No. 648,931. Patented May 8, 1900.

H. J. DOUGHTY.

MANUFACTURE OF FLEXIBLE TUBING.

(Application filed Aug. 23, 1899.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

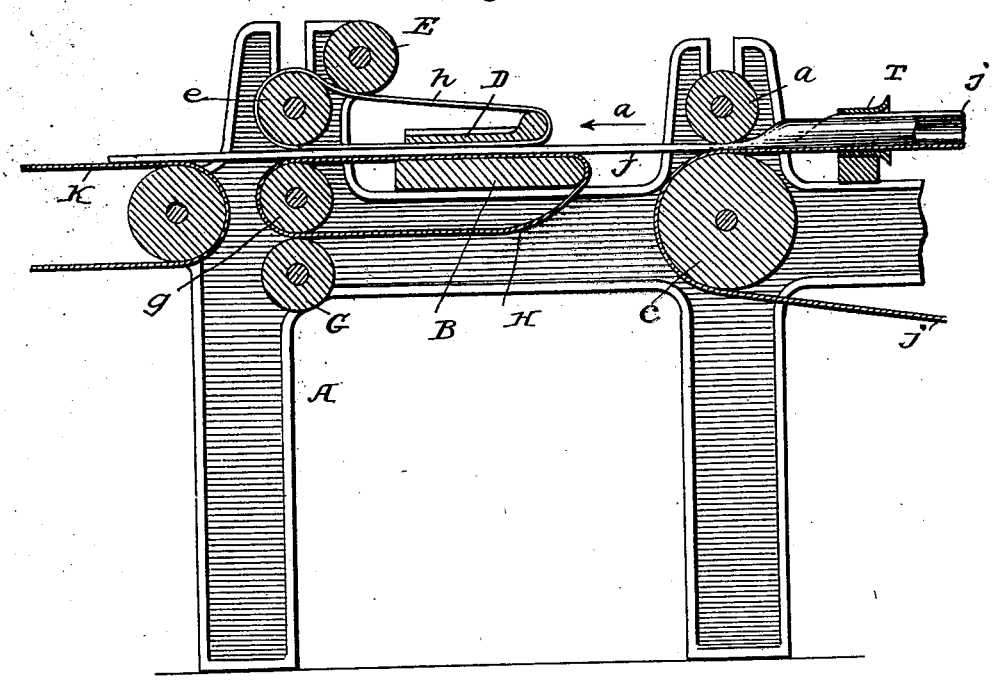


Fig. 3.

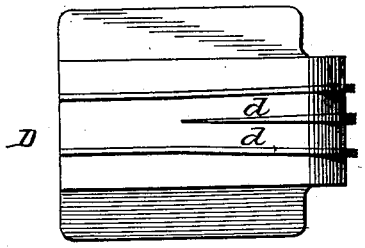


Fig. 4.

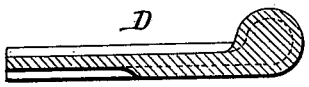
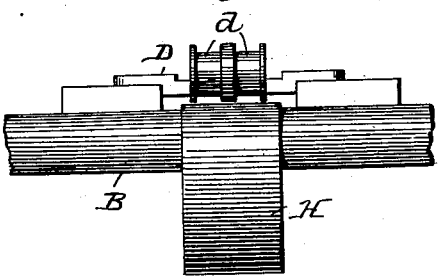


Fig. 5.



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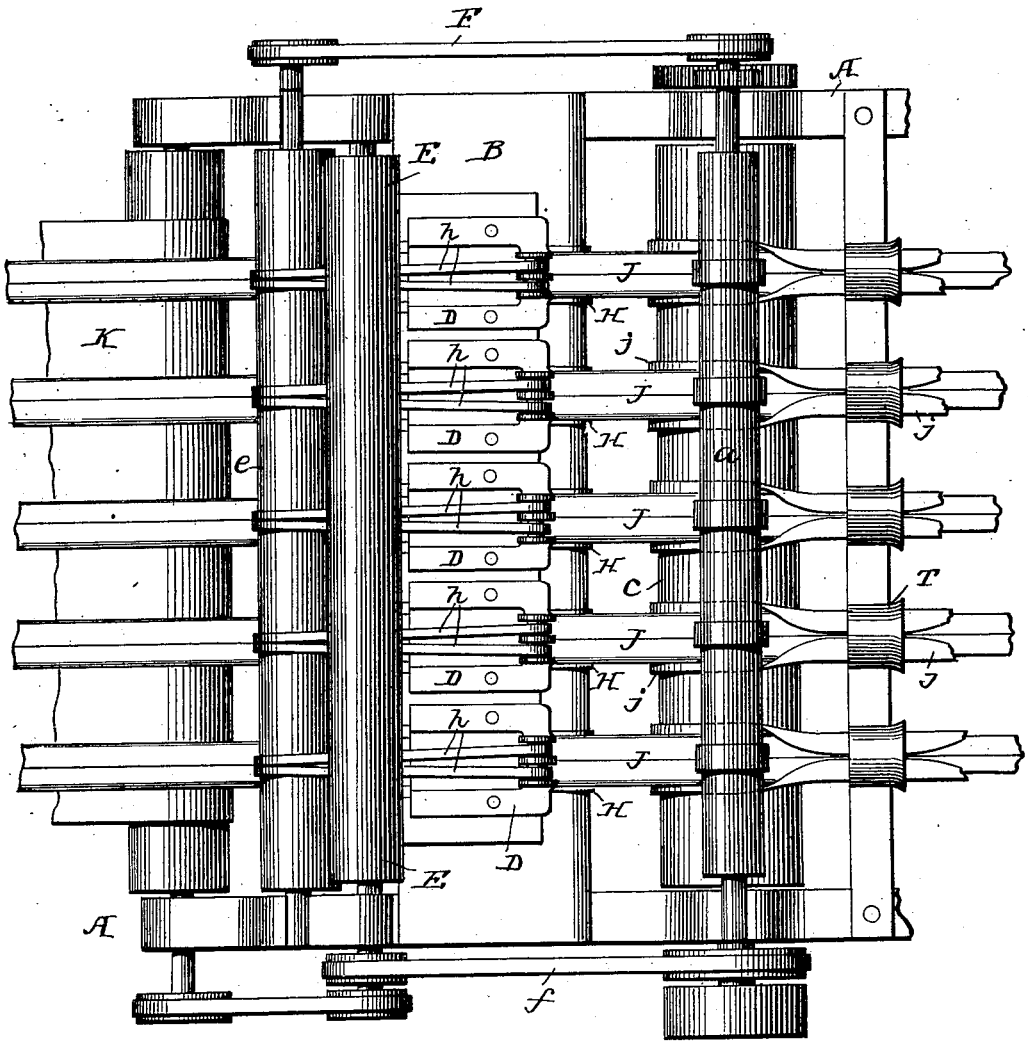
(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

Fig. 6.

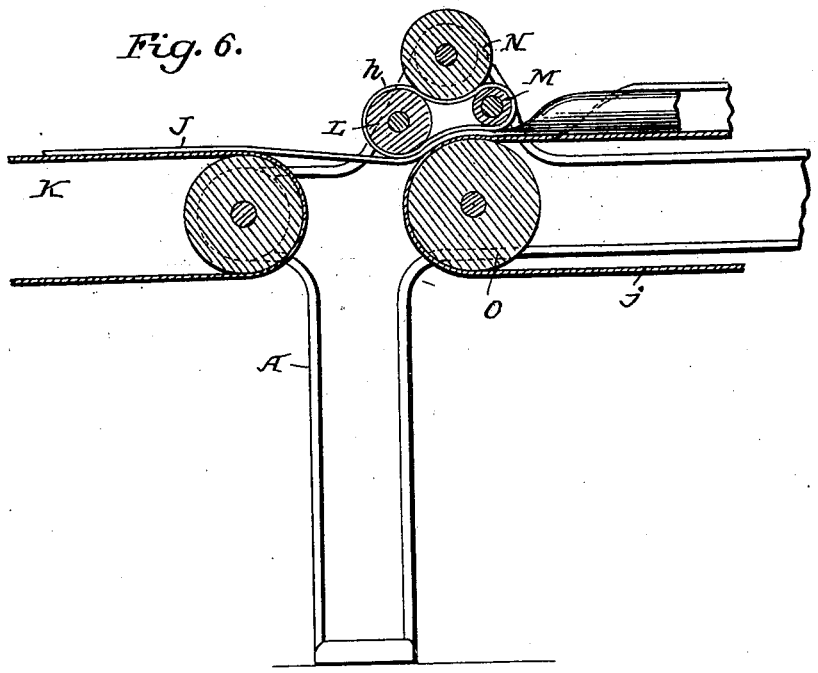


Fig. 8.

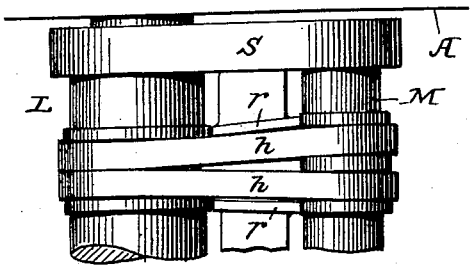


Fig. 9.

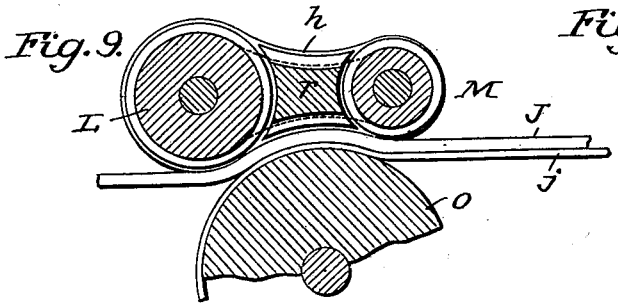


Fig. 10.

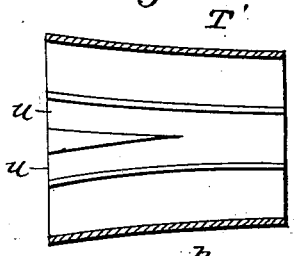
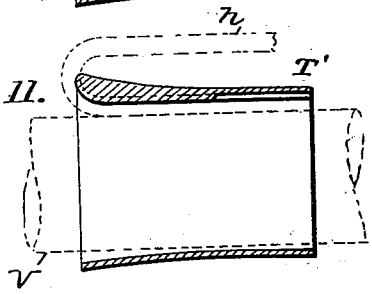


Fig. 11.



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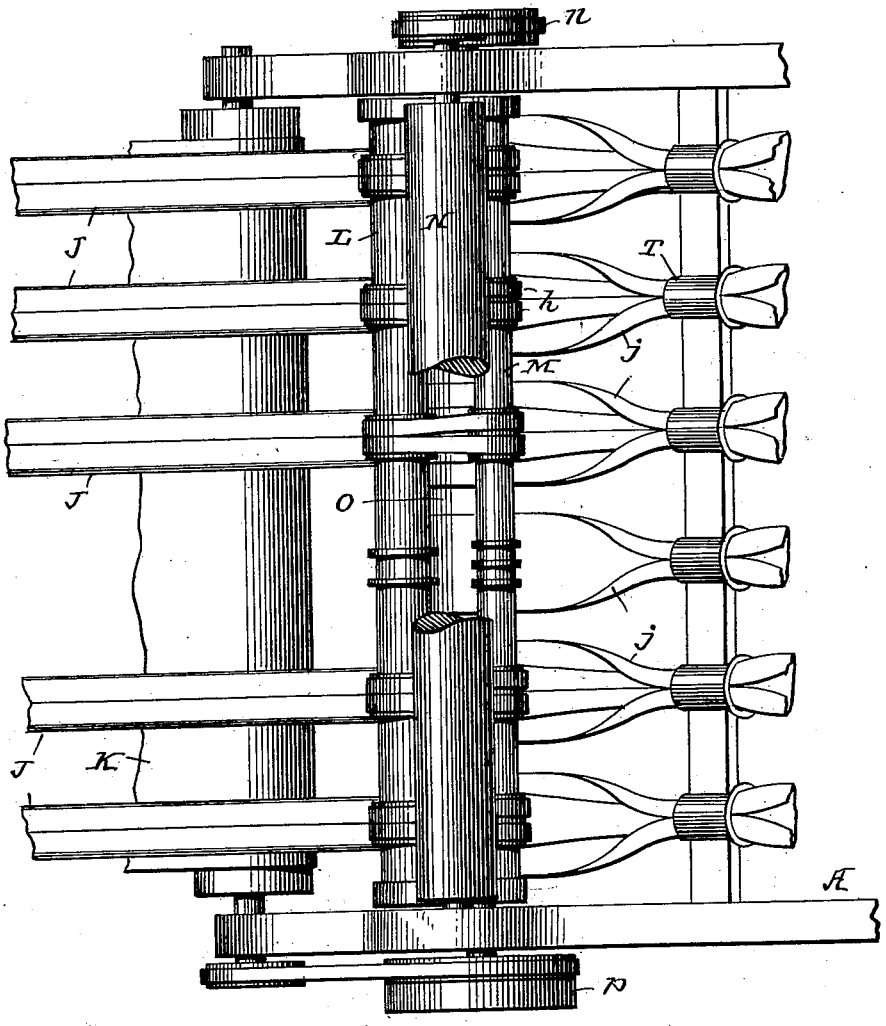
(No Model.) 4 Sheets—Sheet 4.

Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY J. DOUGHTY, OF PROVIDENCE, RHODE ISLAND.

MANUFACTURE OF FLEXIBLE TUBING.

SPECIFICATION forming part of Letters Patent No. 648,931, dated May 8, 1900.

Application filed August 23, 1899. Serial No. 728,205. (No model.)

To all whom it may concern:

Be it known that I, HENRY J. DOUGHTY, a citizen of the United States, residing in the city and county of Providence, and State of Rhode Island, have invented certain new and useful Improvements in the Manufacture of Flexible Tubing, of which the following is a specification.

Heretofore in the manufacture of rubber tubing or tubing covered with rubber I have applied a suitable solvent, as naphtha, to the edges of a strip and have brought and held the edges together until united. Simple contact for a short time is sufficient to secure perfect union in a dry climate; but I have found that in some countries where the atmosphere is humid the solvents I employ in carrying out my invention do not evaporate so rapidly as in a drier climate, and that as a consequence means must be employed to retain the joint or seam of the flexible tubing longer in contact, and that it is necessary to bring such jointed edges tightly together and under pressure. I therefore provide as an addition to the apparatus of tube-making or like machines devices which I will proceed to describe, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation of sufficient of a tube-making machine to illustrate my improvement. Fig. 2 is a plan of Fig. 1. Fig. 3 is an inverted plan, enlarged, of the device for bringing or holding together the inturned edges of the strip. Fig. 4 is a section of Fig. 3. Fig. 5 is an elevation looking in the direction of the arrow *a*, Fig. 1. Fig. 6 is a sectional elevation showing another arrangement. Fig. 7 is a plan of Fig. 6. Fig. 8 is a large inverted plan of the device of Figs. 6 and 7 for bringing together the edges of the strip. Fig. 9 is a section of Fig. 8. Figs. 10 and 11 are views showing the means for bringing and holding together the edges of the folded strip as applied to the folding tube.

In carrying out my invention in the construction shown in Figs. 1 to 5 I mount upon a special frame A (which may be an extension of the tube-forming-machine framing or independent thereof) a bed-plate B, just behind the press-rollers *a c*, which form part of the tube-machine aforesaid. To the bed-plate B, I attach by suitable means a series of guide-plates D, having two converging grooves *d* therein, and behind this bed-plate B, I mount rollers E *e g* G, all or part of which may be geared together; but, as shown, the belt F drives the roller G and the belt *f* drives the roller E, while these rollers in their turn drive the rollers *e g*. Passing around the roller *g* and between the guide-plates D and the bed-plate B are bands or belts H of suitable material, which pass over and around the bed-plate B, and above there are continuous narrow bands *h*, two for each guide-plate—that is, one for each groove *d*—which bands also pass between the guide-plates D and bed-plate B and then around the roller *e*. The grooves *d* are separated for a short distance and then converge into one groove just broad enough to take in the two bands *h*. Thus the two bands *h* are drawn gradually together as they travel longitudinally. Between these traveling bands *h* and the bands or belts H on the bed-plate the folded rubber strip J is drawn by means of the rollers E *e g* G, so that as the bands *h* bear upon the butt-joint of the folded india-rubber or other strip the effect is to draw together the naphtha-prepared edges and to hold them in contact for a sufficient length of time and with sufficient pressure to enable proper evaporation and adhesion to take place.

The tube, with its finished joint, as it emerges from between the traveling bands *h* H may be supported and removed from the apparatus by a carrier-band K or otherwise, as desired. The tube J may be fed forward to the apparatus described by traveling bands *j*, passing around the roller C.

In the construction shown in Figs. 6 to 11 I cause the converging traveling bands *h* to pass around the rollers L M, the roller L being provided with two flanges or guides for each pair of bands *h*, which hold the bands together, while the roller M is provided with three such flanges, which hold the bands separated. These flanges effect a result corresponding to that of the grooves in the guide-plates aforesaid, the bands being separated while they pass around M, but drawing together as they approach the roller L. Two other rollers N O are shown to enable the bands *h* to press effectually upon the tube J, and the rollers L M N O may all or part be

geared in any suitable manner; but in the construction shown N is driven from O by a belt *n* and O may be driven by a belt over the pulley *p* from any source of motion, while L and M are driven by the contact of N and O. The roller O may also serve to drive carrier-bands *j*, which feed forward the tubes J, through the folding-tubes T, thereby reducing friction. A removing carrier-band is also shown, as in the former case. (Represented by Figs. 1 to 6.)

As shown in Figs. 8 and 9, a middle guide-piece *r* serves to guide the bands *h*. The roller L is here shown mounted upon the framing A of the apparatus; but the roller M is mounted upon an arm S at each extremity, such arms S being hung to the shaft of the roller L. This enables the shaft M to be turned over upon L as a fulcrum, the roller N being previously removed, whereby the condition of the tube beneath may be inspected without disturbing any of the bands *h* in relation to their guides.

In Figs. 10 and 11 an adaptation of the invention to the "folding-tubes" of a tube-making machine is indicated, which may be substituted for the guide-plates or guide-rollers. T′ is the "former" or "shaper," provided with converging grooves *u*. The bands *h* are indicated in dotted lines, and in similar manner a core or mandrel V is shown to support the band. Variations in detail—such as the shape or angle of the converging grooves, also the number and arrangement of the draw-rollers and the arrangement for gearing such of them as are requisite to be geared and the arrangement and form of the pressure roller or rollers, also the constitution of the traveling bands—may be made without departing from the peculiar character of the invention.

While my invention is designed more especially for joining the edges of tubes, it may be used to unite the edges of any form of material—such as flat sheets, for instance—and such use is within the scope of my invention.

Without limiting myself to the precise construction and arrangement of parts shown, I claim—

1. In apparatus for joining the edges of rubber or similar materials, bands, and means for moving and guiding the same so that they approach each other and thereby force the edges to be joined tightly together, substantially as described.

2. In a tube-making apparatus, traveling means for folding in the edges of a traveling strip, combined with means for drawing and holding said edges together, substantially as described.

3. In a tube-making apparatus, means for folding in the edges of a traveling strip, combined with two traveling bands, with means for causing them to bear on said folded-in portions and for bringing them gradually together, substantially as set forth.

4. The combination in a tube-making apparatus, of a part having converging grooves and endless bands traveling through said grooves, and means for conducting and supporting a folded strip adjacent to said bands, substantially as set forth.

5. In a tube-making machine, the combination of an open folding-tube, T, a conveyer-belt passing through said tube, substantially as set forth.

6. The combination with the folding-tube, of traveling means for bringing and holding together the edges of the strip folded in said tube, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY J. DOUGHTY.

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