C. F. JENKINS.

APPARATUS FOR MAKING SPIRALLY WOUND TUBES.

APPLICATION FILED MAY 25, 1908.

921,842. **Patented May 18, 1909.**

2 SHEETS—SHEET 1.

Fig. 1.

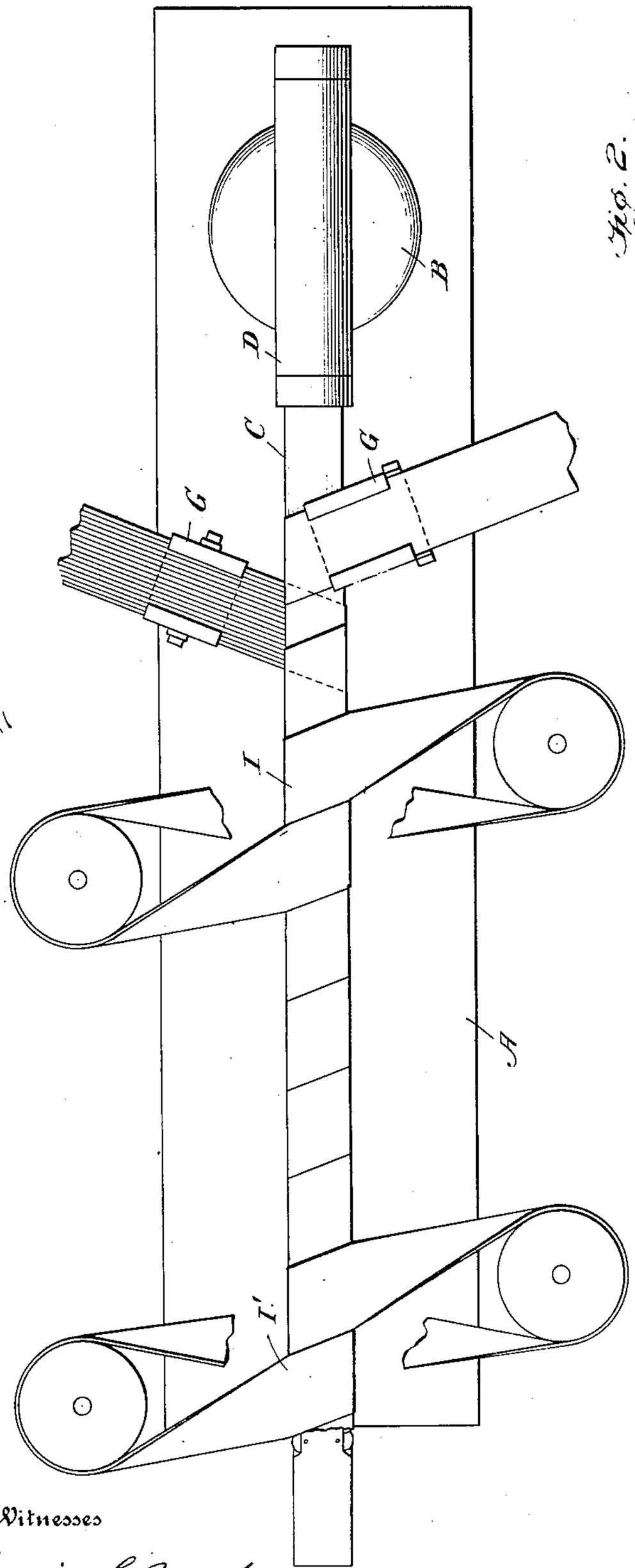
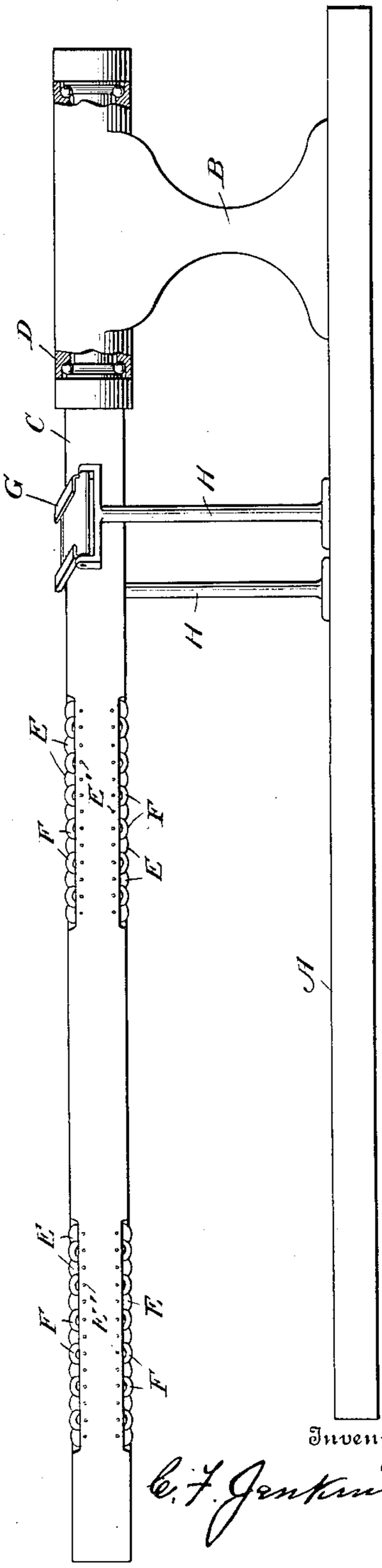


Fig. 2.



Witnesses

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Fig. 4.

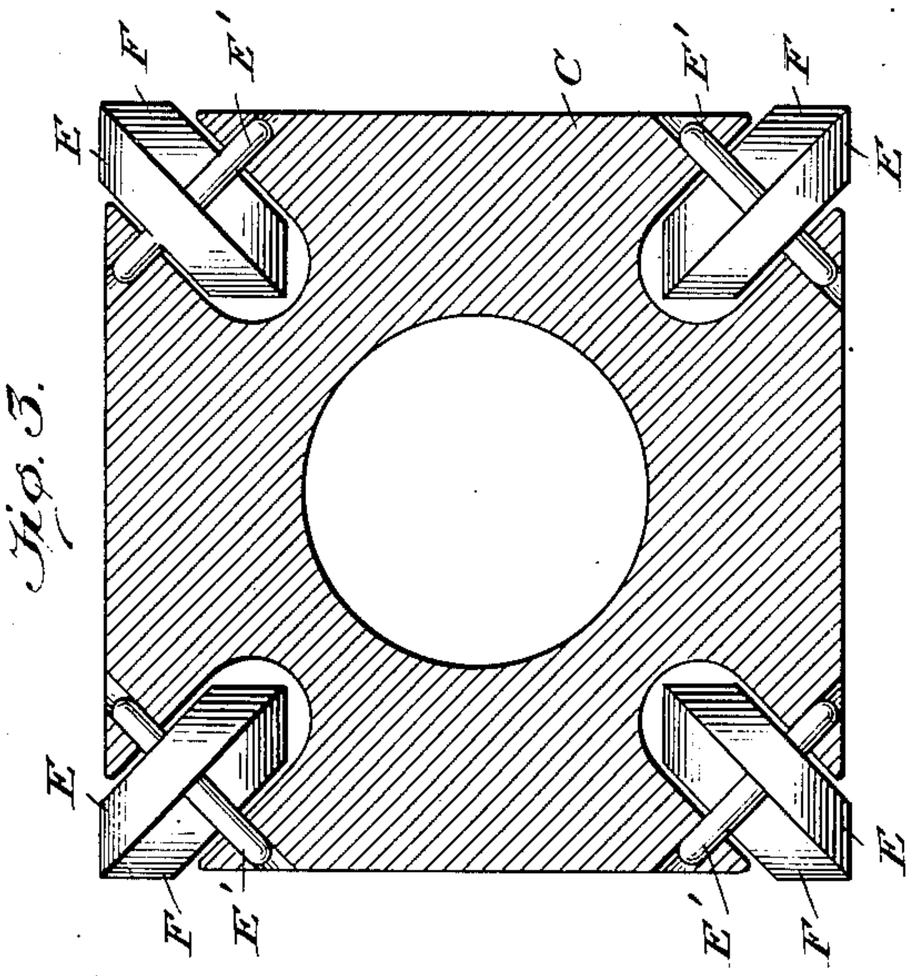

Fig. 3.

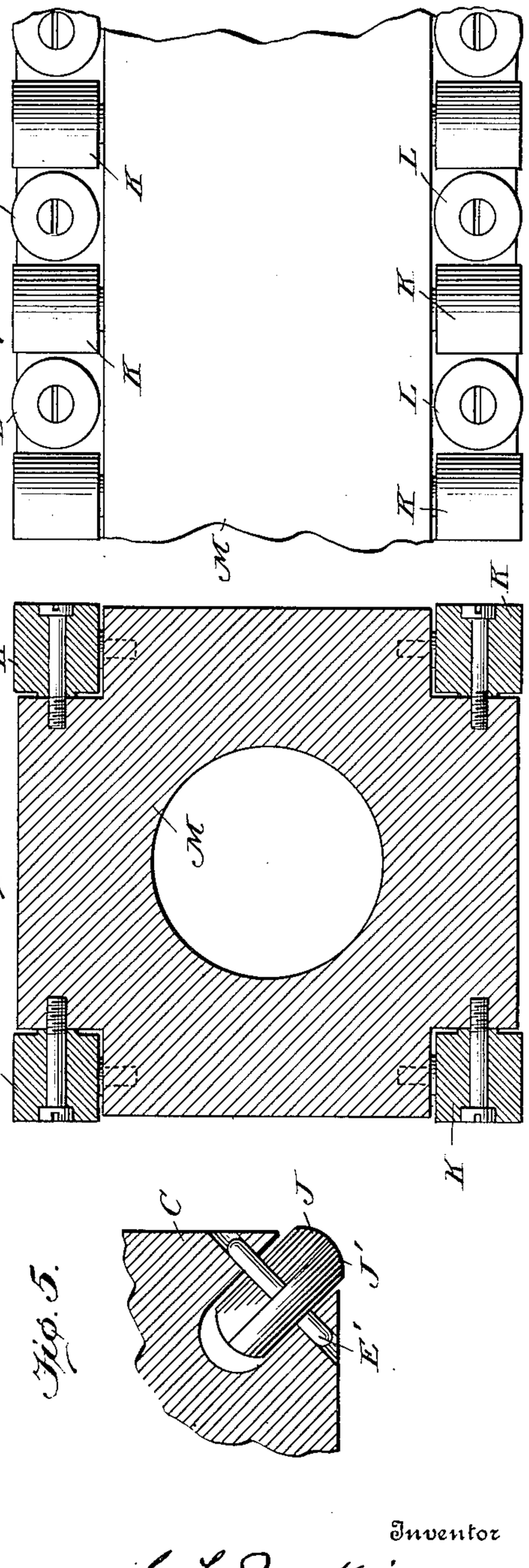

Fig. 7.

Fig. 6.

Fig. 5.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MAKING SPIRALLY-WOUND TUBES.

No. 921,842. Specification of Letters Patent. Patented May 18, 1909.

Application filed May 25, 1908. Serial No. 434,727.

To all whom it may concern:

Be it known that I, CHARLES FRANCIS JENKINS, citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Apparatus for Making Spirally-Wound Tubes, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to making paper tubes and particularly to making spirally wound square tubes of any desired length.

Cylindrical tubes are made by winding strips spirally around a fixed mandrel and continually sliding the formed tube forward; and a very successful method of doing this is by passing one fold of an oblique endless belt around the mandrel and then continually feeding a strip of paper beneath this fold. As the paper slips upon the mandrel more easily than on the belt it is continually advanced along the mandrel while being wound about it by the belt. Usually two parallel laterally overlapping strips are gummed and passed under the belt together, and the inclination of the belt and strips to the mandrel are such that with the proper width of strip the edges of the strip forming either the inner or the outer tube-wall layer are abutted so that the layer is practically continuous. Such tubes are employed for many purposes, and are extensively used for making boxes, being cut into short lengths and provided with paper bottoms and closures,—the whole sometimes being waterproofed with paraffin or the like. For making boxes of this general kind a square tube is on many accounts highly desirable, but it has not heretofore been found practicable to produce a square tube in this manner, since a square tube obviously cannot turn on a mandrel which it fits, nor can it be produced by any prior method, so far as I am aware, that can compete in cost with round tubes.

The leading object of this invention is to obviate this difficulty, and this end is attained by using a novel mandrel and allowing the same to rotate freely under the action of a paper winding belt.

In the accompanying drawings, Figure 1 is a plan view of the apparatus with the strips being wound and advanced by two belts. Fig. 2 is a side elevation of the spindle, its supports, and the paper guides. Fig. 3 is an enlarged cross section through a portion of the mandrel around which the belt passes. Fig. 4 is a corresponding side elevation. Fig. 5 is a fragmentary cross section corresponding to Fig. 3 and showing a slight modification. Figs. 6 and 7 are views corresponding to Figs. 3, 4, respectively, but showing a further modification.

In these views, A represents a suitable base upon which is fixed a standard B, and C is a square mandrel having one end revolubly mounted in bearings, preferably ball or roller bearings, D, carried by said standard. This mandrel consists of a square bar of metal having its corners cut away at certain points to receive a series of slightly separated conical rollers E, E mounted to rotate freely upon shafts E′ set in the mandrel at an angle of 45° with the plane of one of its faces, the arrangement being such that a plane slightly without and parallel to the corresponding plane face of the mandrel will be tangent to all the rollers E which are at that angle or corner of the mandrel. In the same angle of the mandrel are similarly mounted like but oppositely turned rollers F which alternate with and overlap the rollers E. These rollers F all project equally slightly beyond a second face of the mandrel in precisely the same manner as the rollers E, and their outer sides lie in a plane at right angles to the tangent plane before mentioned, while the extreme outer edges of the larger bases of the two sets of rollers lie in the intersection of the two planes. Two like sets of rollers are similarly mounted in each of the four corners of the mandrel, and if paper be wound about this portion of the mandrel it will bend sharply over the many slightly separated points, of the rollers, which lie in the said lines of intersection and its intermediate portions will be flat upon the rollers slightly outside of and parallel to the corresponding face of the body of the mandrel, thus forming a square tube slightly outside and larger than that body. This tube will be free to slide longitudinally of the mandrel since it is in contact with the rollers only, and it will be made to so slide by the action of the endless belt I, having one fold wound about the mandrel as usual.

To feed the strips to the belt two oppositely inclined guides G are provided to de-

liver the two strips upon opposite sides of the mandrel, at a little distance from the belt, after glue or other adhesive has been applied to the proper surfaces by devices not shown. These guides are hinged to supporting standards H so that they rise and fall with the raising and lowering of the strips by the rotation of the square mandrel which is slightly enlarged between the guides and the rollers. The angle at which the strips meet the mandrel is proportioned to the size of the latter and the width of the strips, so that each complete turn of the mandrel will carry the strip forward through a distance equal to its width measured parallel to the axis of the mandrel, and thereby the edges are caused to abut. As is usual, the strips are so delivered that they break joints.

Where the formed tube in advancing along the mandrel leaves the belt above mentioned and the rollers upon which belt presses it, it meets no resistance being larger than the body of the mandrel, but to aid the forming belt in feeding it, a second segment of the mandrel is provided with rollers in form and arrangement like those already mentioned, and about this segment passes a belt I′ similar to the other. The end of the formed tube being inserted within the mandrel encircling fold of this belt, the tube is thereafter drawn forward with the greatest certainty under all probable conditions and is delivered from the free end of the mandrel continuously as a fully set square tube which may be subsequently cut into short segments as desired.

In some cases it is desirable to have the corners of the tube rounded, particularly when pressed one-piece flanged closures are to be applied in making boxes therefrom, and in such cases the rollers may all be rounded as shown at J J′, Fig. 5. It is also quite possible to use cylindrical rollers K, K, L, L, as shown in Figs. 6 and 7 where M represents the mandrel. In this case the axes of the rollers at each angle are parallel alternately to the two adjacent faces of the mandrel, and both the outer sides and outer ends of the rollers should project slightly beyond the corresponding faces of the body of the mandrel. In either form shown the paper total contact surface is but a small fraction of that of the entire mandrel, and even if the rollers all failed to rotate or were purposely fixed so that they became in effect mere rounded protuberances, friction would be slight and the tube slipping over them more easily than in the bight of the belt, the tube would be fed forward so as to give fairly practical results.

What I claim is:

1. In tube forming devices, the combination with a non-cylindrical mandrel provided with rounded surface projections adapted to hold stock wound about it out of contact with its main surface and facilitate the slipping of the stock along the mandrel, of strip delivering devices alongside the mandrel, and means for winding the strips delivered by said devices spirally about the mandrel and for sliding the formed tube along the latter.

2. In tube forming devices, the combination with a revolubly mounted non-cylindrical mandrel provided with surface projections adapted to hold stock wound about it out of contact with its main surface, of means for winding stock strips about the mandrel and at the same time sliding them along the latter.

3. In tube forming devices, the combination with a revolubly mounted mandrel of rectangular cross section of a series of rollers mounted in each side or face near its margins and projecting outwardly beyond said faces.

4. In tube forming mechanism, the combination with a revolubly mounted mandrel of rectangular cross section provided with series of rollers projecting outward beyond its surfaces near their margins, of two similar belts equally inclined to the mandrel and each having one fold wound about the mandrel, and means for delivering stock strips obliquely into the bight of one of the belts.

5. The combination with the revoluble square mandrel provided with the two series of projecting rollers in each of its faces, of an oblique endless belt having one fold passed around the mandrel, and hinged guides arranged to deliver stock strips obliquely to the mandrel and to rise and fall as the rotation of the mandrel raises and lowers the strips carried by the guides, respectively.

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

CHARLES FRANCIS JENKINS.

Witnesses:
WALLACE GREENE,
W. CLARENCE DUVALL.