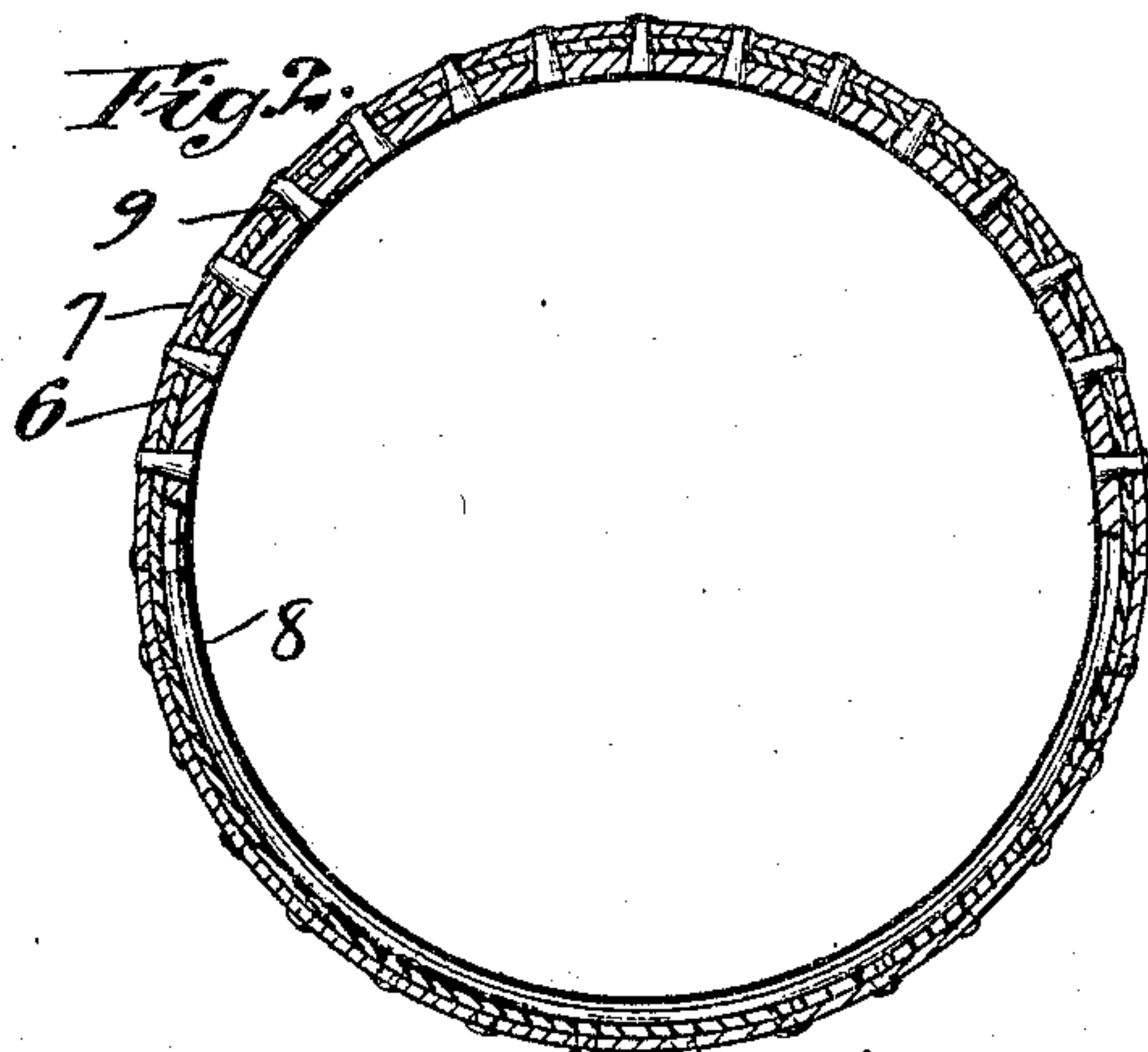
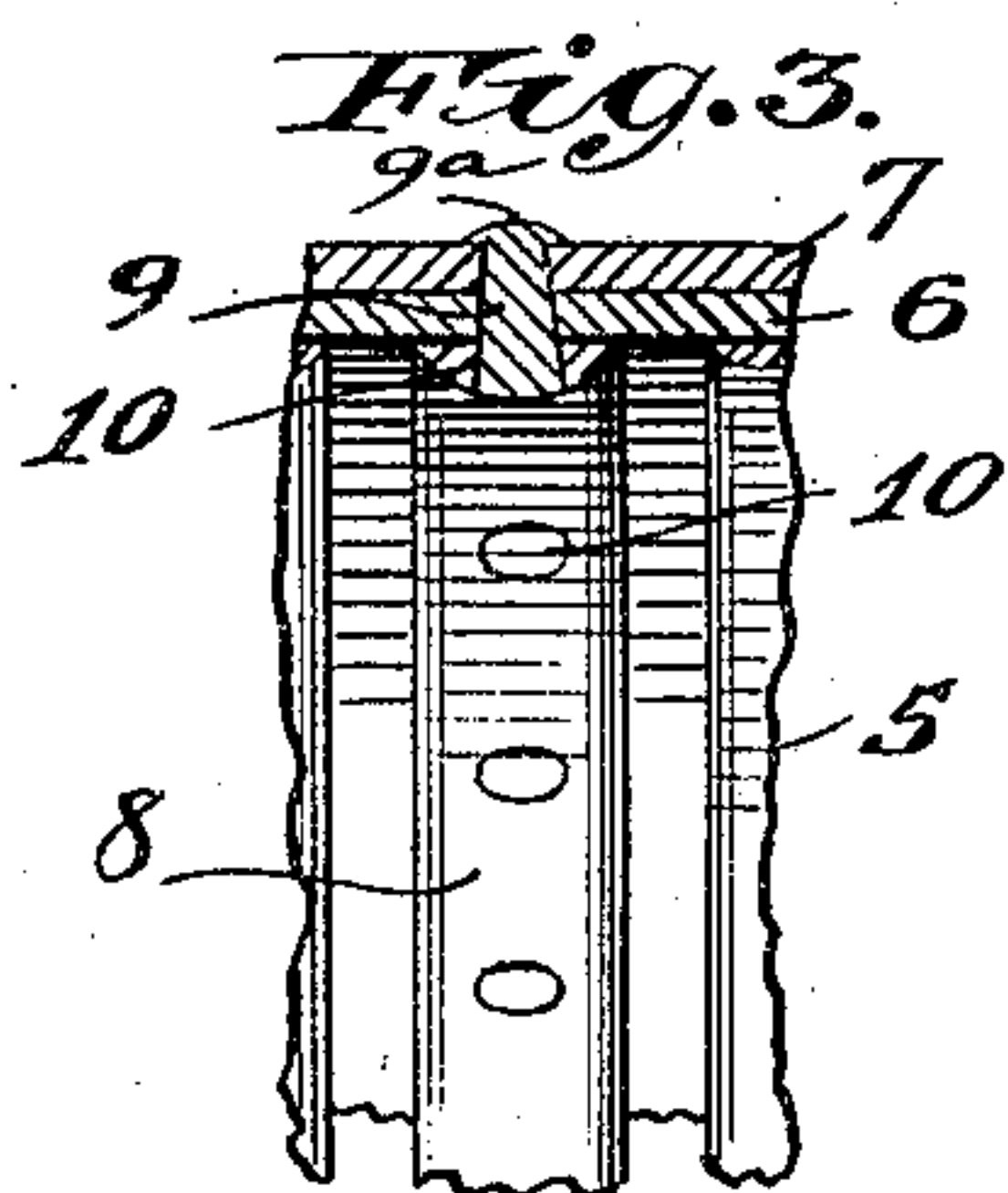
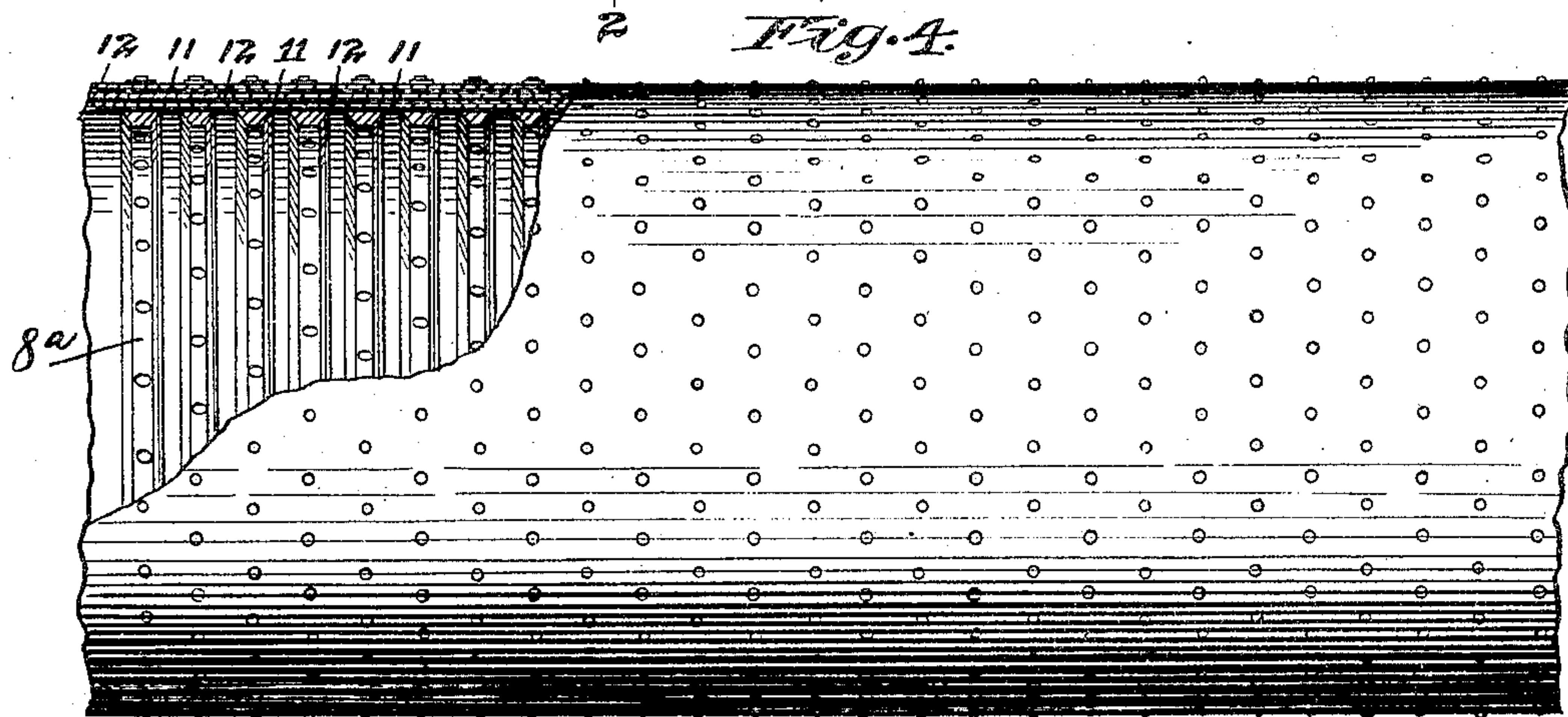
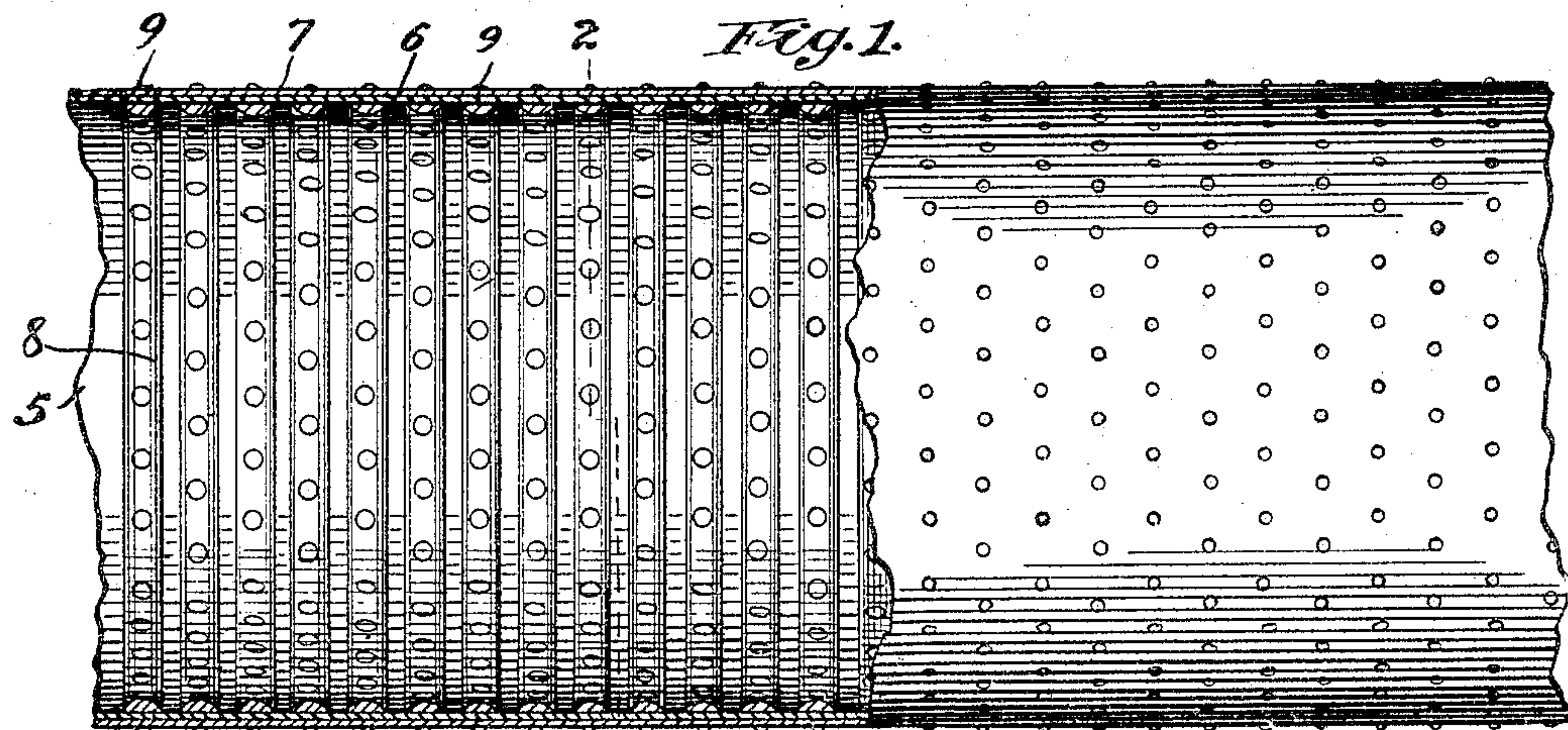


No. 789,948.

PATENTED MAY 16, 1905.

E. T. WILLIAMS.  
ARMORED FLEXIBLE TUBING.  
APPLICATION FILED DEC. 28, 1903.



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# UNITED STATES PATENT OFFICE.

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## ARMORED FLEXIBLE TUBING.

SPECIFICATION forming part of Letters Patent No. 789,948, dated May 16, 1905.

Application filed December 28, 1903. Serial No. 186,796.

*To all whom it may concern:*

Be it known that I, EZRA T. WILLIAMS, a citizen of the United States, residing at Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Armored Flexible Tubing, of which the following is a specification.

My invention relates to flexible tubing—such, for instance, as is extensively employed in hydraulic dredging apparatus for the transference of spoil discharged from hydraulic dredges. In such dredging systems the suction and discharging apparatus on the dredge is connected on its suction side with the cutter by a section of flexible hose, and on its discharge side it is connected by a similar section with the bank or other depository of the spoil. Experience has demonstrated that these hose-sections at the points where they lead off from the hull of the dredger sag and kink more or less, with the result that the gravel and other abrasive substances frequently found in the spoil wear upon the inwardly kinked or bent portion of the hose, not infrequently cutting it entirely through, and thus creating an imperfect suction on one side and a leaky discharge on the other.

It is the object of the present invention to eliminate this fault through a construction of armored hose which shall eliminate the formation of the sharp or angular kinks which have heretofore existed at certain points in spoil-conducting hose and which shall furthermore present an armored or wear-resisting surface at such points in the hose where more or less deflection or curvature of the latter is inevitable.

To this end my invention consists in an improved armored hose for the purpose above referred to and similar purposes constructed substantially as hereinafter described, and more particularly defined in the appended claims.

Referring to the drawings, which illustrate my invention in a preferred form, Figure 1 is a side elevational view, partly in central longitudinal section, of a section of hose embodying my improvements. Fig. 2 is a cross-sectional view thereof on the offset line 2 2 of Fig. 1. Fig. 3 is a detail fragmentary view more particularly illustrating the preferred

form of rivet employed for securing the internal reinforcing-rib to the hose; and Fig. 4 is a side elevational view, partly broken away to disclose the internal structure of a slightly-modified form of hose and armor.

Referring to Figs. 1, 2, and 3, 5 designates as an entirety a section of hose, which may consist of an inner rubber tube 6, surrounded by an outer sheath or covering of heavy fabric 7, cemented to or vulcanized or otherwise united therewith. 8 designates each of a series of annular metallic ribs secured in close parallel relation to the inner wall of the hose by means of rivets 9. These annular ribs 8 are preferably made of brass and of a semi-oval form in cross-section, and the holes drilled therethrough for the reception of the rivets 9 are preferably and as shown in Fig. 3 of tapered formation, having their greatest diameter at their inner ends. The rivets 9 are also formed with tapered stems or shanks, largest at their inner ends, to fit the apertures 10, the outer projecting ends of the rivets being flattened down and headed on the outer side of the hose, as shown at 9<sup>a</sup>.

The above-described construction of hose, while permitting all necessary longitudinal flexibility thereof to enable the hose to accommodate itself to the necessary turns and curves, nevertheless effectively prevents the formation of sharp or angular kinks or transverse bends therein, which have hitherto proved such weak points, owing to the abrading character of the material conducted therethrough, and, furthermore, at points where the hose is necessarily curved or bent to some extent, thus producing increased wear on the longitudinal convex inner surface of the hose, the metal ribs 8 receive such abrasion and wear and protect the flexible wall of the hose therefrom. The peculiar means of attaching the ribs or hoops 8, hereinabove described and shown in connection with Fig. 3, secures an important advantage in that it permits a considerable wearing away of the metal ribs without impairing the fastening, since the relative taper of the engaging walls of the rivet and rib whereby the latter is maintained united to the inner surface of the hose remains so long as any considerable thickness of the metal of the rib is left.



Fig. 4 of the drawings shows a hose made up of several alternate layers of rubber and reinforcing fabric (designated by 11 and 12, respectively) and shows metal ribs or hoops 5 8<sup>a</sup>, which are angular instead of rounded in cross-section. The operation of these latter and the results secured thereby are the same as in the construction shown and described in connection with Figs. 1, 2, and 3, this 10 last-described construction being illustrated merely to show one of numerous detail modifications that might be employed within the spirit and purview of the invention.

From the foregoing it will be seen that my 15 invention provides a simple and comparatively inexpensive means of stiffening and strengthening a hose against the transverse kinks which arise in connection with sharp turns in the direction of lead of the hose and further 20 increases the durability of the inner or wearing surface of the hose at such points, thus rendering it less likely to be cut or worn through by the material for which it forms a conduit.

25 My invention is not concerned with the character or make of the hose, since it is obviously applicable to advantage with any kind of flexible hose adapted for the transmission of abrasive material therethrough. It is evident, as 30 illustrated by Fig. 4, that the invention might be considerably modified in respect to details without departing from the principle or sacrificing any of the advantages thereof, and hence I do not limit the latter to such detail 35 features except to the extent that they are made the subject of specific claims.

I claim—

1. A hose provided with a series of independent annular ribs secured to and projecting within the inner surface thereof at close 40 intervals, said ribs being laterally symmetrical and adapted to permit the flow of material through the hose with equal facility in either direction, substantially as described.

2. A hose provided with a series of independent 45 annular metal ribs secured to the inner surface thereof at close intervals, each of said ribs having a flat outer periphery engaging the inner wall of the hose and a rounded inner periphery permitting flow of material 50 thereover with equal facility in either direction, substantially as described.

3. The combination with a hose, of means for preventing sharp transverse bends or kinks therein consisting of a series of independent 55 annular metal ribs substantially semi-oval in cross-section, and rivets securing said ribs with their flat sides to the inner surface of the hose, substantially as described.

4. The combination with a hose, of means 60 for preventing sharp transverse bends or kinks therein consisting of a series of independent annular metal ribs substantially semi-oval in cross-section applied to the inner surface of the hose, and tapered rivets uniting said ribs 65 to the hose, substantially as and for the purpose described.

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