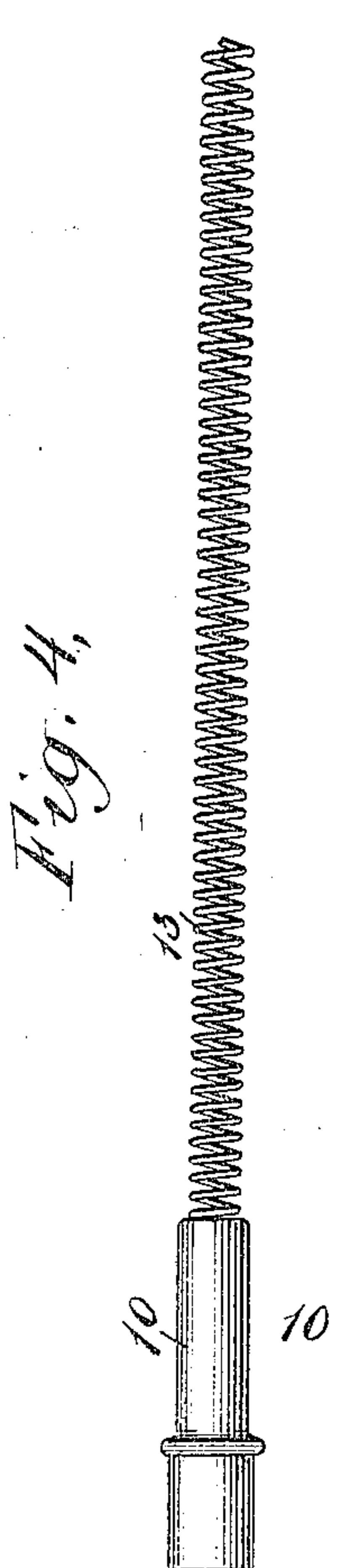
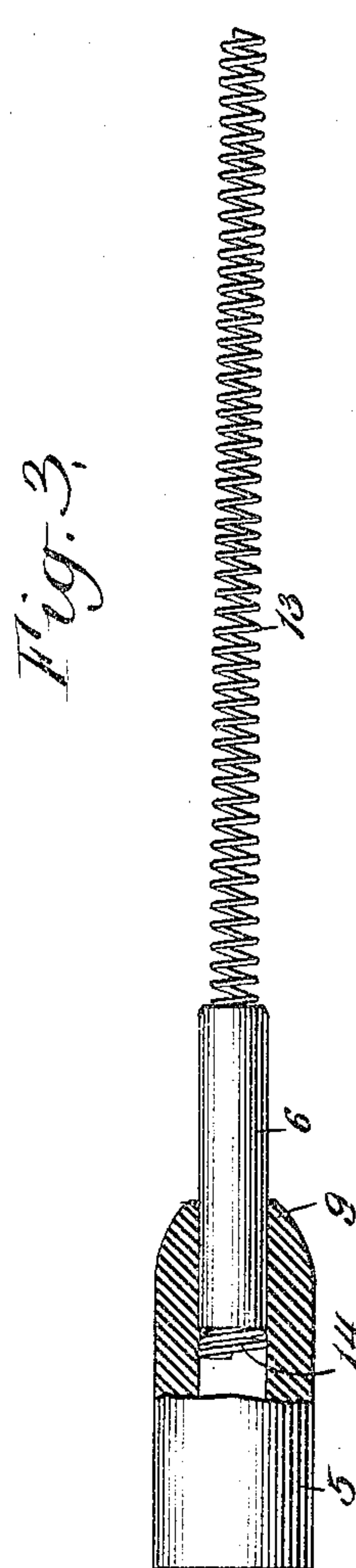
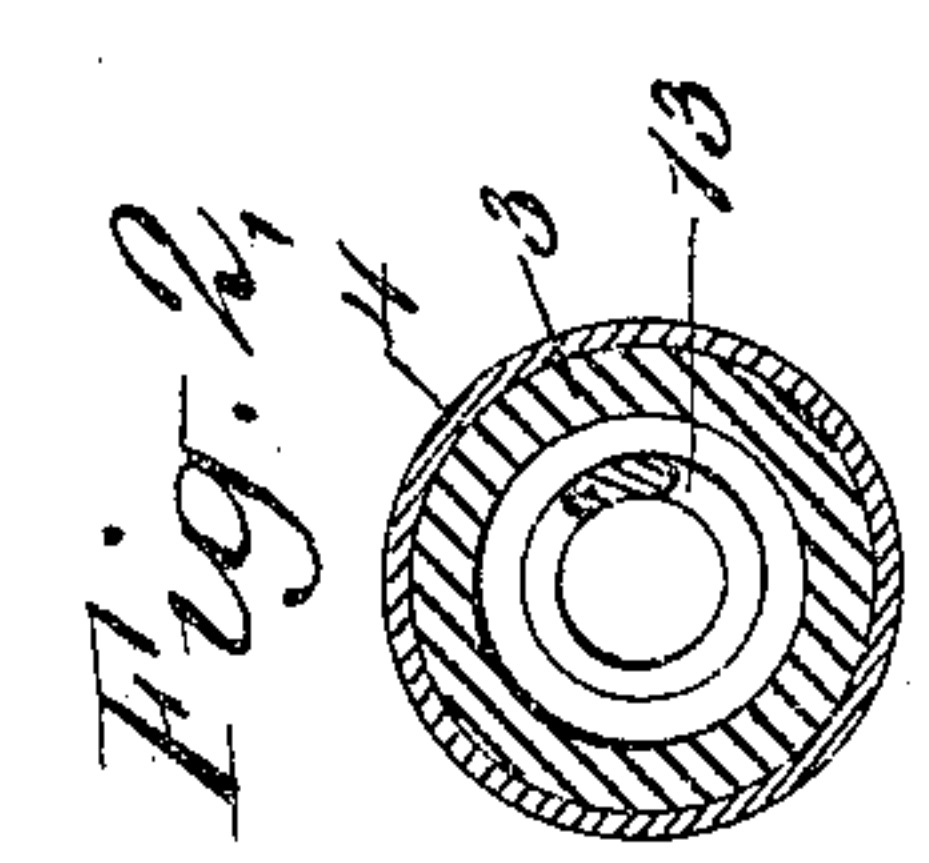
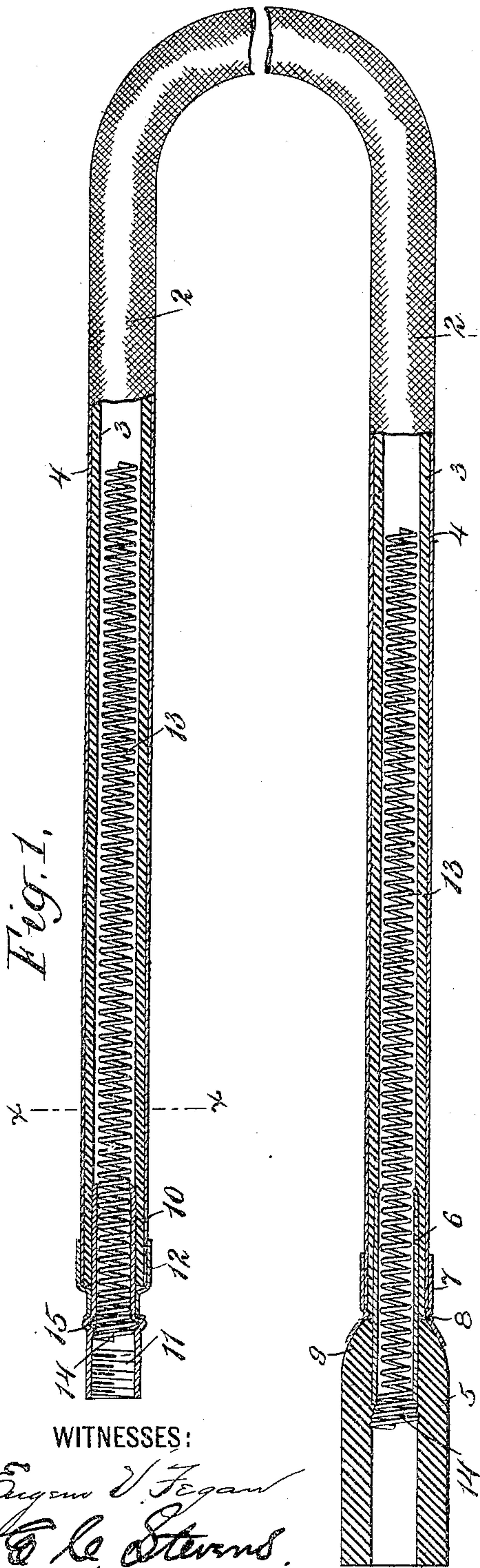


A. W. NICHOLLS.
FLEXIBLE TUBE AND CONNECTION.
APPLICATION FILED JUNE 1, 1904.



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FLEXIBLE TUBE AND CONNECTION.

SPECIFICATION forming part of Letters Patent No. 790,971, dated May 30, 1905.

Application filed June 1, 1904. Serial No. 210,692.

To all whom it may concern:

Be it known that I, ALBERT W. NICHOLLS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Flexible Tubes and Connections, of which the following is a specification.

This invention relates to flexible tubing, with particular reference to comparatively short lengths of flexible tubing which provide a detachable and adjustable connection between a portable heat or light generating burner and a fixed source of fuel-supply. As is well known, the yielding and elastic nature of such tubing permits of the moving of the lamp, stove, or other device at the discharge end of the tube to almost any point within the circle which may be described with the permanent connection as a center and the tube as a radius. This flexible tube, however, while capable of sharp curvature, cannot be abruptly bent at an angle without causing not only a temporary collapse of the tube-body at the angle and a consequent closure of the channel, but a permanent impairment of the necessary elasticity of the material at that point. Such abrupt bending rarely occurs at points intermediate of the ends of the tube, but is likely to and frequently does occur at or near one or the other of the points of attachment, due to the gradually-increasing rigidity of the tube toward either connection.

This invention contemplates simple means for preventing collapse of the tube, due to bending at points most exposed to lateral strains, and, further, improved means for detachably connecting each end of the tube to the lamp or burner and to the fixed hose-cock, respectively. This flexible tubing is generally marketed in graduated lengths, which are equipped with what are known as the "lamp" and "hose-cock" connections.

One object of the present invention is therefore to provide connections which may readily be secured to and removed from the tubing by any one of ordinary intelligence without the employment of a skilled workman, thereby permitting of the purchase of the tubing alone in any length desired and

without the connections, which may be applied by the purchaser, enabling him to utilize connections from tubing which has been worn out or has been otherwise rendered unfit for further service.

My invention consists generally in novel means for reinforcing the resistance of the tube-body to lateral strains, in making the reinforcing means removable, in novel means for combining or joining the connection and the reinforcing means in a connection so equipped, and in a flexible tube provided with any one or more of the above features.

My invention further consists in various other novel details of construction and in combination of parts, all as hereinafter more fully described, and particularly pointed out in the claims.

My invention will be more readily understood by reference to the accompanying drawings, in which I have illustrated a practical and convenient embodiment thereof, and in which—

Figure 1 is a central longitudinal section, part broken away, of a flexible tube having end connections embodying my invention. Fig. 2 is a transverse section substantially on the line *xx* of Fig. 1. Fig. 3 is a view, partly in section, of one connection equipped with the tube-reinforcing means. Fig. 4 is a similar view of the other connection.

Referring now to the drawings in detail, numeral 2 refers to a section of flexible tubing, which may be of any desired character or construction, the one shown comprising the rubber center 3 and the exterior protecting braid or fabric 4, preferably with the usual thin gelatin coat therebetween. This tubing may be manufactured in very long lengths, from which may be cut from time to time shorter lengths adapted for the particular conditions of practical use. As is well known, one end of this tube is designed to be connected with in a manner to form a flexible continuation of a permanent supply-pipe, such as one of the burners of a chandelier from which the tip has been removed or a hose-cock projecting through the wall or otherwise from any pipe in which gas is under pressure from the

constant source of supply. For this connection the tube is usually provided with a heavy cylindrical soft-rubber attachment 5, which has heretofore been permanently secured to the tube 2. To make this connection detach-
 5 able, easily manipulated by one not skilled in this line, and still safely gas-tight, I prefer to employ a short length of metallic, preferably brass, tubing 6, substantially one-half of
 10 which is frictionally held within the bore of the heavy tube 5 by the elasticity of the material. The other portion thereof projects longitudinally from the said member 5 and is adapted to be similarly inserted into the
 15 smooth bore of the tube 2, the diameters of these members being such that the metal tube 6 is similarly frictionally held with reasonable security within the tube 2.

Adapted to be snugly fitted over the end of the tube 2 is a metallic, preferably nickel or
 20 brass, ferrule 7, which is cylindrical throughout that portion of its length overlying and snugly embracing the extremity of the tube 2, at the end of which, however, it is contracted
 25 to smaller diameter and then expanded to form a wedge or cone shaped receptacle 8 for the extremity 9 of the member 5, which is correspondingly shaped to interfit therein. I have found that this construction provides a per-
 30 fectly gas-tight joint the permanency and efficiency of which, however, may be enhanced through the employment of a little liquid glue. This heavy rubber connection 5, as is well known, is designed to be by pressure snugly
 35 fitted upon and over the usual stepped or wedge-shaped hose-cock, the natural elasticity of the rubber insuring a gas-tight temporary joint. Attachment to the supply-pipe of the lamp, stove, or burner is usually of a
 40 more permanent character, including a metal connection which is provided with either exterior or interior screw-threads meshing with interior or exterior screw-threads upon the projecting extremity of the supply-duct
 45 leading to the burner. To provide a detachable connection of this character, I have shown a metallic tube 10, having screw-threads 11, which, while shown interior of said tube in the drawings, may obviously be
 50 either interior or exterior, depending upon the character of the cooperating member in the portable burner. A portion of this metallic tube 10 is adapted to be inserted within the bore of the tube 2 and held therein with
 55 reasonable security by the elasticity of the tube-body. Cooperating with the tube 10 is the ferrule 12, which, similar to the ferrule 7, is cylindrical throughout a portion of its length and adapted to overlie and embrace
 60 the end of the tube 2. This ferrule 12 is similarly contracted at the extremity of the tube 2 to a diameter approximately equal to an exterior diameter of the metal tube 10, so that there will be a certain amount of frictional
 65 resistance to relative sliding movement. An

annular substantially wedge-shaped chamber is thus formed between these members adapted to securely contain the end of the tube 2.

In the above I have described simple forms of detachable connections embodying in themselves distinct improvements; but I prefer to further increase the efficiency of the device by providing means for reinforcing the resistance of the tube-body near the extremities thereof to lateral strains, which tend to collapse said body and completely or partially to close the channel therein. For this purpose I employ a comparatively short coil 13, of spring-wire, the diameter of the coil being slightly less than the diameter of the bore of
 80 tube 2 and which when inserted into said tube is non-interferent with the flexible character of said tube, and yet absolutely prevents the abrupt bending or collapsing of the tube occasioned by any ordinary use where supported or reinforced by the spring-coil 13.

I am aware that, generally speaking, the employment of a coil of wire within a rubber tube for the purpose above is not new. Such employment has, however, been heretofore
 90 confined to a coil which extends continuously throughout the whole length of the tube. Such a construction is for the purposes of this invention objectionable for the reason that the continuous coil decreases capacity
 95 and increases friction. Furthermore, the continuous coil is liable to be "mashed" by accidental pressure, and thus be rendered unfit for use, while tubing having no wire at its center will yield to direct pressure to the point
 100 of complete collapse and return to its original condition at once upon release from the pressure.

In the present invention the tube 2 has a perfectly smooth bore to points near either
 105 extremity thereof, the reinforcing-coil 13 being employed only where there is greatest liability to abrupt bending and collapse. For convenience I prefer to make each reinforcing-coil a part of its adjacent connection. In
 110 this manner I provide for the withdrawal of the coil from the tube when the connection is removed, whereby the tube alone may be easily and readily renewed at any time. In this manner I also insure these coils being retained in
 115 their proper positions at the ends of the tube. I therefore prefer to secure one of the coils 13 to the metallic tube 10 at one end of the tube 2 and the other coil to and within the rubber connection 5 at the other end of the tube 2. These
 120 members may obviously be joined or held together in many ways. I have found, however, that the simplest and best manner of carrying out this idea is by expanding one end of the coil 13 to form a cone or bell-shaped ex-
 125 tremity 14. This extremity may be forced into the tube 10, although the diameter of the bore of said tube is considerably less than the greatest diameter of the enlarged portion of the coil. An annular groove or socket 15
 130

may be provided within the tube 10, into which the enlarged extremity of the coil 13 will expand and cannot be subsequently removed therefrom without destroying the coil.

5 At the other end of the tube 2 similar insertion of the enlarged end 14 of a coil 13 may be forced into the metal tube 6 and through the same, and when the interior extremity of said tube 6 is reached the enlarged end 14 of said
10 coil will force itself against and into the soft rubber of which the member 5 is made and similarly resist effort to withdraw except upon application of force sufficient to destroy the coil.

15 Attention is particularly directed to the fact that my improved tubing may be employed between a hanging chandelier and a table-lamp without the employment of what is known as "gooseneck," the only function of
20 which is to avoid collapse of the tube when it is bent for connection with the elevated fixture.

Many modifications of minor details of my improved flexible tubing and connections will
25 doubtless readily suggest themselves to those skilled in the art to which it appertains, and I therefore do not desire to limit my invention to the specific construction herein shown and described.

30 Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In combination, a flexible tube, a detachable connection, and a removable wire coil secured to said connection.

2. The combination, with a flexible tube, of 35 a detachable connection and a coil of wire secured to said connection free of and projecting into said tube.

3. The combination, with a flexible tube, of a detachable connection and a coil of wire free 40 within said tube and having a flared or expanded end engaging the interior wall of said connection.

4. A connection for flexible tubes comprising a sleeve of elastically-yielding material, a 45 rigid tube partially inserted and frictionally held within said sleeve, and means projecting from said rigid tube for reinforcing the flexible tube-body against collapsing strains.

5. A connection for flexible tubes comprising a sleeve of elastically-yielding material, a 50 rigid tube partially inserted and held within said yielding member, and a wire coil projecting from said rigid tube.

6. A connection for flexible tubes comprising 55 a sleeve of elastically-yielding material, a rigid tube partially inserted and held within said sleeve, and a wire coil having an expanded end engaging the yielding interior wall of said sleeve, said coil extending through and pro- 60 jecting from said rigid tube.

In testimony of the foregoing I have hereunto set my hand in the presence of two witnesses.

ALBERT W. NICHOLLS.

Witnesses:

AGNES L. CLUNE,
J. F. CAVANAGH.