless for its intended purpose. Obviously, such damage constituted a considerable loss to the 45 manufacturer.

Another consideration which has been observed in the operation of a loom is the fact that it is frequently difficult to determine whether or not there is sufficient weight applied to the warp wires to make the cloth firm. The effect of the tension 50 however, cannot be definitely determined until

the first fabric has been removed from the loom, and if the initial tension is not sufficiently great, the fabric will lack the desired degree of firmness.

A further consideration in the operation of a loom is the fact that the reed dents frequently 5 become loosened. This is apt to happen at any time during the weaving operation and when it does occur it has been necessary to stop the loom to scrap part of the fabric and to then install a new reed. The reed however, had to be re- 10 threaded, and as such operation entailed considerable time, it is obvious that the cost of production is increased materially in accordance with the operation of the reed.

An object of our invention is to provide a 15 method and apparatus for straightening woven wire fabric, so as to remove wrinkles, puckers, blisters, ridges, creases, curvatures and all other irregularities with a material saving in labor and time, and with a marked increase in quality and 20 appearance of the belt.

In addition, we contemplate a method of straightening which will materially add to the firmness of the belt, even though the tension on the warp wires is improper during the opera- 25 tion of the loom, and which will permit the continued operation of the loom, notwithstanding the fact that some of the reed dents may become weakened during use.

Referring now to the drawings, Fig. 1 is a side 30 view of an apparatus embodying our invention; Fig. 2 is a top plan view thereof; Fig. 3 is an enlarged sectional view taken on the line 3—3 in Fig. 2; Figs. 4 and 5 are sections taken on the correspondingly numbered lines in Fig. 3; Fig. 6 is 35 an enlarged, transverse sectional view taken through the contacting part of the apparatus; Fig. 7 is a section taken on the line 7—7 in Fig. 3; Fig. 8 is a horizontal section taken on an enlarged scale on the line 8—8 in Fig. 3, and Fig. 40 9 is a section taken on the line 9—9 in Fig. 5.

Prior to the treatment of a belt in accordance with our invention, it is placed upon a stretcher which as shown in Figs. 1 and 2 comprises rollers 10 and 11, which are journaled in brackets 45 that are supported on rails 12. One of the rolls is adapted to be rotated, and to this end a motor 13 is shown as being suitably connected to the roll 11. Provision is also made for varying the distance between the rolls, and accordingly, the 50 roll 10 is illustrated as being mounted on bearing blocks 14, which are shiftable within the associated brackets 15. After a belt is placed around the rolls, the brackets 10 are shifted along the rails 12 until the belt is taut and are then fas- 55 tened to them by any suitable arrangement. Thereafter, the tension can be increased by adjusting the handwheels 16 which control the position of the journal blocks 14 with reference to their supporting brackets. The increase in ten- 60

sion may be made while the belt is moving around the rolls. The movement of the belt upon the stretcher frame makes the belt taut, but is not sufficient to remove the wavy edges and other irregularities hereinbefore described.

The present invention has accomplished astonishing results in the treatment of a belt, for it has removed all of the unsatisfactory creases, wrinkles, puckers, etc., with an immense saving in time and labor, and has resulted in an improved quality and appearance of the belt.

The method which we have devised comprises passing the belt between relatively rigid straightening members, and then progressively moving the members closer together, so as to subject the belt to a reversely acting pressure over a relatively restricted area. The apparatus can be shifted with reference to the belt and can therefore, be disposed obliquely of the belt, wherefore all irregularities can be removed regardless of the direction in which they extend through the belt. This is an important feature, for when the pressure is applied obliquely, the wires are subjected to pressure simultaneously in a longitudinally and transverse direction. The degree of pressure to be applied will vary with the extent of the imperfections, and as it is always under control, the operator can determine by inspection, the extent to which the operation must be continued.

The straightening members which we have illustrated comprise a set of upper bars 20 and a set of lower bars 21 which, as shown in Fig. 5, are attached to beams 22 and 23 respectively. The upper reach of the belt passes beneath bars 20 and above the bars 21 so that in an extreme position, the fabric is bent upwardly as it passes under the first bar 20, and then downwardly as it passes over the bar 21, then downwardly again over the second bar 21, and thence upwardly under the bar 20. This reverse bending of the wires while the belt is in motion has accomplished extremely satisfactory removal of irregularities without necessitating the hand treatment of the edges and interior parts.

While we have illustrated two sets of straightening members, each comprising a pair of bars, which are offset vertically with reference to each other, we may, if desired, utilize only two members that are offset with reference to each other. If desired, we may use one on one side of the fabric and one on the opposite side thereof. In each case however, the bars on opposite sides of the fabric are offset with reference to each other, so as to bend the fabric first in one direction, and then in the opposite direction while it is in motion.

The beams which carry the straightening bars are sufficiently large in size to avoid deflection of the bars during the application of pressure to the belt. As some of the belts now in use are twenty-feet in width, it is apparent that the deflection is an important item to take into consideration. We have found for example, that if the straightening members comprise angle bars, which are attached to the adjacent flanges of opposed I-beams, the deflection will be minimized for all practical purposes. We have also found that if the fabric contacting surface of the straightening members is covered with a relatively thin hardened steel or alloy strip 25 (Fig. 6) and that if the strips present a curved edge to the fabric, the fabric will not be cut or damaged by the application of pressure.

To move the straightening members with ref-

erence to each other, we have illustrated an arrangement by means of which the ends of the I-beams may either be moved independently or conjointly. The independent motion is desirable to effect a quick adjustment before contact is made with the fabric while the conjoint movement is desirable to insure uniform application of pressure across the belt.

The independent movement of the ends of the beams may be accomplished by utilizing shafts 30, which are journaled in the ends of the beams, and are operable by hand wheels 31, as shown in Figs. 3 and 4. In use, the upper beam is preferably suspended at points 35 and 36 by suitable hoists while the lower beam is suspended from the upper beam by the shafts 30. To this end, the lower ends of the shafts are threaded to engage nuts 37 which are held against rotation on the lower beams. Thus, whenever the shafts are rotated, the lower beam is moved vertically with reference to the upper one.

To move the ends of the beams conjointly, we have shown worm wheels 40 on the shafts 30, and worms 41 which mesh therewith and are carried at the ends of a shaft 42, which in turn, is journaled in brackets that are attached to the upper beam. A hand wheel 43 on one end of the shaft 42 enables an operator to rotate the shaft 42 from one end of the machine while pointers 44 and scales 45 serve to indicate the relative position of the ends of the lower beam to those of the upper beam. As shown in Fig. 8, the pointer may be held against rotation but permitted to be moved freely vertically by virtue of a notch 38 thereon into which a tongue 39 extends, and the tongue in turn may be fastened to the web of the beam. In the various illustrations we have shown suitable collars 46, which are rigidly fastened to the shaft 30 adjacent the upper and lower sides of the pointer, and which operate to move it vertically at the same rate at which the associated end of one beam is moved with reference to the same end of the other beam.

The shafts 30 cannot be moved independently of each other so long as the worm wheels 40 are in engagement with the worm wheels 41. Accordingly, we have journaled the ends of the shaft 42 within eccentric bearing blocks, as is indicated at 50 in Fig. 7. This enables the worms to be swung out of contact with the associated worm wheels.

In Fig. 2, we have shown in full line position, the straightening apparatus as extending transversely of the direction of rotation of the belt. In this same view, we have illustrated the straightening members in broken lines 55 as extending obliquely to the direction of movement of the belt.

To obtain such selective positioning one end of the apparatus is swivelly mounted as at 60 upon the base, and to facilitate the swinging of the apparatus while it is suspended, we have shown a carriage 62 which is adapted to move along the underside of the top flange on the upper beam, while it is suspended from an overhead hoist. It is to be understood of course, that during such swinging motion, the hoist which supports the apparatus at the point 36 is movable along an overhead trackway which extends parallel to the direction of rotation of the belt.

Inasmuch as the beams are suspended during use, it is necessary to provide adequate support against lateral movement while allowing vertical movement during the time that pressure is applied to the fabric. It is also important to have

a supporting arrangement, which permits the beams to be handled independently of each other, for it is obvious that the lower beam must be inserted between the regions of the belt and then assembled to the upper beam at each operation. This is necessary because of the fact that the seam is made at a work bench before the belt is brought to the stretching machine.

The preferred apparatus for supporting the straightening device comprises a pair of frames at each end of the beams. Each frame may comprise a base 70 in the form of an inverted channel that is slidable along the supporting rail 12, an upright 72 which is attached to one end of the base, and a strut 73, which connects the base to the upright. Suitable notches 74 may be provided in the upper surfaces of the rails 12, and a coating threaded member 85 on each frame may be utilized for extending into one of the notches, and thus operating to hold the frame to the rail. The upper ends of the frame may then be selectively locked together by a bar 76 upon operation of a hand wheel 77. The degree of locking is so controlled by the operator that the beams have a slight clearance with the walls of the uprights, whereby the beams may be moved vertically with reference to each other.

As it is desirable to sew the seam at a place remote from the stretching frame, it is necessary as has been heretofore stated, to handle the straightening beams independently of each other. To this end, it is necessary to provide disengagement bearings for supporting the shafts 30 at the ends of the beams. We have provided an arrangement which accomplishes this object by providing forked recesses in the flanges of the I-beam and by cutting back of the webs of the beams to admit the shafts, as is shown particularly in Figs. 3 and 4. Thus, at the time of assembly, the lower beam may be supported on the rails 12 and the upper beam may be superimposed upon it. Then after the bearing blocks are locked to the beams, the entire beam assembly may be raised and suspended.

We have found, after a belt has been passed around the stretcher rolls, that the ends of the fabric are usually inclined out of the plane of the fabric, and in extreme cases, the deflection has been so pronounced that it has been necessary to remove the seam. We have also found that this difficulty can be completely removed if our apparatus is positioned transversely to the direction of belt movement, and then drawing the straightening members together progressively while the belt is in motion. We have found also that the straightening of the wires adjacent the seam can be facilitated if the bars 20 or 21 are covered with a tube-like housing that present a broad rounded surface to the fabric. These covers or sleeves are illustrated in Fig. 6 at 75 and may comprise either one long tube that covers the full length of each bar, or a series of tubes of relatively short length that are placed end to end over the bars. In either case, they may be slid into place lengthwise of the bars without disturbing the hardened members 25.

The sleeves 75 in effect present relatively large contacting surfaces as compared to the uncovered bars. Accordingly, whenever a fabric is passed through a straightener wherein the upper bars are sheathed, as is shown in Fig. 6, while the lower bars and not, the upper bars serve more as a guide, while the lower ones effect the straightening operation. This arrangement would be used if the region adjacent the seam were bent

downwardly. If however, the ends of the fabric adjacent the seam are bent upwardly, then the sleeves 75 would be placed upon the lower set of bars, and in such case, the upper set would exert a bending stress across the fabric and thus straighten it at the seam. With this apparatus and method of treatment, the most abnormal bending adjacent the seam can be readily straightened. The number of times which the seam must be passed through the members will vary, of course, in accordance with the degree of bend that is present in the fabric.

From the foregoing description it will be apparent that the apparatus embodying our invention provides a flexible control for applying a variable pressure to both surfaces of the fabric, and that the shiftability of it with reference to the direction of belt travel enables us to eliminate irregularities in all directions in the body of the belt. This is best accomplished by positioning it obliquely to the direction of travel of the belt. Thereafter, irregularities adjacent the seam may be removed by positioning it at right angles to the direction of travel of the belt. The machine has demonstrated the fact that it will not only remove irregularities with a minimum expenditure of labor and time, but that the resulting belt has improved qualities. It has been found for example that the paper web leaves the belt with much less tendency to adhere to it and that the paper is more free from wire marking. These differences in quality are extremely valuable in promoting the sale of the belt.

We claim:

1. An apparatus for straightening woven wire fabric comprising in combination two pairs of non-rotatable straightening members disposed in offset relationship on opposite sides of the fabric and means for moving one pair with reference to the other to cause both pairs to act on the same stretch of fabric at the same time.
2. An apparatus for straightening woven wire fabric comprising straightening members arranged in offset relationship and adapted to engage the opposite sides of a fabric simultaneously, means for moving the members toward and away from each other and other means for swinging the members about a common pivot as a unit in the plane of the fabric.
3. An apparatus for straightening woven wire fabric comprising two sets of straightening members which engage opposite sides of the fabric to be straightened, means for moving the members toward each other, and other means for suspending them during the straightening operation.
4. An apparatus for straightening woven wire fabric in belt form comprising in combination a pair of stretcher rolls around which the belt is passed, means for rotating one of the rolls to move the belt, straightening bars disposed between the rolls and extending across the belt and adapted to engage the opposite sides thereof, means for holding one of the members relatively stationary, means for moving the other toward the stationary member while the belt is passing therebetween and means for swivelly mounting said members for movement as a unit.
5. In combination, a pair of superimposed straightening members, vertical guides therefor, means for suspending the upper member and adjustable mechanism for suspending the lower member from the upper member and for moving it toward and from the upper member.
6. In a device of the character described, a pair

of non-rotatable straightening members arranged in superimposed relationship and adapted to engage opposite sides of a web of woven wire fabric, and detachable means for supporting the members against lateral movement while permitting vertical movement of one with reference to the other.

7. In combination, a pair of straightening members arranged in superimposed relationship and adapted to engage the opposite sides of a web of woven wire fabric, means for supporting the members against lateral movement while permitting the vertical movement of one with reference to the other, means for supporting the upper member and other means for suspending the lower member from the upper, said last named means including a screw and nut couple by means of which the members may be adjusted with relation to each other.

8. An apparatus for straightening woven wire fabric comprising two pairs of non-rotatable straightening members arranged in superimposed offset relationship, one pair of straightening members being disposed inside of the other pair, means for holding one pair relatively stationary, and other means for varying the vertical distance between the pairs.

9. In an apparatus for straightening woven wire fabric in belt form, the combination of spaced non-rotatable straightening members and detachable covers therefor, the covers being adapted to be used selectively for engaging the fabric to straighten a deformation adjacent the belt seam.

10. An apparatus for straightening woven wire fabric comprising in combination, a pair of relatively large non-rotatable straightening members, and a pair of relatively small non-rotatable straightening members, said members extending across the body of the fabric and engaging opposite sides thereof, and means for moving one pair of members toward and away from the other.

11. An apparatus for straightening woven wire fabric, comprising in combination, at least one pair of non-rotatable straightening members extending across the body of the fabric and engaging one side thereof, and another pair of non-rotatable straightening members extending across the body of the fabric and engaging the opposite side thereof, means for moving a member on one side of the fabric with reference to the fabric, and means for moving all of the straightening members as a unit obliquely to the direction of the fabric.

12. An apparatus for straightening woven wire fabric comprising two straightening members extending entirely across the body of the fabric and disposed in offset relationship, and means for moving the members toward each other, said means including a detachable connection whereby one end of each member may be moved with relation to the opposite end thereof.

13. An apparatus for straightening woven wire fabric comprising in combination two straightening members adapted to engage the opposite sides of a web of woven wire fabric, a beam supporting each member, a screw and nut couple connecting the beams at the ends thereof, a shaft journaled on one of the beams, gearing connecting the shaft to one member of each of said couples, whereby rotation of the shaft effects simultaneous-rotation

of the couples and thereby moves one straightening member with reference to the other, and means for disconnecting the gearing, whereby the adjacent ends of one beam may be moved with reference to each other, and independently of the opposite ends.

14. An apparatus for straightening woven wire fabric, comprising in combination, two superimposed beams, a downwardly extending straightening member carried by the upper beam, an upwardly extending straightening member carried by the lower beam, the members being adapted to engage opposite sides of a body of fabric that is passed therebetween, means for suspending the upper beam, rotatable supporting members for suspending the lower beam from the upper one, and means for moving each end of one member independently of the other end, and other selectively operable means for conjointly moving the two ends of said member.

15. An apparatus for straightening woven wire fabric comprising straightening members adapted to engage the opposite sides of a body of fabric that is passed therebetween mechanism for simultaneously moving the ends of one member toward and away from the other member, said mechanism including a detachable connection whereby one end of one member may be moved independently of the opposite end, and means adjacent the ends of the member for indicating the distance between the ends of the members.

16. In an apparatus for straightening woven wire fabric, the combination of straightening members adapted to engage opposite sides of the fabric that is passed therebetween, a detachable cover on one of the members for increasing the area of contact between the member and the fabric, said cover having a slot extending longitudinally thereof whereby the cover may be slid onto the member by movement in a lengthwise direction.

17. The method of treating a woven wire web, comprising maintaining the web in tension, causing relative motion between the web and non-rotating surfaces spaced from each other in the direction of relative movement and disposed in positions oblique to the direction of relative movement, and pressing the surfaces against the web in directions substantially normal to the plane of the portion being treated.

18. A method of treating woven wire fabric in belt form to remove irregularities therefrom, comprising causing the belt to travel around stretching rolls across non-rotating surfaces and progressively moving the surface toward each other to bend the fabric upwardly and downwardly across the belt and between the supported regions while it is in motion and varying the distance between the axes of the stretching rolls.

19. The method of treating a woven wire web, comprising maintaining the web in tension, causing relative motion between the web and non-rotating surfaces obliquely to the direction of the aforesaid relative movement and on opposite sides of the web, and maintaining sufficient pressure on said surfaces of the web to alternately bend the web portion being treated first in one direction and then in an opposite direction with reference to the plane of such web portion.

FRED CROSSMAN.
WALTER C. SUTTON