

E. T. GREENFIELD.
TUBING.
APPLICATION FILED DEC. 29, 1905.

966,396.

Patented Aug. 2, 1910.

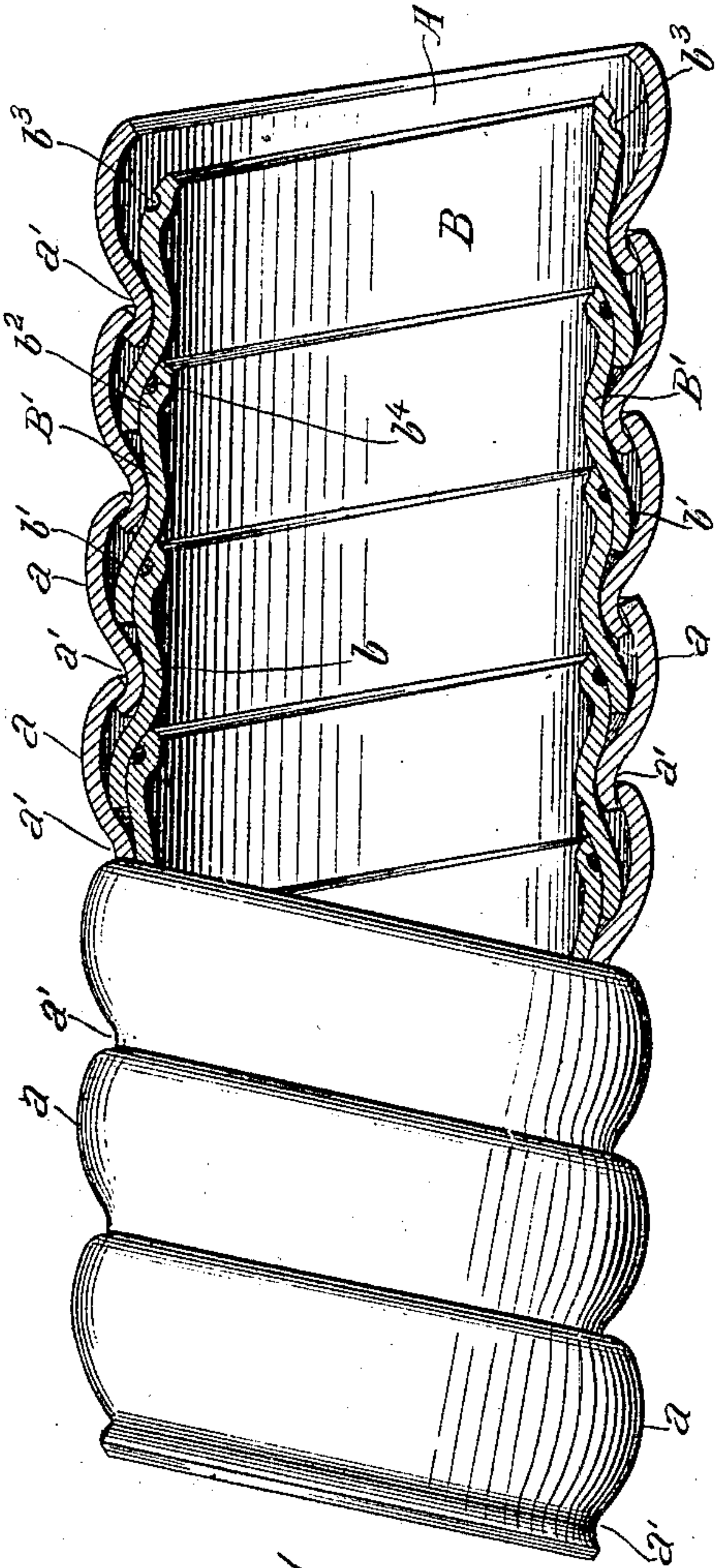


Fig. 1

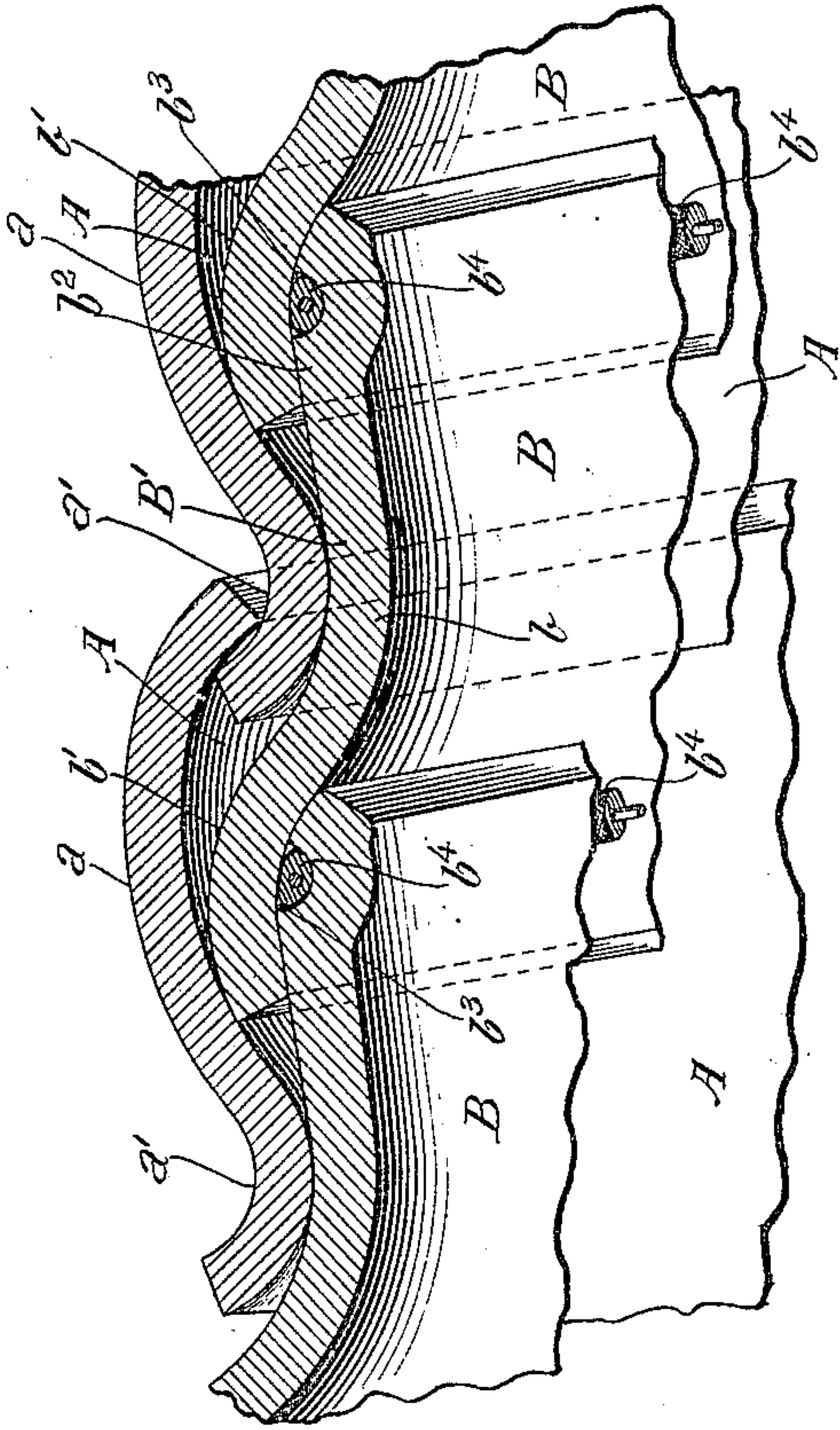


Fig. 2

WITNESSES:

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EDWIN T. GREENFIELD, OF KIAMESHA, NEW YORK.

TUBING.

966,396.

Specification of Letters Patent.

Patented Aug. 2, 1910.

Application filed December 29, 1905. Serial No. 293,784.

To all whom it may concern:

Be it known that I, EDWIN T. GREENFIELD, a citizen of the United States, residing at Kiamesha, in the county of Sullivan and State of New York, have invented a certain new and useful Improvement in Tubing, of which the following is a specification.

The object of the present invention is to produce a metallic tube capable of use either for inclosing a cable or electric conductors or for conducting fluid pressure, which shall be possessed of maximum strength combined with the necessary flexibility and the walls whereof shall at all times be of substantially the same thickness, whether the tube be straight or bent. In the latter respect the invention is designed as an improvement upon certain existing types of tubing in which as the same are bent, as, for instance, in passing the same around a corner in the operation of house-wiring, certain joints are opened so that the enveloping material at these points is possessed of less strength than are the other portions of the tubing. Thus, where the tubing is used for inclosing electric conductors of the character used in house-wiring, these, when the tubing is straight, are protected commonly by a double thickness of the material used. When the tubing is bent, however, and the joints between the successive spirals opened, the conductors are protected, at certain points, by but a single thickness of the material, this spanning the spirals which have been separated as the tubing has been bent.

In carrying out the invention, I form in effect a tube within a tube, the material used for each being in the form of a metallic strip. Each of these strips is preferably passed between coacting die-rolls and laterally curved, so that when the same are subsequently, by means of suitable winding, forcing or other apparatus, formed into successive spirals, one of such spirals will overlap and interlock with the next adjacent spiral. As this operation proceeds, what is practically another tube, composed also of laterally-curved metallic strips, is formed within the tube first named, and, also like the latter, the edge of one spiral overlapping the edge of the next adjacent spirals. In flexing a tube so constructed, the spirals of the inner tube are moved relatively to each other, the spirals of the outer tube permitting this more by reason, preferably, of

their resiliency than by the bodily movement (*i. e.*, one part sliding or moving along the surface of the adjacent part) which characterizes the movement of the spirals of the inner tube. The extent of overlap of the spirals of the inner tube is such as to permit any required degree of movement without affecting the interlocking relation of these spirals.

A preferred form which the invention may take is illustrated in the drawings, in which—

Figure 1 is a side elevation, partly in section, of a tube constructed in accordance with this invention, and Fig. 2 is an enlarged detail view, illustrating a portion of the tubing shown in Fig. 1.

Referring to these drawings, it will be seen that each of the tubes A and B is formed of a single metallic strip. Prior to the spiraling operation, this strip is laterally curved, as, for instance, by means of coacting die-rolls of the general character of those illustrated in Patent No. 630,503, granted to me August 8th, 1899. In the present instance, this lateral curvature is shown as comprising the convex portion *a* and the concave portion *a'*. The strip so laterally curved is formed into successive spirals by means of a mandrel, a bending die or other suitable apparatus, the edge of one spiral overlapping upon and interlocking with the edge of the next adjacent spiral. As this operation is performed, the inner tube B is similarly spiraled, both operations proceeding simultaneously. Said inner tube B is, like the outer tube A, formed of a single strip *B'*, and this, also like the strip above described, is given a lateral curvature, such, for instance, as that illustrated in the drawing. At about its longitudinal center, the strip *B'* is provided with a concavity *b*, and, on either side of this, with a convexity *b'*, *b*². In winding, bending or otherwise forming the strip *B'* to form the inner tube B, the edge of one spiral is caused to overlap upon the edge of the adjacent spiral a substantial distance, as clearly shown in Fig. 2. If desired, during the process of laterally curving the strip *B'*, the same may be provided, at the point at which it is to be overlapped after being spiraled, with a groove *b*³, and in this may be placed a gasket *b*⁴, the same being fed or drawn forward as the strip *B'* is fed or drawn forward for the spiraling operation, and said gasket being

preferably slightly compressed as the spirals are formed in the process of constructing the inner tube.

I prefer to so construct the spirals of the outer tube A that the same will oppose some resistance to bending, permitting such bending largely, if not chiefly, by reason of the resiliency of the metal of which such outer tube is composed. On the other hand, I also prefer to so construct the spirals of the inner tube that, the outer tube permitting, these spirals may be moved relatively to each other, the engaging portions of the overlaps sliding or moving more or less readily upon each other. The structure so characterized is preferred for practical reasons. Also I prefer for various reasons, as, for instance, economy of space, that the overlaps of the inner tube B be arranged to alternate with the overlaps of the outer tube A, as clearly shown in the drawings.

In tubing constructed in accordance with this invention, there are, as will be seen, no joints to be opened as the structure is flexed or bent. Normally the parts occupy the position and relation illustrated in the drawing. As the tubing is bent, however, there is no separation of the spirals, the overlaps (and in addition the resiliency of the material where this is utilized) permitting such bending while, however, maintaining the same wall-diameter whether the tubing be bent or straight.

Having now described my invention, what I claim as new therein and desire to secure by Letters Patent is as follows:—

1. The combination of a tube consisting of a spirally formed metallic strip curved laterally to provide a convex and a concave portion, the edges of adjacent spirals of said

tube overlapping and interlocking, and a second tube inclosed within said tube consisting of a spirally formed metallic strip curved laterally to provide a concave portion and on either side thereof a convex portion, the edges of adjacent spirals of said second tube overlapping and interlocking, the overlapping edges of the spirals of the second tube underlying the convex portion of the strip of the outer tube and the overlapping edges of the spirals of the outer tube overlying the concave portion of the strip of the inner tube, substantially as set forth.

2. The combination of a tube consisting of a spirally formed metallic strip curved laterally to provide a convex and a concave portion, the edges of adjacent spirals of said tube overlapping and interlocking, a second tube inclosed within said tube consisting of a spirally formed metallic strip curved laterally to provide a concave portion and on either side thereof a convex portion, the edges of adjacent spirals of said second tube overlapping and interlocking, the overlapping edges of the spirals of the second tube underlying the convex portion of the strip of the outer tube and the overlapping edges of the spirals of the outer tube overlying the concave portion of the strip of the inner tube, and a gasket between the overlapping edges of the strip of the inner tube, substantially as set forth.

This specification signed and witnessed this 27th day of December, 1905.

EDWIN T. GREENFIELD.

Witnesses:

J. O. EDMONDS,
I. McINTOSH.