(No Model.) 3 Sheets—Sheet 1.

C. JACKSON.

METHOD OF AND APPARATUS FOR COILING AND INSERTING WIRE.

No. 482,965. Patented Sept. 20, 1892.

FIG. 1.

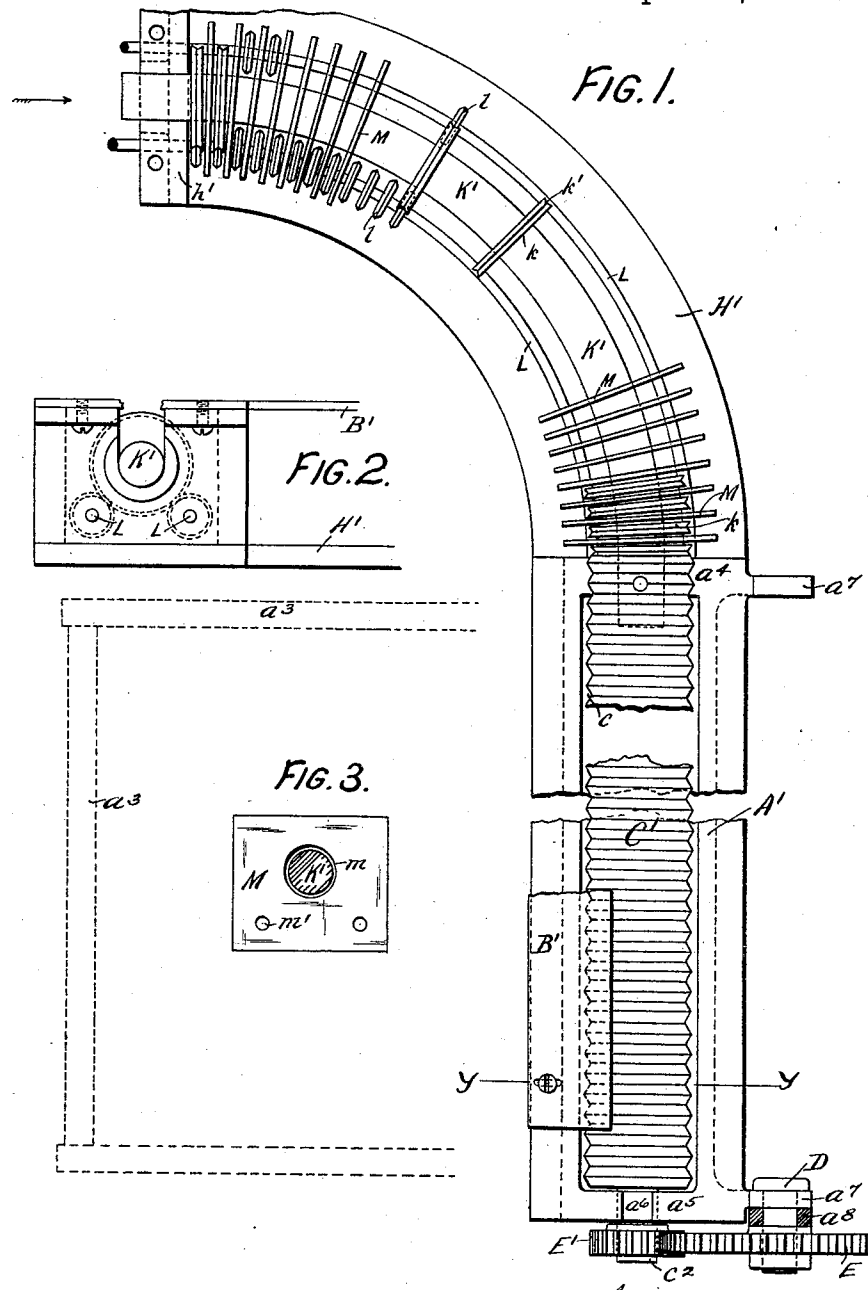


FIG. 2.

FIG. 3.

Witnesses
E. A. Kelly.
Wm. H. Kearns

Calvin Jackson Inventor
By his Attorney W. J. Clemens

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

C. JACKSON.

METHOD OF AND APPARATUS FOR COILING AND INSERTING WIRE.

No. 482,965. Patented Sept. 20, 1892.

FIG. 4.

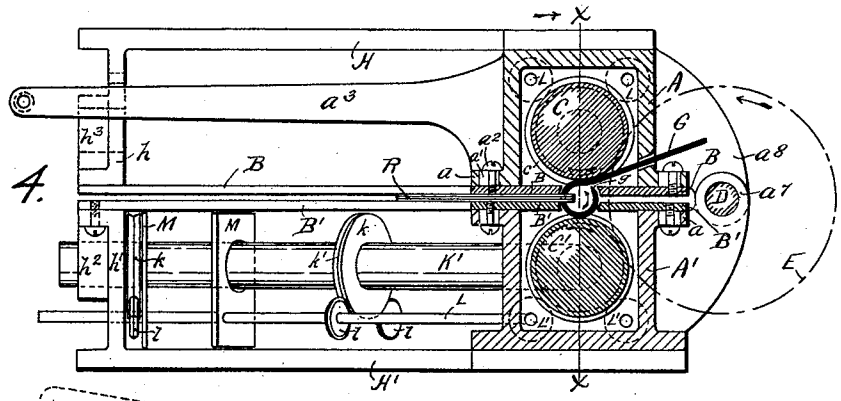


FIG. 5.

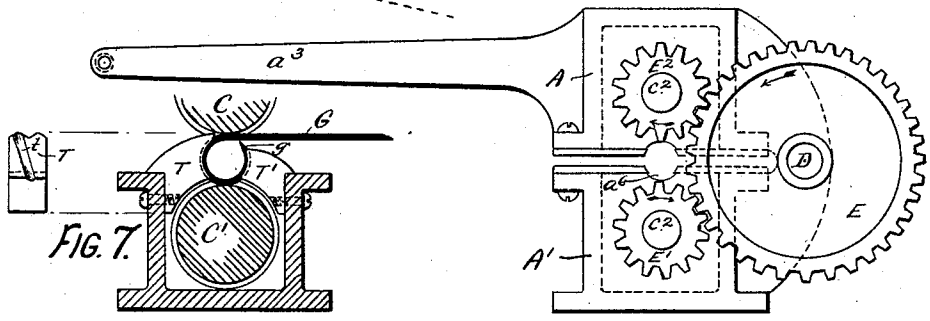
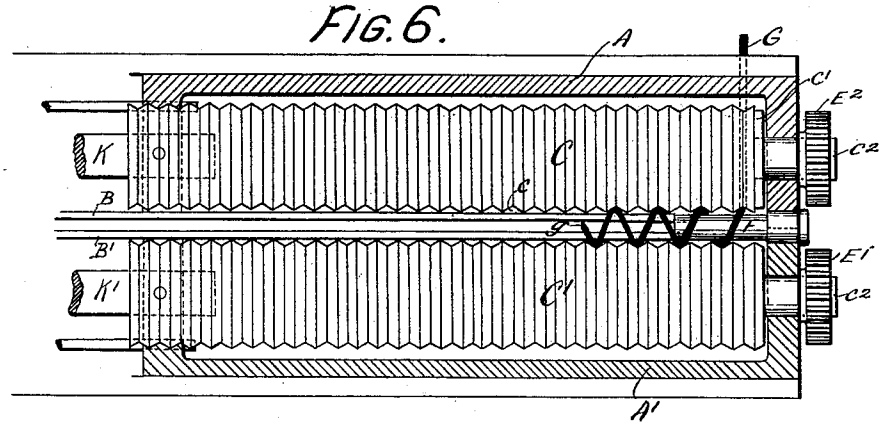


FIG. 7.

FIG. 6.



Witnesses
C. A. Kelly.
Wm. H. Karns

Calvin Jackson Inventor

By his Attorney Wm. Gilmark

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 3.

C. JACKSON.

METHOD OF AND APPARATUS FOR COILING AND INSERTING WIRE.

No. 482,965. Patented Sept. 20, 1892.

FIG. 8.

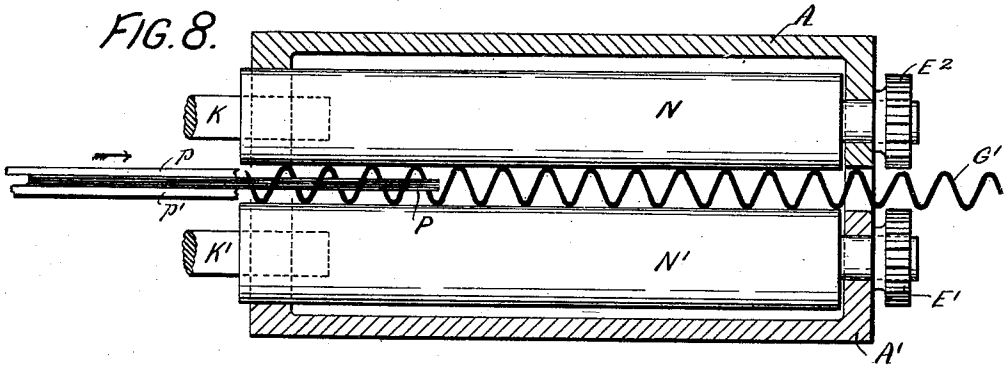


FIG. 9.

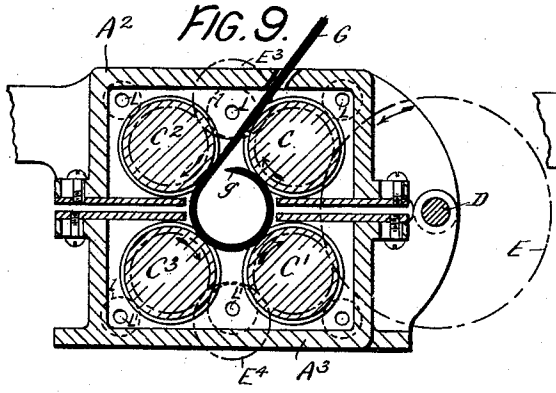


FIG. 10.

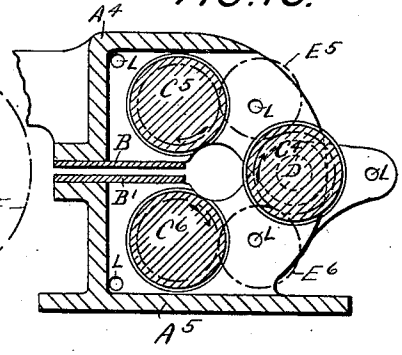


FIG. 11.

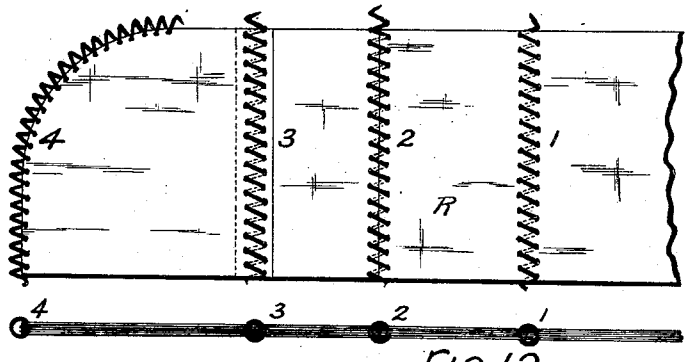


FIG. 12.

Witnesses
E. A. Kelly.
Wm. H. Kearns

Calvin Jackson Inventor
By his Attorney Wm. F. Stewart

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CALVIN JACKSON, OF JACKSONWALD, ASSIGNOR TO CHRISTIAN H. RUHL, TRUSTEE, OF READING, PENNSYLVANIA.

METHOD OF AND APPARATUS FOR COILING AND INSERTING WIRE.

SPECIFICATION forming part of Letters Patent No. 482,965, dated September 20, 1892.

Application filed March 31, 1890. Serial No. 345,995. (No model.)

To all whom it may concern:

Be it known that I, CALVIN JACKSON, a citizen of the United States, residing at Jacksonwald, in the county of Berks and State of Pennsylvania, have invented certain Improvements in Methods of and Apparatus for Coiling and Inserting Wire, of which the following is a specification.

The main object of my invention is to effect the combination of a metal in the form of wire with softer material, as for the purpose of joining together two or more separate pieces of such material, forming an edge thereon, or strengthening or ornamenting the same.

The principle involved in my invention is that the wire shall be guided and rotated in forming and inserting the coil by an exterior pressure upon the coil, leaving the opening through it free to permit the passage of the material with which the coil is to be combined.

The invention is fully described hereinafter in connection with the accompanying drawings and is specifically pointed out in the claims.

Figure 1 is a plan view of the fixed or lower portion of a simple form of machine embodying my invention. Fig. 2 is an end elevation of the curved extension. Fig. 3 is a separate view of one of the supporting-plates for the flexible shaft of the extension. Fig. 4 is a sectional elevation through *y y* of Fig. 1, showing the flexible shaft of the lower extension with the larger number of the disks, supporting-plates, and rollers removed. The upper or hinged portion of the machine is also shown, but without the flexible shaft. Fig. 5 is an elevation showing the geared end of the two-roller machine. Fig. 6 is a sectional elevation through *x x* of Fig. 4. Fig. 7 shows an attachment for automatically coiling the end of a wire. Fig. 8 is a sectional elevation, corresponding with Fig. 6, of a modified form of machine having smooth instead of grooved rollers. Figs. 9 and 10 are sectional elevations, corresponding with Fig. 4, of modified machines provided with four and three rollers, respectively. Figs. 11 and 12 illustrate the character of work done.

In the two-roller machine illustrated in Figs. 1 to 8 the lower roller C′ is supported in a fixed frame A′, which is represented as of U-shaped cross-section, with end bearings a^4 and a^5 for the roller. A top roller C is carried by an upper and movable frame A of similar shape to A′, but inverted, and the two frames are hinged together at D by means of lugs a^7 and a^8. The projecting journals c^2 c^2 of the upper and lower rollers are provided with gear-wheels E^2 and E′, both of which gear with a third wheel E. The center of rotation of the latter is the pivotal or hinging point D of the frames.

In the sectional views of Figs. 4, 9, and 10, the gear-wheels being cut away, the pitch circles are indicated by long and short dots alternately.

The rollers C and C′ are formed with circumferential grooves *c*. Upon the meeting faces of the upper and lower frames clamping-plates B B and B′ B′, respectively, are adjustably secured by means of screws a^2, passing through slots a' in the flanges *a*. The inner edges of these clamping-plates are brought as near to the line joining the center of the lower and upper roller as the diameter of the coil will permit, their function being to firmly clamp the material into which it may be desired to insert the coil, and also in the present construction to assist in regulating the position of the latter.

The main features of my invention are embodied in the simple mechanism already described, the operation of which is as follows: It being desired to insert a wire into a fabric or other comparatively soft material R in the manner indicated at 1 in Figs. 11 and 12, or to unite the abutting edges of two adjoining materials, as indicated at 2, or of two lapping edges, as at 3, or to insert it in the edge of a straight-cut material, in either case the material R is properly placed in the machine between the frames A and A′, as indicated in Fig. 4, the former being raised by suitable handles a^3 to permit its introduction. The upper roller C being moved around the center D of the gear-wheel E, the latter wheel is always in gear with both rollers, and on either one of the rolls being rotated in the direction of the arrow the other will be rotated in the same direction, as shown. The end *g* of the

wire G being pointed and given one or more turns around a proper-sized mandrel F, placed between the rollers, as indicated in Fig. 6, the upper frame is closed, thus clamping the material and at the same time causing the coiled end on the wire to be pressed between the upper and lower rollers C and C′ and to be rotated by them, as indicated by the arrow. Liners may be used to adjust the clamping-plates for different sizes of coils and thicknesses of materials, so that pressure may be brought upon both at the same time. The point *g* as rotated enters successive grooves *c* in the upper and lower rollers and each time it reaches the material R punctures and passes through it, additional wire G being at the same time drawn from a conveniently-placed reel and continuously coiled as it passes between the grooved rollers. It will be seen that the wire is thus automatically and simultaneously drawn from the reel, coiled, and inserted in the material, the coil being either right or left, as determined by the direction in which the rollers are rotated. It is evident, however, that, if desired, the forming of the coils and the inserting of them in the material may be accomplished in two separate operations, the wire being coiled as described without placing any material in position to be punctured by it, and the pointed end of the completed coil being afterward placed between the rollers with the other end projecting beyond the end of the machine, the rotation of the coil, as already described, causing the pointed end to enter the material successively at each rotation, while the projecting portion of the coil gradually advances into the rollers.

In Fig. 7 I have illustrated a means by which the initial coil may be made automatically. The pointed end of the wire G after passing between the upper roller and the mandrel F comes in contact with an attachment T, having a diagonal groove *t* in its concave face, adapted to give the wire the proper deflection and curve for any desired diameter and pitch of coil, the concave face being arranged in close proximity to the mandrel. A supplemental attachment T′ may also be used, if desired, to complete the first coil, the pitch of which mainly determines the pitch of the coils subsequently formed.

When it is desired to insert the coil in other than a straight line, it becomes necessary to provide a substitute for the rollers C and C′, and Figs. 1 to 4 illustrate a mechanism for this purpose, adapted to form an extension of the machine already described for the purpose of running the wire around a curve.

As a substitute for the rollers C and C′, I employ flexible shafts K and K′, which may be formed of oppositely-wound coils of wire or in any suitable manner. One end of a flexible shaft is secured to the end of a roller, by which it is thus rotated, while the other end may be supported, as represented, in a suitable bearing h^2 or h^3, forming part of curved extension-plates H′ and H, which may be secured to the main frames A′ and A. The clamping-plates B B and B′ B′ are also provided with corresponding curved extensions, which are fastened to the right-angled ends *h* and *h′* of the extension-plates H and H′, and the flexible shafts K and K′ are thus located between the plates H and B and H′ and B′, respectively. Instead of the grooves *c* in the rollers C and C′, disks *k*, with corresponding grooves *k′*, are used, being secured to the shaft in any suitable manner, so as to rotate with it. Between these disks are placed supporting-plates M, through which pass wires or rods L, and loosely strung upon these wires between the plates M are rollers *l*, having their peripheries shaped to correspond with the grooves *k′* of the disks *k*, upon which they bear, the strain upon each separate disk being conveyed through the said rollers and the supporting-plates M to the extension-plates H and H′. It will be readily seen that the coil of wire will be guided around the curve between the grooved disks and clamping-plates in substantially the same manner as it is between the rollers C and C′, and it may thus be inserted in material in a curved line, as indicated at 4 in Fig. 11. There is no friction upon the flexible shaft except in the outer bearing h^2 or h^3, it being allowed to pass loosely through the plates M and the strain and wear being conveyed through the grooved disks *k* and rollers *l* to the wires L L. The bearings h^2 and h^3 may, however, be dispensed with as for irregular curves, leaving the plates M alone to support the flexible shafts in any curve that they may be set to.

It is evident that more than two rollers may be used to advantage in some cases—as, for instance, where the size of wire employed requires increased rotary contact with the exterior of the coil to insure its rotation. In Fig. 9 I have shown an arrangement of four rollers, of which C and C′ are geared directly with the wheel E at the pivotal center D in the same manner as in the previous construction, the additional rollers C^2 and C^3 being operated through idlers E^3 and E^4 to secure the same direction of rotation for all. With this arrangement four flexible shafts will be required instead of two, as in the previous arrangement, and six wires L and series of supporting-rollers *l* instead of four, the location of which are indicated in the drawings.

In Fig. 10 an arrangement of three rollers is shown, the center of C^4 being represented at the pivotal point of the frames and it being geared through idlers E^5 and E^6 with the two other rollers C^5 and C^6. Four wires L and series of supporting-rollers *l* will be required for the three flexible shafts in this arrangement, located as indicated.

In Fig. 8 I have shown a modified apparatus, by means of which a coil may be in-

serted in material in an equivalent manner to that already described without imparting a longitudinal movement to the coil. In this case smooth rollers N and N′ are used, the finished coil being placed between them and rotated thereby, while the material P, which may be held between suitable clamps *p* and *p′*, is drawn in between the rollers as the pointed end of the wire enters it at each rotation successively.

My method, unlike that heretofore in use, of coiling the wire upon a rotary mandrel is adapted to permit the simultaneous formation of the coil and its insertion into a material, as described. It is also, however, a very satisfactory method of forming a coil independently of such insertion, the length of the coil being only limited by the length of the wire fed to it and any pitch being formed with equal facility. The same grooved rollers may be adapted to form coils of different pitches by horizontally adjusting them, as by a removable washer *c′*, Fig. 6. The general character of the work that may be done by the insertion of coiled wire into material, as described, is indicated in Figs. 11 and 12, and its specific application to different articles of manufacture will be readily suggested thereby. A butt or lap seam is thus readily made in a novel manner or a coiled wire edge or bead formed on a straight or curved line for any desired purpose.

Having thus fully revealed my invention in such practical shape as will enable those skilled in the art to practice it, I do not intend to limit myself to the specific mechanism of the special application described; but

What I claim is—

1. In a wire-coil machine, the combination, with the geared rollers and a mandrel F, located between said rollers, of a forming device T, secured to the machine-frame and provided with a grooved concaved face arranged contiguous to said mandrel, substantially as set forth.

2. In a wire-coil machine, substantially as described, the combination, with one or more rollers supported in a fixed frame, of one or more similar rollers supported in a movable frame pivoted to the fixed frame, said rollers being geared with a gear-wheel having its center at said pivotal point, substantially as set forth.

3. In a wire-coil machine, substantially as described, the combination, with the fixed frame, the movable frame hinged thereto, and the rollers supported in said frames, of clamps adjustably secured to the meeting faces of said frames, the inner edges of said clamps being brought close to the wire coil and holding the material through which the coil is to be inserted, substantially as and for the purpose set forth.

4. In a wire-coil machine, substantially as described, a rotary flexible shaft suitably supported at the ends and having a series of circumferentially-grooved disks secured thereto, in combination with a series of supporting-plates arranged between said disks, substantially as set forth.

5. In a wire-coil machine, substantially as described, a flexible shaft suitably supported at the ends and having a series of circumferentially-grooved disks secured thereto, in combination with a series of supporting-plates arranged between said disks and one or more series of rollers for said grooved disks, strung upon wires or rods passing through said supporting-plates, substantially as set forth.

6. In a wire-coil machine, substantially as described, the combination, with straight roller supported in a suitable frame, of a curved extension of said roller, consisting of a flexible shaft having one end secured thereto, said shaft being provided with a series of disks and supported by a series of plates arranged between said disks, substantially as set forth.

7. The method of strengthening or uniting softer materials by means of wire, which consists, first, in forming the wire into a spiral coil, and, second, in permanently combining said coiled wire with the aforesaid material by rotating the coil and passing the pointed end thereof successively through a series of punctures made in the material, substantially as set forth.

8. The method herein described of continuously forming wire into a spiral coil and combining the same with a softer material, which consists, first, in simultaneously forming said wire into a spiral coil and advancing the pointed end of the same by means of exterior rotary pressure thereon, and, second, in simultaneously puncturing and inserting the coil into the material, substantially as set forth.

9. In a wire coiling and inserting machine, the combination of the geared rollers, the mandrel F, located between said rollers, a forming device T contiguous to said mandrel, and the clamps for holding the material through which the coil is to be inserted, all arranged and adapted to operate substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

CALVIN JACKSON.

Witnesses:
DAVID LEVAN,
HOWARD P. WANNER.