No. 846,996. PATENTED MAR. 12, 1907.

E. T. GREENFIELD.

TUBING.

APPLICATION FILED JAN. 24, 1906.

Fig. 1,

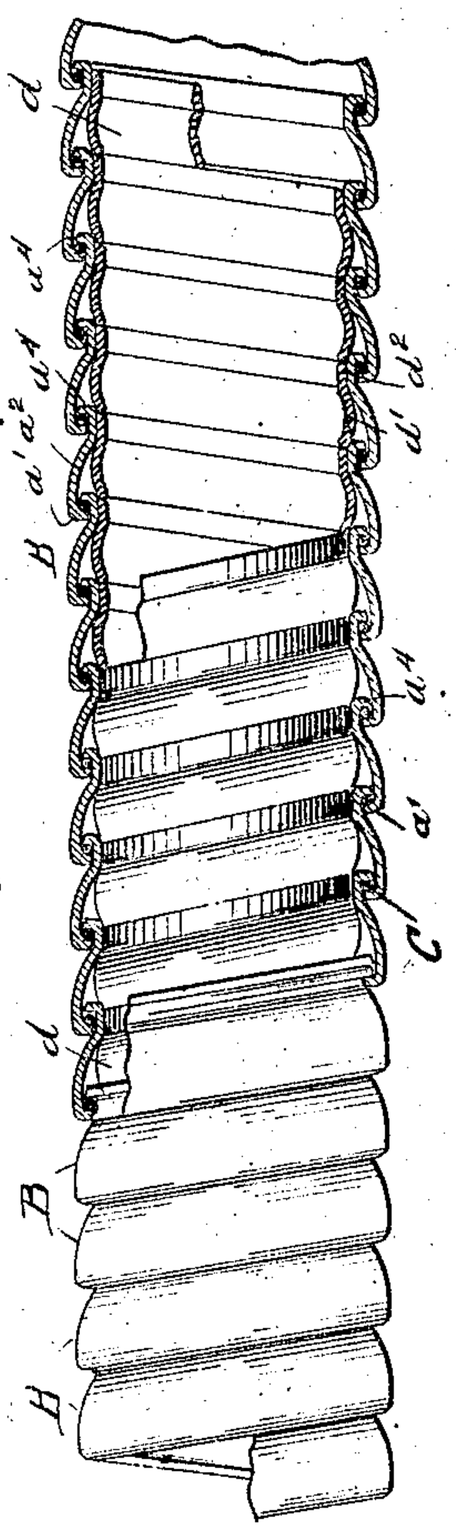


Fig. 2,

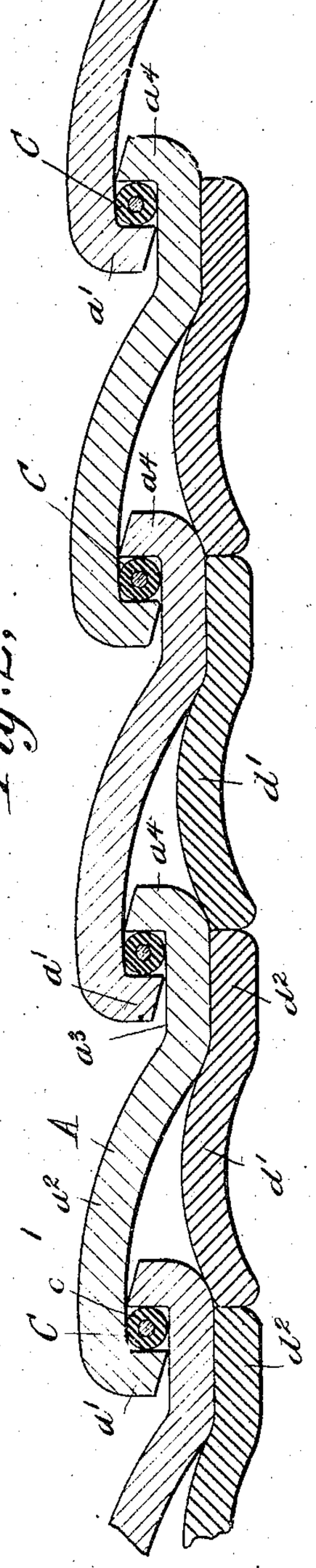


Fig. 4,

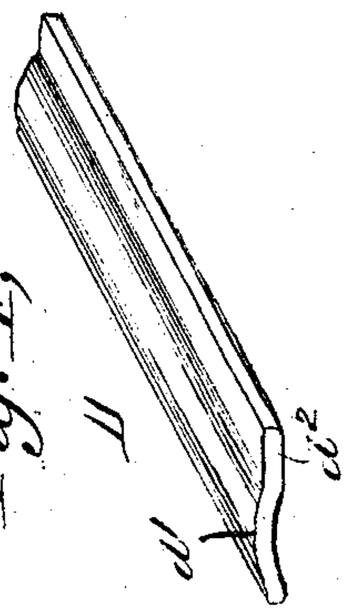
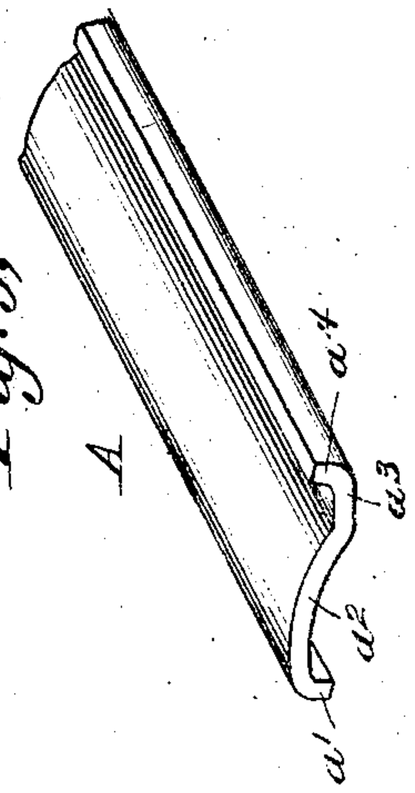


Fig. 3,



WITNESSES:

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TUBING.

No. 846,996. Specification of Letters Patent. Patented March 12, 1907.

Application filed January 24, 1906. Serial No. 297,644.

To all whom it may concern:

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

The invention concerns generally that type of tubing employed for inclosing electric conductors, either as conduit or as armor therefor, or for the transmission of a fluid agent—such, for example, as steam.

The object is to provide a simple and durable structure which may readily be made in large quantities, which shall be sufficiently flexible to meet the requirements of practical use, which shall possess maximum strength whether straight or bent, and which shall when used as conduit for electric wires and the like present a smooth interior, permitting the ready and easy fishing of the wires therethrough.

In a preferred form of the invention I construct the tubing of two concentric tubes, each made of a spirally-formed strip, preferably of metal. Previous to the spiraling operation each of these strips is laterally curved by any suitable means—such, for example, as the die-rolls described and illustrated in Letters Patent No. 630,502, heretofore granted to me. As a result of this lateral curving the strip from which the outer series of spirals is formed is provided at each edge with a flange, one turned outwardly and the other inwardly, so that the successive spirals formed from such strip shall interlock but be capable of the requisite degree of movement relatively to each other to produce the desirable feature of flexibility. Within the tube so formed, and preferably as the same is formed, I place another tube, also comprising successive spirals of a single strip of metal. This strip also may be curved laterally; but as the same is spiraled its edges instead of overlapping, as do the edges of the spirals of the outer tube, are brought into alinement in substantially the same plane, thereby forming butt-joints. The spirals of the inner series immediately underlie those of the outer series, and while preferably the same may not when the tube as a whole is flexed or bent move a substantial distance toward or from each other they may readily move out of their normal plane, still leaving the interior of the tube smooth where the same is used as conduit for the passage of the wires.

A preferred form in which the invention may be employed is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section. Fig. 2 is an enlarged section. Fig. 3 is a portion of the strip from which the spirals of the outer tube are formed, and Fig. 4 is a portion of the strip from which the inner tube is formed.

Referring to these drawings, A designates the strip from which the spirals B B of the outer tube are formed. By means, for example, of the die-rolls above referred to this is curved between its lateral edges, preferably as shown in Fig. 3, being provided with an inturned flange a' at one edge, the outwardly-bowed portion a^2, the substantially flat portion a^3, and the outwardly-projecting flange a^4 at the lateral edge opposite the inturned flange a'. This strip is by means of suitable bending or winding mechanism formed into a series of successive spirals B B, each spiral overlapping an adjacent spiral and the inturned flange a' of one spiral coacting with the outwardly-turned flange a^4 of the next adjacent spiral. As this spiraling operation proceeds I preferably pass between such flanges a suitable gasket C, which may be of wire provided with an elastic or compressible covering c of rubber, fabric, or other desired material.

As will be readily understood, the outer spirals B B are capable of movement, within predetermined limits, not only toward and from each other, but also out of the normal plane thereof.

D designates the strip from which the spirals d d of the inner tube are formed. This strip may, if desired, be spiraled in the flat; but I prefer to form the same with an outwardly-bowed portion d' and a substantially flat portion d^2, the former underlying the outwardly-bowed portion a^2 of one of the outer spirals B and the latter underlying the substantially flat portion a^3 of such spiral. In the spiraling operation, during which preferably both the outer and the inner series of spirals B and d are formed simultaneously, the spirals of the outer series are made to overlie those of the inner series and are interlocked in the manner above stated, while those of the inner series are butt-jointed, the

joints of the inner series of spirals being, therefore, adjacent to those of the outer series of spirals. If the spirals B B be so formed as to permit movement toward and from each other in the same plane, the latter movement may result in correspondingly separating the spirals *d d*. This separation, however, necessarily occurs at points where the tube is adequately protected by the overlaps of the spirals of the outer series, and thus does not result in weakening the structure. The return movement of the spirals B B brings the edges of the spirals *d d* again together, as shown in the drawings. The curvature of the strip from which said spirals *d d* are formed is deemed desirable as aiding in maintaining the proper relation between these spirals and those of the outer series B B.

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

1. A series of interlocking and relatively movable spirals and a series of butt-jointed spirals incased therein, the spirals of the inner series being laterally curved and coacting with the outer series to prevent displacement lengthwise thereof, substantially as described.

2. A series of laterally-curved, interlocking and relatively movable spirals having gaskets, and a series of butt-jointed spirals incased therein, said spirals being movable relatively to each other and the spirals of the inner series being laterally curved and coacting with the outer series to prevent displacement lengthwise thereof, substantially as described.

3. A series of interlocking and relatively movable metallic spirals and a series of butt-jointed spirals incased therein and directly underlying those of the outer series, the spirals of the inner series being laterally curved and coacting with the outer series to prevent displacement lengthwise thereof, substantially as described.

4. A series of metallic spirals each having edge flanges one of which overlaps an edge flange of the adjacent spiral, a gasket between said overlapping flanges and a series of butt-jointed spirals incased within said series first named, the spirals of the inner series being laterally curved and coacting with the outer series to prevent displacement lengthwise thereof, substantially as described.

5. A series of metallic spirals, each having edge flanges one of which overlaps an edge flange of the adjacent spiral, and a series of butt-jointed spirals incased therein, the joints between the spirals registering substantially with those of the outer series, the spirals of the inner series being laterally curved and coacting with the outer series to prevent displacement lengthwise thereof, substantially as described.

This specification signed and witnessed this 22d day of January, 1906.

EDWIN T. GREENFIELD.

Witnesses:

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D. S. EDMONDS.