

No. 713,560.

Patented Nov. 11, 1902.

L. P. DODGE.
PAPER CONDUIT.

(Application filed Apr. 1, 1902.)

(No Model.)

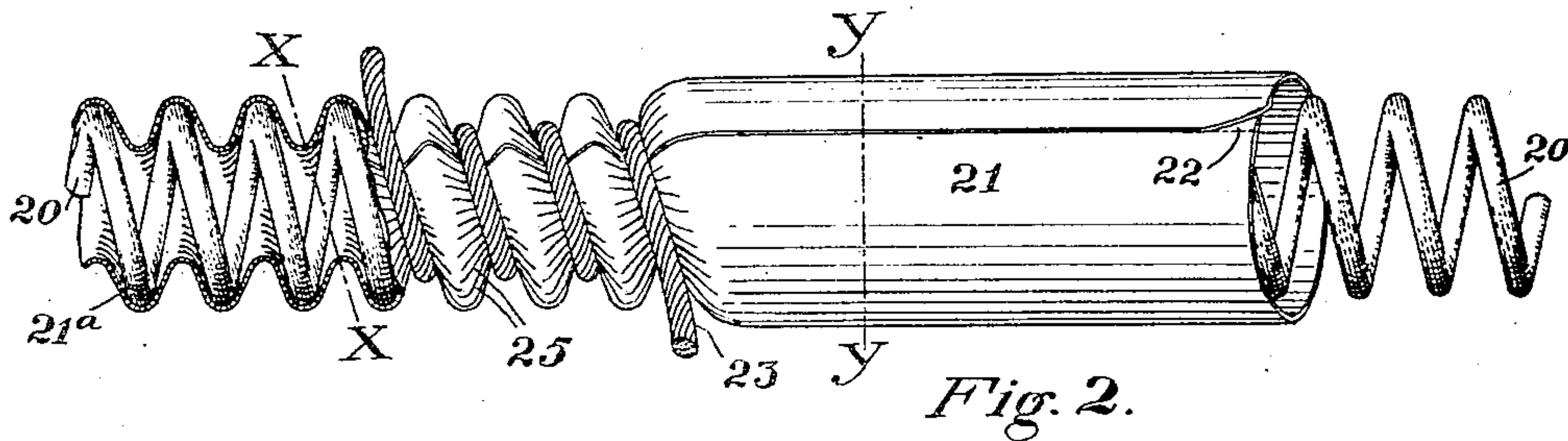


Fig. 2.

Fig. 1.

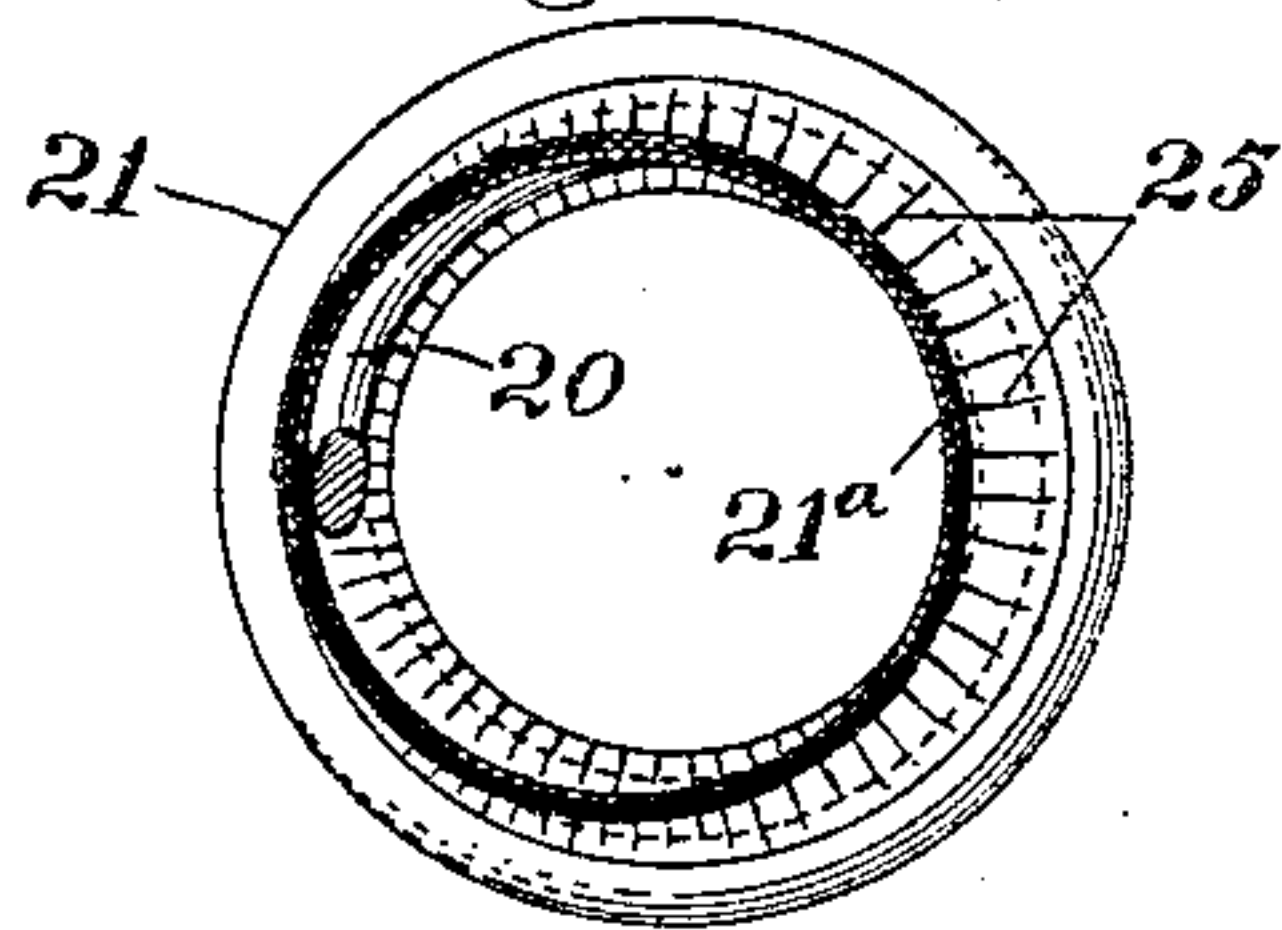


Fig. 3.

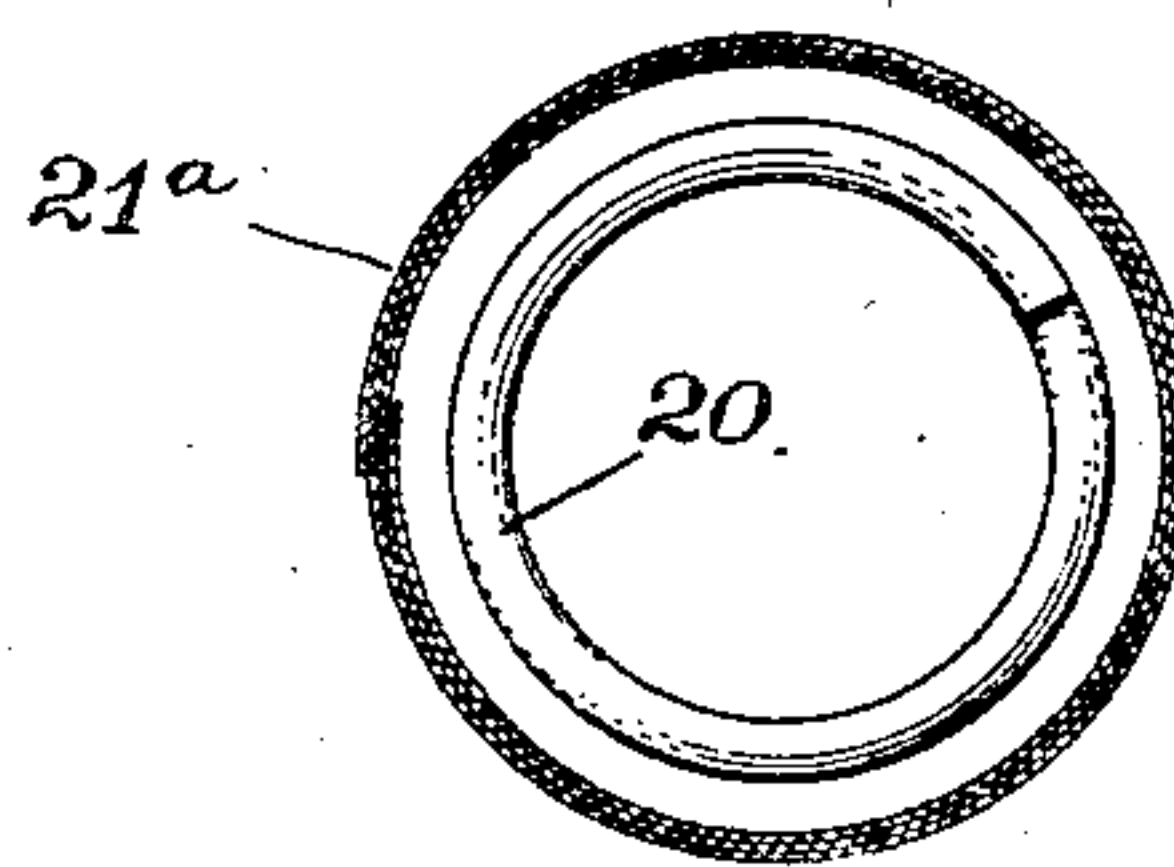


Fig. 4.

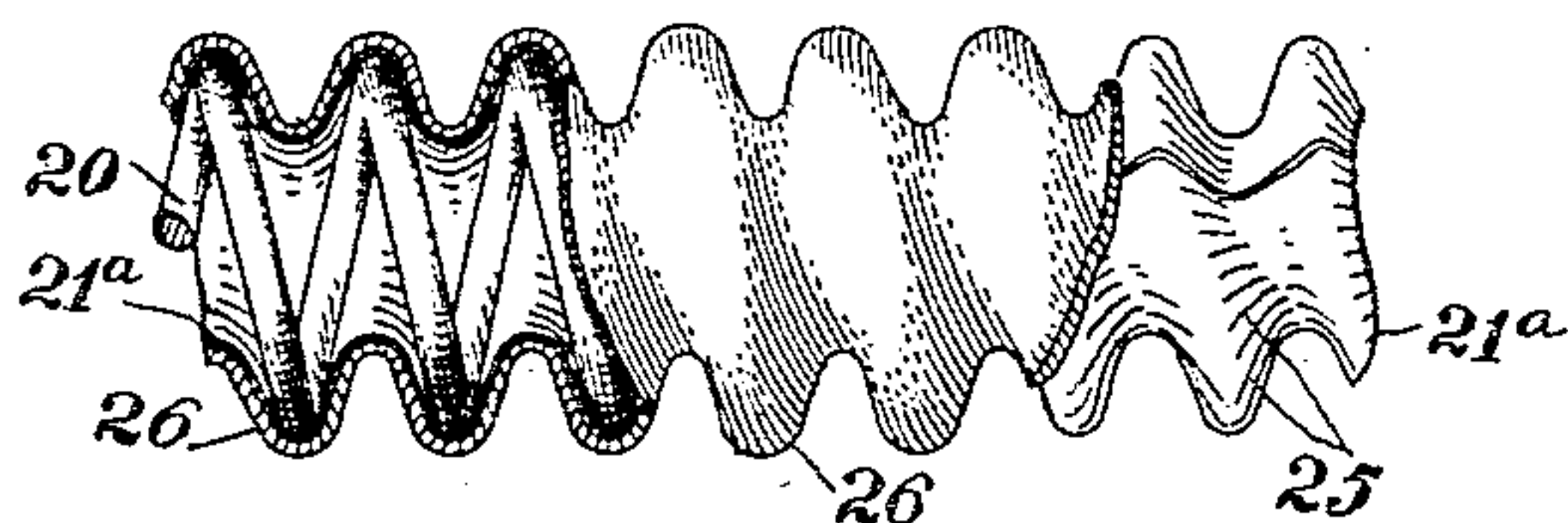


Fig. 5.

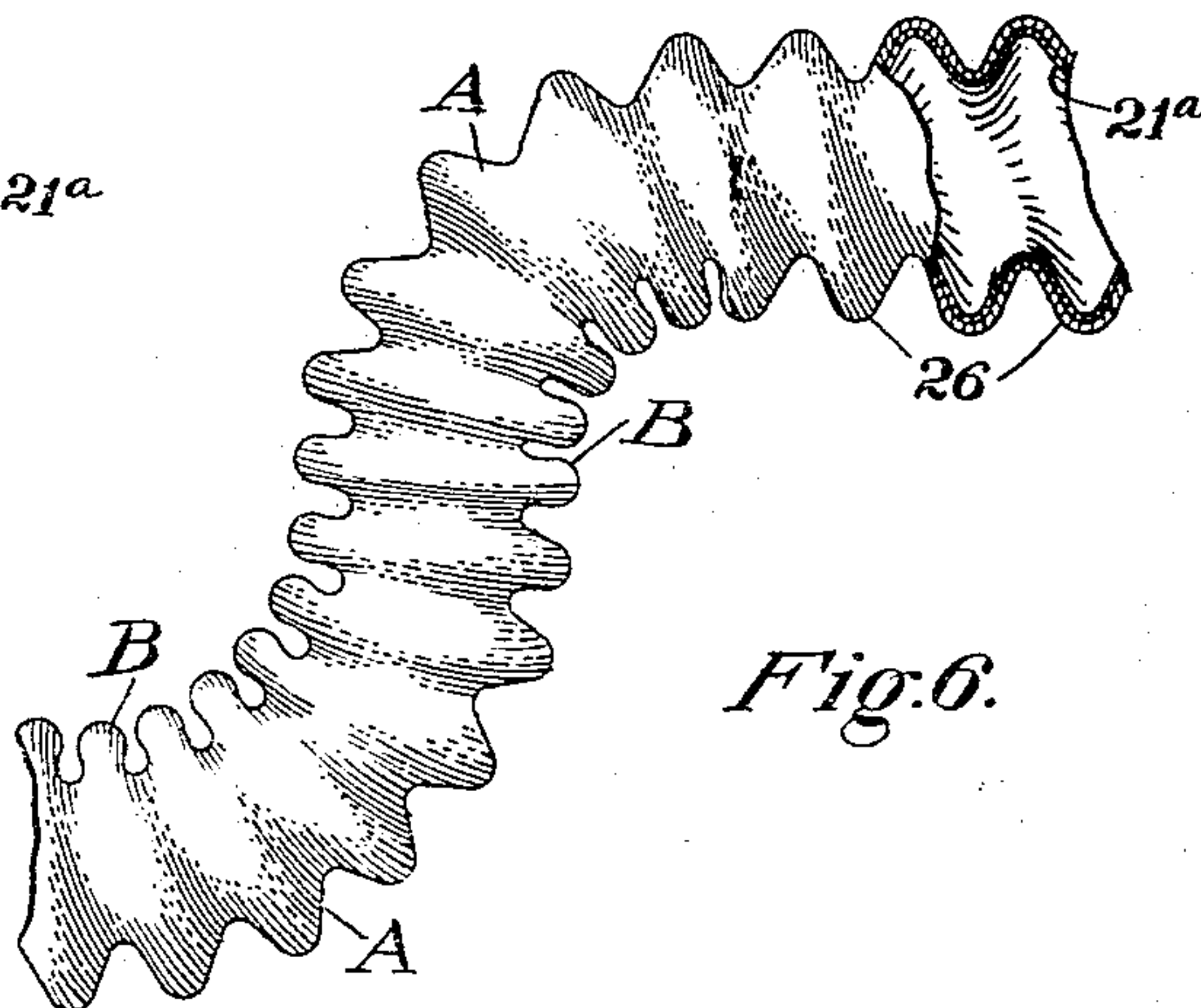


Fig. 6.

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UNITED STATES PATENT OFFICE.

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PAPER CONDUIT.

SPECIFICATION forming part of Letters Patent No. 713,560, dated November 11, 1902.

Original application filed December 26, 1901, Serial No. 87,298. Divided and this application filed April 1, 1902. Serial No. 101,007. (No model.)

To all whom it may concern:

Be it known that I, LEMUEL P. DODGE, a citizen of the United States, residing in New York, borough of Manhattan, in the county of New York and State of New York, have invented certain new and useful Improvements in Paper Conduits, of which the following is a specification.

This invention relates to paper tubing, and is a division of my application filed December 26, 1901, Serial No. 87,298.

In the accompanying drawings, Figure 1 is a transverse section taken on the line $x x$ of Fig. 2. Fig. 2 shows one method of crimping paper or other material upon a helical wire form so as to produce a rugose or plaited tube. Fig. 3 shows a thin coating or layer of an impervious mixture or proofing material applied. Fig. 4 is a cross-section taken at the line $y y$ of Fig. 2. Fig. 5 shows a plain paper conduit—that is, one not reinforced by a wire or other form. Fig. 6 shows how the product readily lends itself to flexure.

In the several views similar parts are designated by similar characters of reference.

In the preferred mode of practicing my invention I employ a helical wire form 20, over or upon which I place or roll a tubing 21 of paper, preferably manila-rope paper. This is preferably wrapped in several plies, three plies being shown in this instance. The plies may be loosely wrapped, and the outer edge may be coated with glue, as indicated at 22, or otherwise. This paper tube is loose upon the helix 20, its internal diameter being by preference materially in excess of that of the helix, as clearly seen at Fig. 4. By suitable means I tuck or crimp the material of the tube 21 between the whirls or ribs of the form 20. I find it advantageous first to dampen or moisten the paper, so as to render it limp or plastic, thereby enabling it to crimp with facility and without injury and also causing it to acquire a permanent set in its crimped form. One way of crimping the material is illustrated at Fig. 2, in which it will be seen that a core 23 may be wound over the tube with sufficient tightness to sink or crowd the material between the ribs of the form, the wind-

ing of the cord following the helical interval between the ribs or whirls. Widely variant methods of crimping or corrugating the tube may be resorted to within the scope of my invention, and it is not essential in all cases that the crimps be of the kind herein illustrated. The object in making the tube of extra diameter is to furnish material for the depressed portions or flutes 24 of the corrugations, or, in other words, to enable said flutes to be formed without danger of tearing the fabric. As the forming of the conduit progresses the material of the tube 21 is used up in longitudinal direction, so that it is necessary for the original length thereof to be greater than that of the finished conduit. The paper when being tucked into the crevices between the wires is also caused to shirr or wrinkle, as at 25. The conduit or tube thus formed may be used for a variety of purposes and possesses many valuable qualities, being highly flexible, capable of elongation or contraction, strong, durable, and simple, and, moreover, it may be constructed of inexpensive material in a simple manner and with great expedition and at low labor cost.

In the production of gas-tubing I preferably treat the Fig. 2 product with a coating 26 of material impervious to gas, such as a compound of glue or glycerin. Preferably the material is applied with substantially even thickness over the plaits of the tubing, as clearly seen at Fig. 3, so that in the Fig. 3 product the fine wrinkles or shirrs 25 are somewhat filled up or evened by the material 26, which may be applied thereto in a heated liquid form and then allowed to dry or cool and harden. The paper, it will be understood, forms a backing or body which is both inexpensive and also well adapted for receiving and protecting from injury the gas-proof material 26. Moreover, the tubing thus formed, owing to the corrugated or rugose formation of the gas-proof material, is rendered far more flexible than heretofore and may be also drawn out or compressed endwise without injury. Owing to this formation, neither the gas-proof coating nor the paper is liable to take a permanent set when

maintained for a long time in a flexed condition, thereby overcoming or, at least, minimizing a common fault in gas-tubing. My tubing is therefore more durable and superior than
 5 prior tubing and is also adapted for use in a variety of ways not hitherto found practicable. I prefer to use manila-rope paper for the tubing, since it absorbs little or none of the proofing material. In fact, the paper
 10 itself is almost impervious to gas, and hence only a thin wash of proofing material is required. The proofing may be otherwise applied than as a coating.

Fig. 6 illustrates the facility with which
 15 the product may be flexed, whether having a form 20 or not, the plaits at the outer portion of the bend separating, as at A, and those at the inner portion of the bend crowding together, as at B, this result being effected
 20 without appreciable tendency to injure either the fabric or the proofing and without rendering either of them liable to acquire a permanent set.

At Fig. 5 is illustrated my crimped or corrugated tubing without a wire form. Such
 25 tubing may be produced either by the Fig. 2 method, after which the wire helix may be wormed out, or it may be otherwise formed without departing from my invention. In
 30 other words, although I show my flexible paper or papery-fabric tubing 21^a as used in connection with the wire form upon which it is made, still it may be otherwise made or it may be used without any wire or other form
 35 within the scope of my improvements.

Having described my invention, I claim—

1. A paper tubular limber conduit having transverse plaits for rendering it limber and extensible.
- 40 2. A tubular paper limber conduit crimped into the form of a longitudinal succession of plaits so as to render it firm, limber and extensible.
3. A limber tubular conduit made of manila-rope paper crimped into the form of a
 45 succession of transverse or circumferential rugæ.
4. A limber conduit consisting of a paper tube reduced in diameter and transversely
 50 stiffened by a succession of transverse crimps.
5. A limber conduit consisting of paper rolled into tubular form and reduced in diameter by a longitudinal succession of crimps.
6. A tubular limber conduit consisting of a
 55 plurality of plies of paper formed into a tube which is transversely plaited or serrated for rendering the conduit limber.
7. A limber conduit consisting of paper rolled into the form of a multiple-ply tube
 60 and transversely crimped.

8. A limber conduit consisting of a glued, transversely-plaited, multiple-ply paper tube.

9. A tubular helically-crimped paper limber conduit.

10. A limber conduit consisting of paper rolled into tubular form and reduced in diameter by helical crimps.

11. A tubular limber conduit consisting of a plurality of plies of paper formed into a tube which is helically crimped.

12. A limber conduit comprising a succession of transverse ribs within a paper tube which is crimped between the ribs so as to render the conduit limber.

13. A limber conduit comprising a succession of ribs, and a tube of paper crimped into the form of a succession of transverse plaits.

14. A limber conduit comprising a succession of circular ribs or whirls, and a roll or tube of paper inclosing said ribs and reduced
 8 in diameter by being crimped between the ribs.

15. A limber conduit comprising a succession of circular ribs or whirls within a multiple-ply roll of paper which is reduced in diameter by being crimped between the ribs.

16. A limber conduit comprising a helix and a tube one within the other, said tube being formed of paper and crimped between the ribs or whirls of the helix.

17. A limber conduit comprising a helix within a paper tube, the paper being crimped between the whirls of the helix.

18. A limber conduit comprising a wire helix within a tube of manila-rope paper which is deeply crimped between the whirls of the helix so as to form a succession of plaits.

19. A tubular proofed-paper limber conduit crimped into the form of a succession of transverse plaits.

20. A transversely-crimped proofed multiple-ply paper limber conduit.

21. A helically-crimped, proofed, multiple-ply rope manila-paper limber conduit.

22. A limber conduit comprising a transversely-crimped tubular paper incased by a coating of impermeable material.

23. In a conduit, the combination of a transversely-crimped paper limber tube and a tube of impermeable material, one of said tubes
 11 inclosing the other.

24. A limber conduit comprising a multiple-ply paper tube crimped in the form of helical plaiting and incased in a coating or tube of proofing material.

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Witnesses:

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