

No. 817,059.

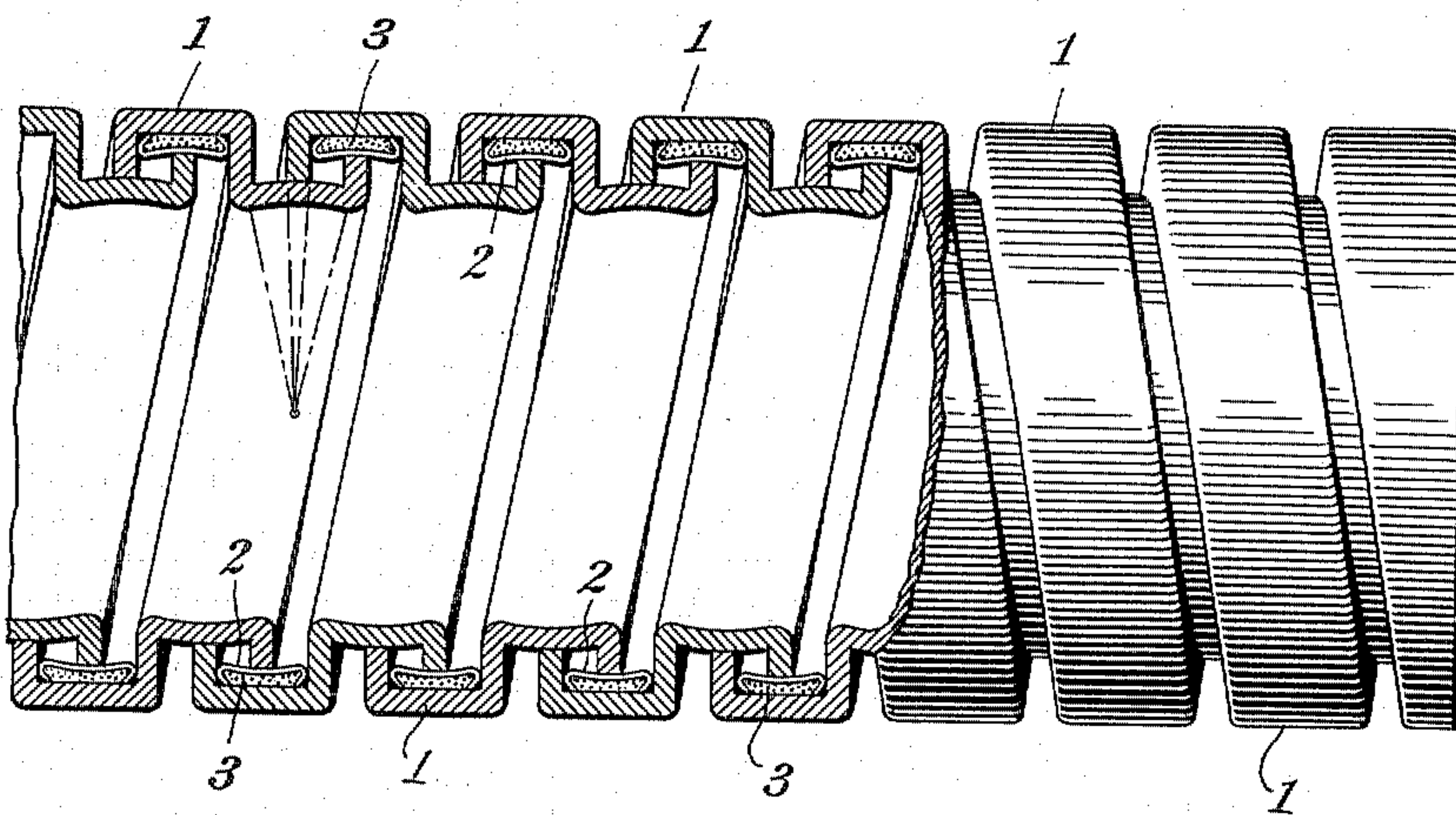
PATENTED APR. 3, 1906.

E. T. GREENFIELD.

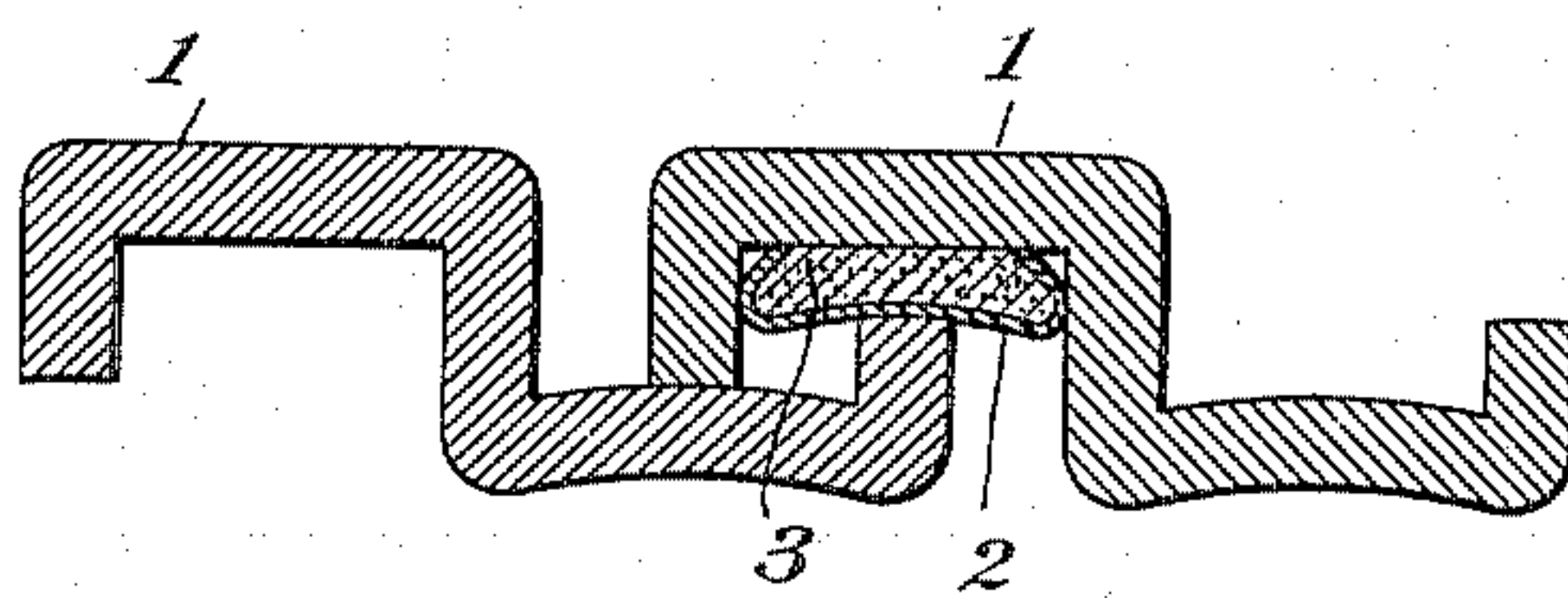
FLEXIBLE TUBE.

APPLICATION FILED APR. 12, 1905.

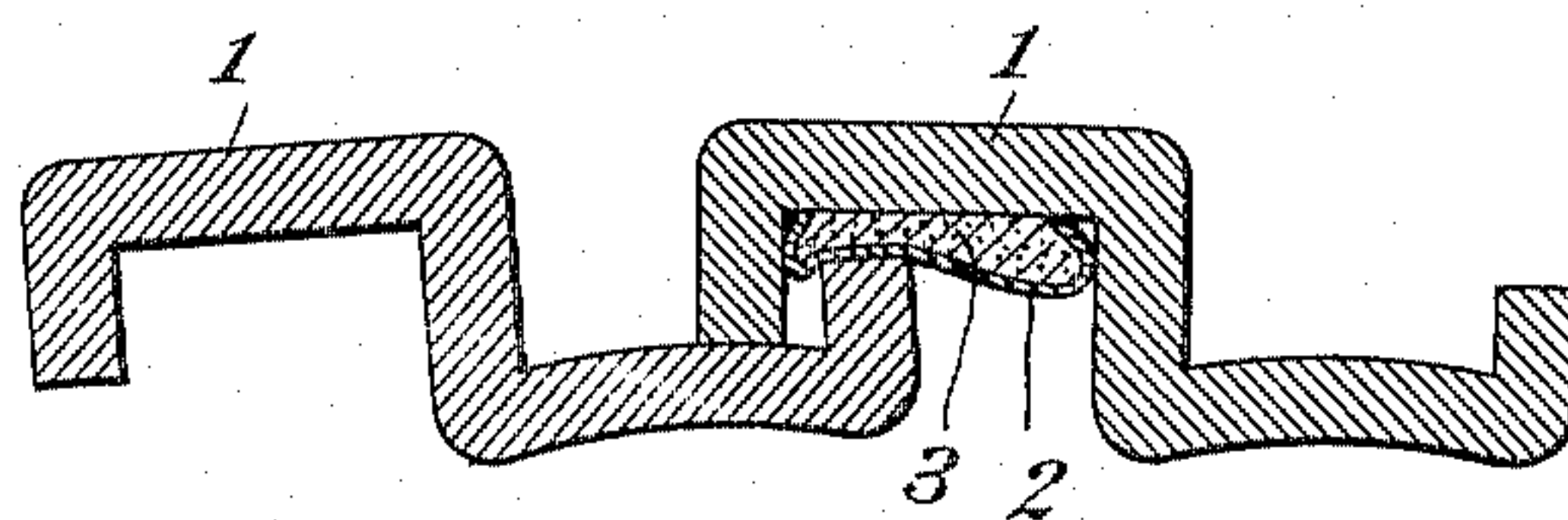
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



WITNESSES:

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# UNITED STATES PATENT OFFICE.

EDWIN T. GREENFIELD, OF MONTICELLO, NEW YORK.

## FLEXIBLE TUBE.

No. 817,059.

Specification of Letters Patent.

Patented April 3, 1906.

Application filed April 12, 1905. Serial No. 255,148.

*To all whom it may concern:*

Be it known that I, EDWIN T. GREENFIELD, a citizen of the United States, residing at Monticello, county of Sullivan, and State of New York, have made a new and useful In-  
vention in Flexible Tubes, of which the fol-  
lowing is a specification.

My invention is directed particularly to improvements in flexible tubes constructed  
of one or more spirally-wound interlocking  
strips of metal—such, for instance, as is dis-  
closed in numerous United States patents  
heretofore granted to me; and it has for its  
objects, first, the construction of such a tube  
in such manner as to give to the same great  
strength with the desired flexibility and in  
such manner as to be water and gas tight un-  
der extreme pressures and under all condi-  
tions of usage; second, the construction of  
such a tube from a single strip of metal with  
a spirally-disposed spring-gasket between  
the interlocking parts and of such material as  
will withstand great heat and be of great  
durability; third, the construction of such a  
tube with a spirally-wound spring-gasket be-  
tween the outer locking edge of the inner part  
and the inner surface of the outer part, said  
gasket being adapted to yieldingly withstand  
indefinite wear and strain, thus enabling it to  
be used as a hose or conveying-pipe under  
conditions where enormous pressures are  
transmitted and at practically all temper-  
atures.

For a full and clear understanding of my  
invention, such as will enable others skilled  
in the art to construct the same, reference is  
had to the accompanying drawings, in which—

Figure 1 is a part longitudinal sectional  
part side elevational view of a short section  
of tube constructed in accordance with my  
improvement. Fig. 2 is an enlarged detail  
sectional view showing the relation of the in-  
terlocking parts and the spring-gasket when  
the tube is in normal condition, and Fig. 3 is  
a similar view illustrating the same when the  
tube is put under a bending strain.

1 represents a spirally-disposed strip of  
metal having a substantially S cross-section  
and constructed, preferably, in the manner  
disclosed in prior patents heretofore granted  
to me, by forcing a strip of steel and the seal-  
ing-gaskets through a screw-threaded die,  
which will give to it the conformation just in-  
dicated and will also cause the overlapping  
edges thereof to interlock in the manner  
shown, the inner portion of the strip having

the cross-sectional curved formation indi-  
cated and the outer portion thereof a rec-  
tangular conformation, such that when the  
tube is bent the outer or exposed locking edge  
will bear upon the curved portion and move  
in each instance in a radius extending from  
the axial center of the tube, as indicated in  
dotted lines.

2 is a yielding or flexible strip of non-oxi-  
dizable metal, preferably bronze-copper,  
which has the formation in cross-section  
shown, and 3 is a strip of packing or porous  
material, preferably asbestos, located within  
the grooved portion of this strip, the arrange-  
ment being such that when all of the parts  
are formed and interconnected in the man-  
ner shown there results an absolutely water  
or gas tight joint throughout the lengths of  
the spirals. The flexible strip 2 is so con-  
structed, as shown, that when the tube as-  
sumes any curvature the interior locking edge  
thereof rests upon the longitudinal center of  
this strip and moves in curves corresponding  
to the curvature indicated by the dotted ra-  
dial lines, the gasket as a whole assuming the  
conformation illustrated in Fig. 3. It will be  
clear on inspection of the drawings that this  
gasket is located between the outer surface of  
the entire interlocking edge of each part of  
the completed tube and fills the entire inner  
surface of the tubular corrugations in the  
loop or body portion of the S-shaped con-  
struction in cross-section. Such a tube  
when thus constructed possesses the greatest  
flexibility and greatest possible strength  
when made of a steel strip of the desired cross-  
section.

I have ascertained that by reason of the  
yielding nature of the flexible strip 2 and the  
porous packing 3, which together constitute  
a sealing strip or gasket, I am enabled to pro-  
duce an absolutely water and gas tight tube  
of the greatest possible strength both as to its  
power to withstand radial pressure from the  
liquid or gas confined therein and as to the  
locking relation of the locking edges of the  
strip.

I am aware that heretofore a tube has been  
constructed of spirally-wound interlocking  
strips of metal having gaskets of soft rubber  
between the interlocking edges, as disclosed  
in United States patent to Herbert Knight,  
No. 367,301, granted July 26, 1887, and I  
make no claim hereinafter broad enough to  
include such a structural device. I have as-  
certained that a flexible tube constructed in



the manner indicated in the before-mentioned patent deteriorates materially in use, particularly when hot water or steam is conveyed therethrough, for two reasons—first, by reason of the rapid wear of the gasket, and, second, by reason of the vulcanization of the rubber—while my improvement by reason of the yielding or spring nature of the metallic gasket and its inclosed porous medium possesses great strength, as before pointed out, and overcomes the objections above enumerated. Furthermore, with my novel flexible tube the gasket being of yielding material and located between the bearing-surfaces of the successive spirals it is rendered assuredly water and gas tight. Nor do I limit my novel tube to a single strip-armor, as obviously two interlocking strips might be used with radially-disposed spring-gaskets. To illustrate, two spring-gaskets might be used with the two interlocking spiral strips disclosed in the before-mentioned patent to Knight and come within the generic idea of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. A flexible tube constructed of a spirally-wound metal strip having interlocking edges and a sealing-gasket located between the outer surface of the inner interlocking edge and the entire inner surface of the outer tubular part of the strip.

2. A flexible tube constructed of a spirally-wound metal strip of substantially S cross-section; in combination with a sealing-gasket located between the entire inner surface of one part of the strip and the outer or locking edge of the other part thereof.

3. A flexible tube constructed of a spirally-

wound strip of metal having interlocking edges and a flexible metallic gasket located between the entire inner surface of one part and the interlocking edge of the next adjacent part.

4. A flexible tube constructed of a spirally-wound strip of metal having a cross-section of substantially S form; in combination with a spirally-wound gasket filling the space between the interlocking edges of the inner part and the interlocking inner surface of the outer part of the strip.

5. A flexible tube constructed of a spirally-wound strip of metal having a cross-section of substantially S form, one part thereof being curved exteriorly; in combination with a spirally-wound yielding gasket between the outer surface of the locking edge of said part and the entire inner surface of the other part.

6. A flexible tube constructed of spirally-wound interlocking parts and a spirally-wound gasket located between the outer surface of the locking edge of said part and the entire inner surface of the other part.

7. A flexible tube made of spirally-disposed strip metal having interlocking edges; in combination with a spring-gasket located between the entire bearing-surfaces of the successive spirals, so that the outward pressure of the confined liquid or gas holds all of the parts of the tube in firm contact and renders the same practically liquid and gas tight.

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

EDWIN T. GREENFIELD.

Witnesses:

C. J. KINTNER,  
M. F. KEATING.