

(Model.)

2 Sheets—Sheet 1.

W. AUSTIN.
SHEET METAL PIPE.

No. 290,659.

Patented Dec. 25, 1883.

Fig. 5.

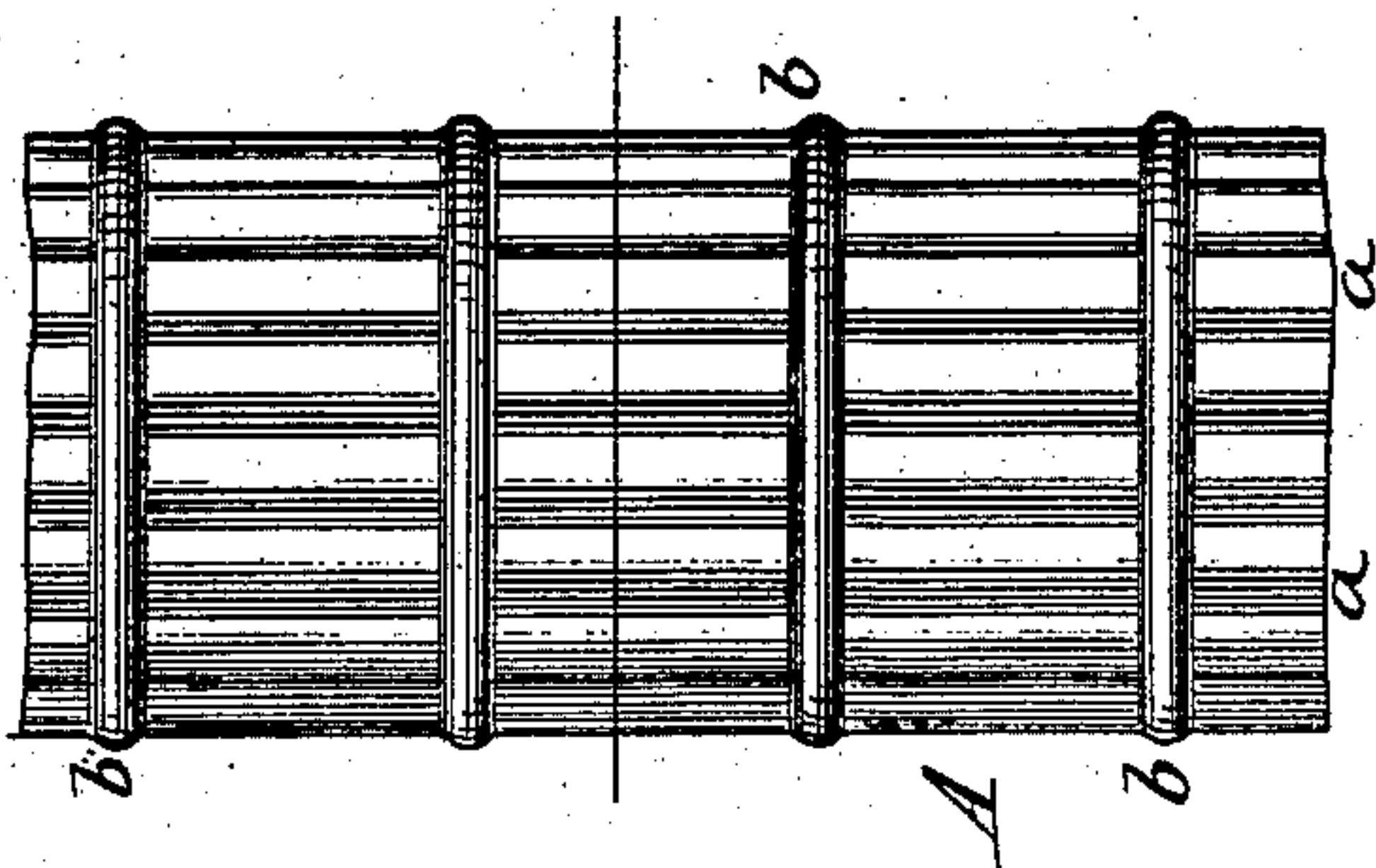


Fig. 3.

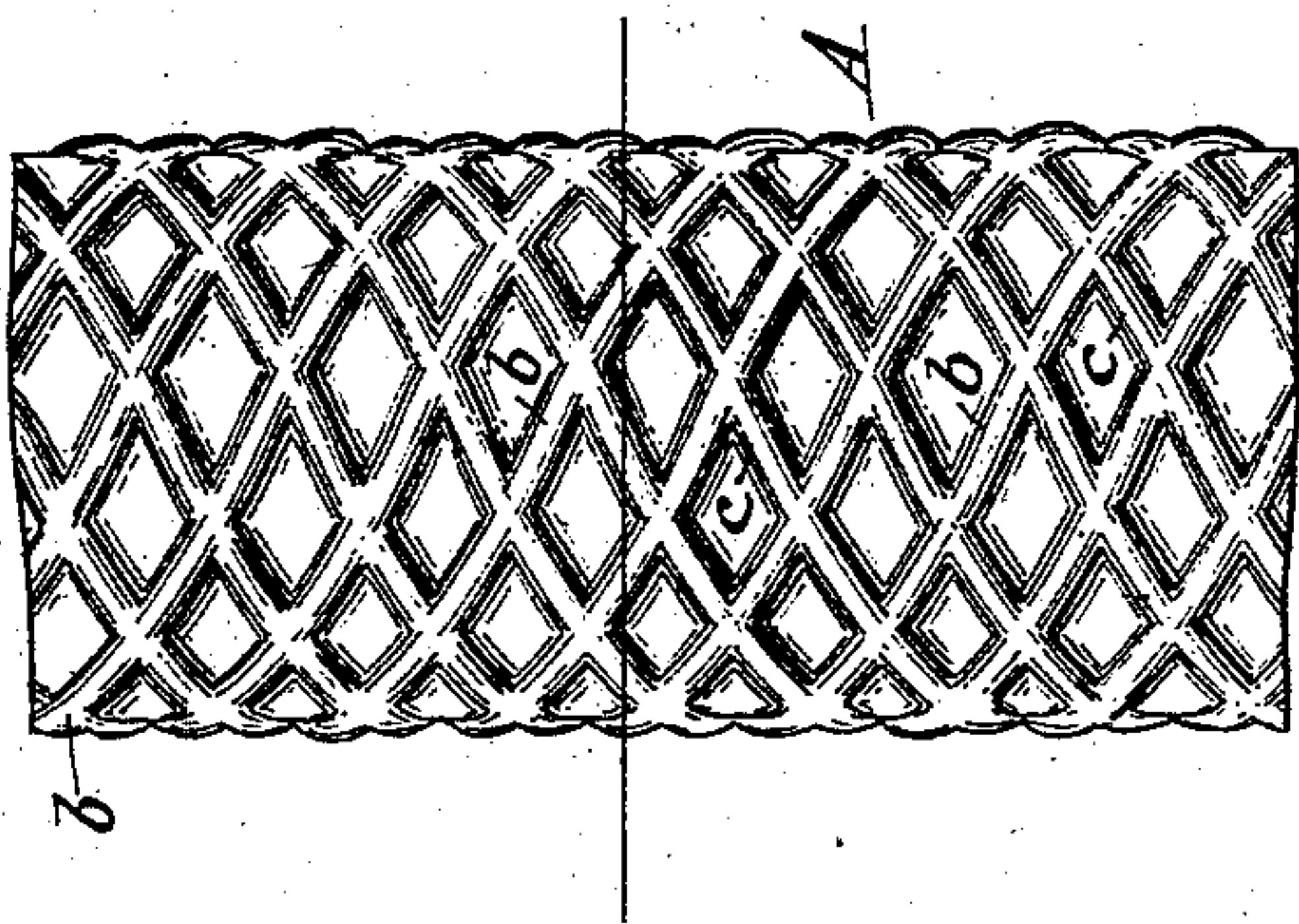


Fig. 1.

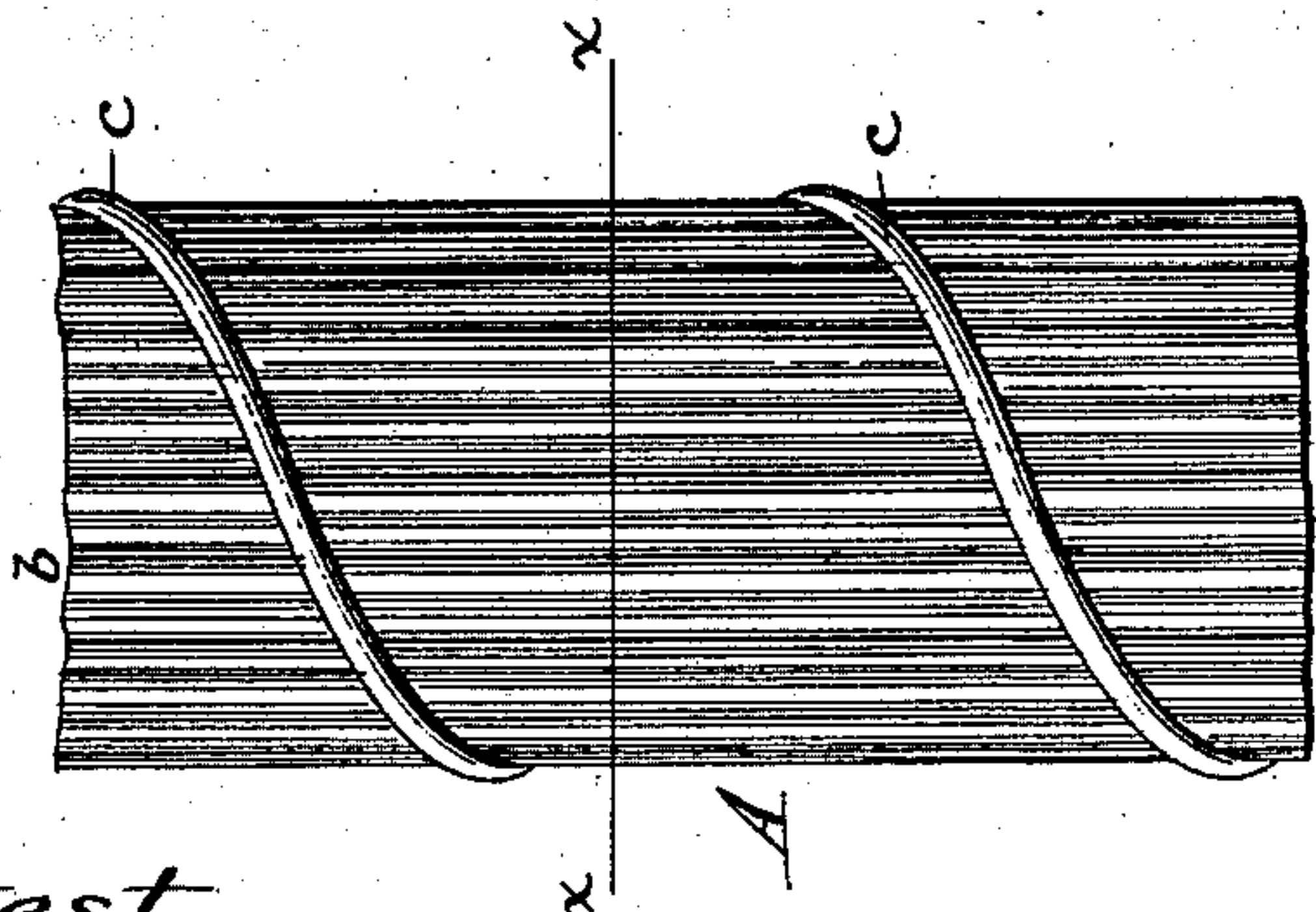


Fig. 6.

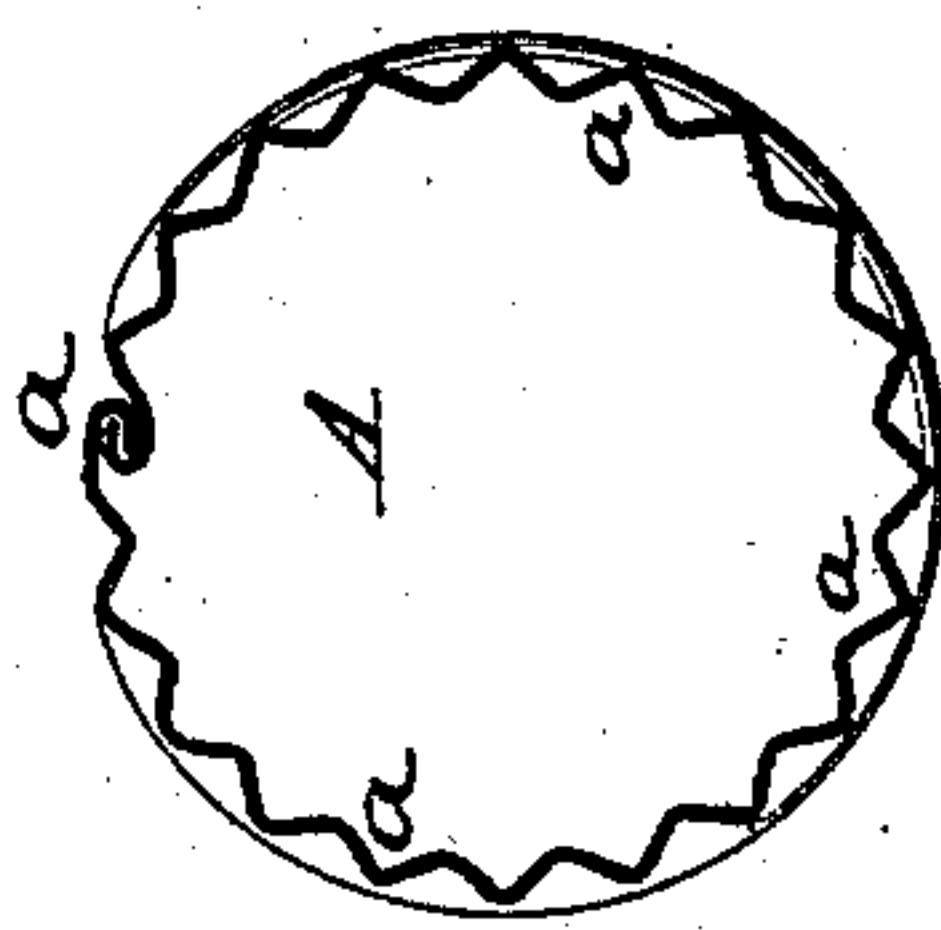


Fig. 4.

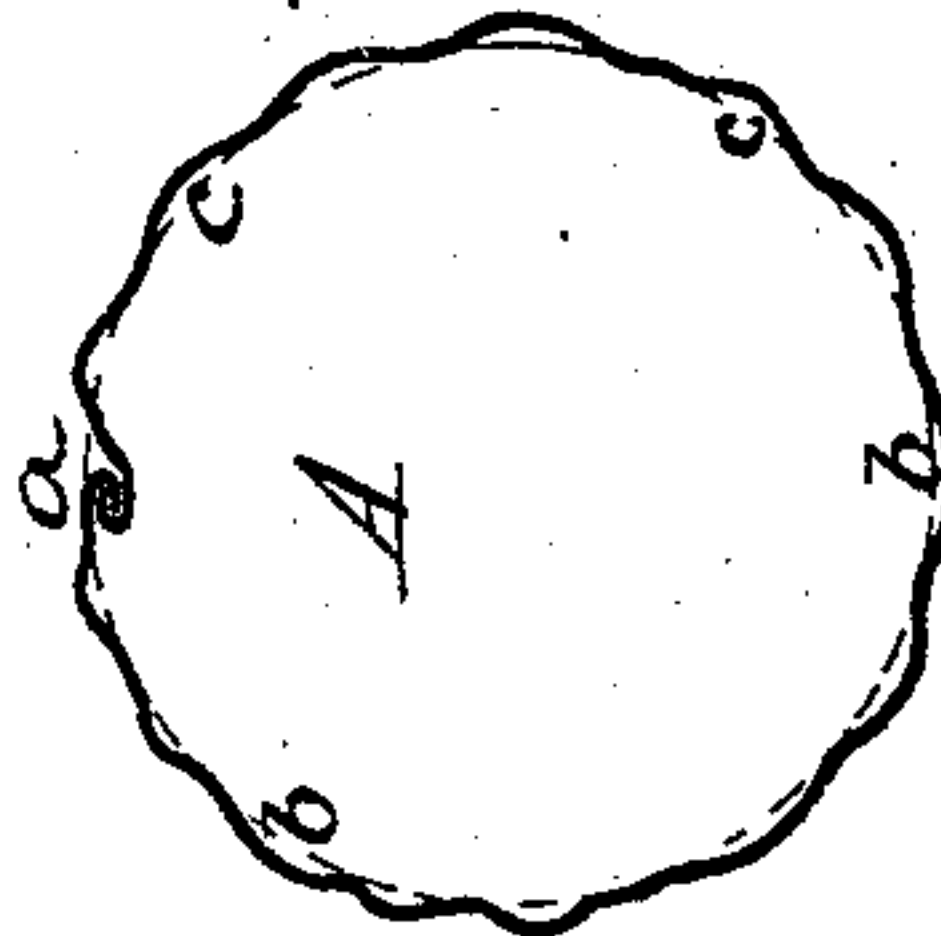
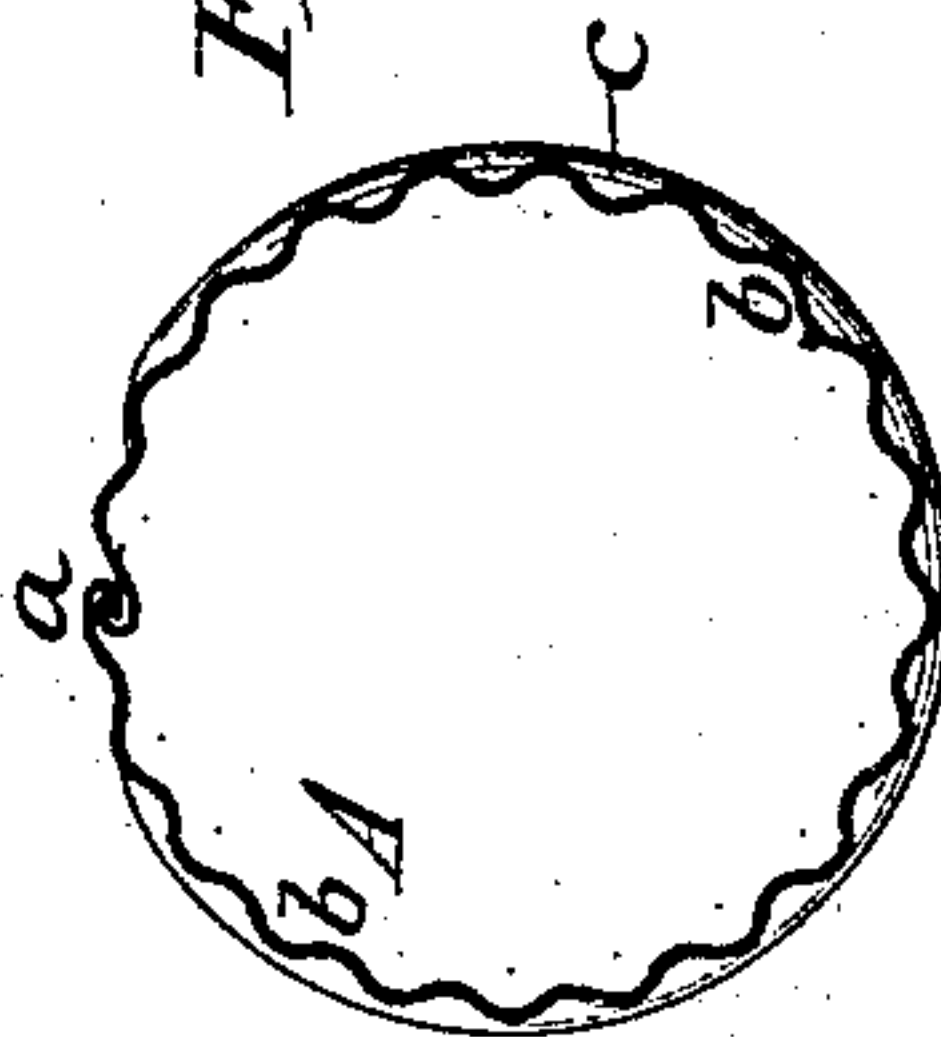


Fig. 2.



Attest.

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Philip T. Dodge.

(Model.)

2 Sheets—Sheet 2.

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Fig. 7.

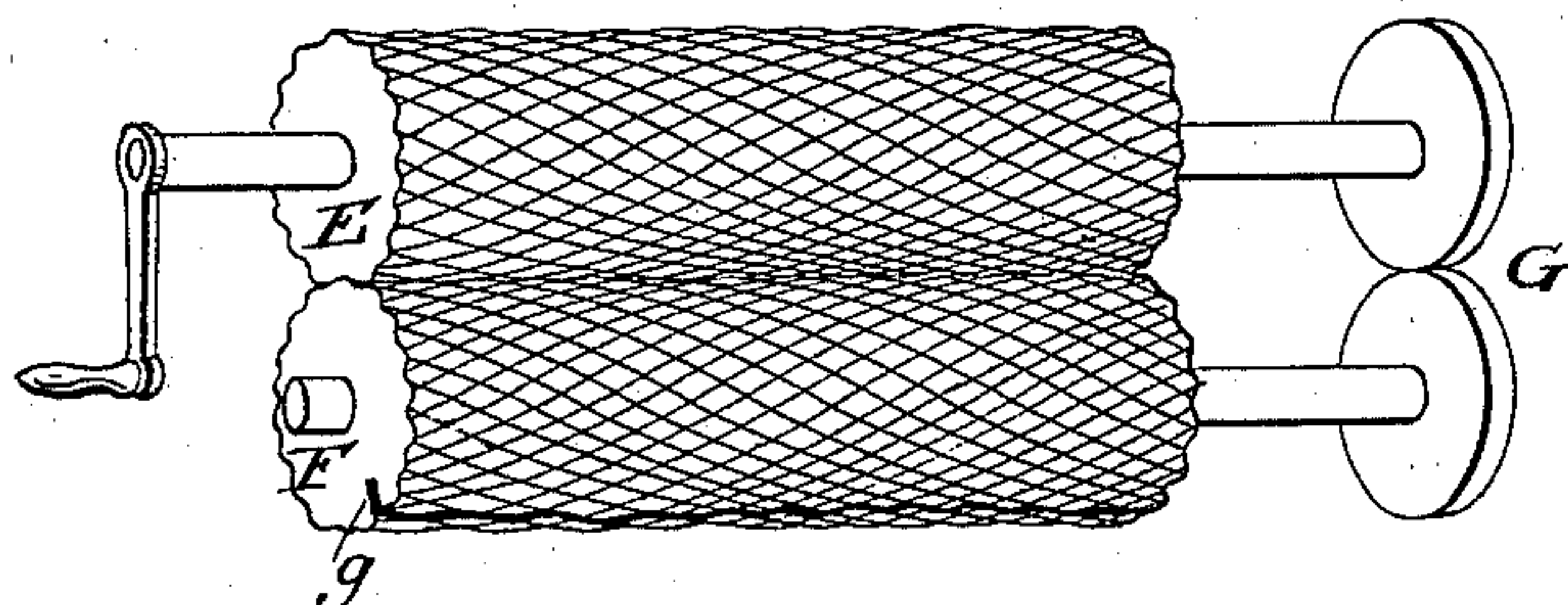


Fig. 8.

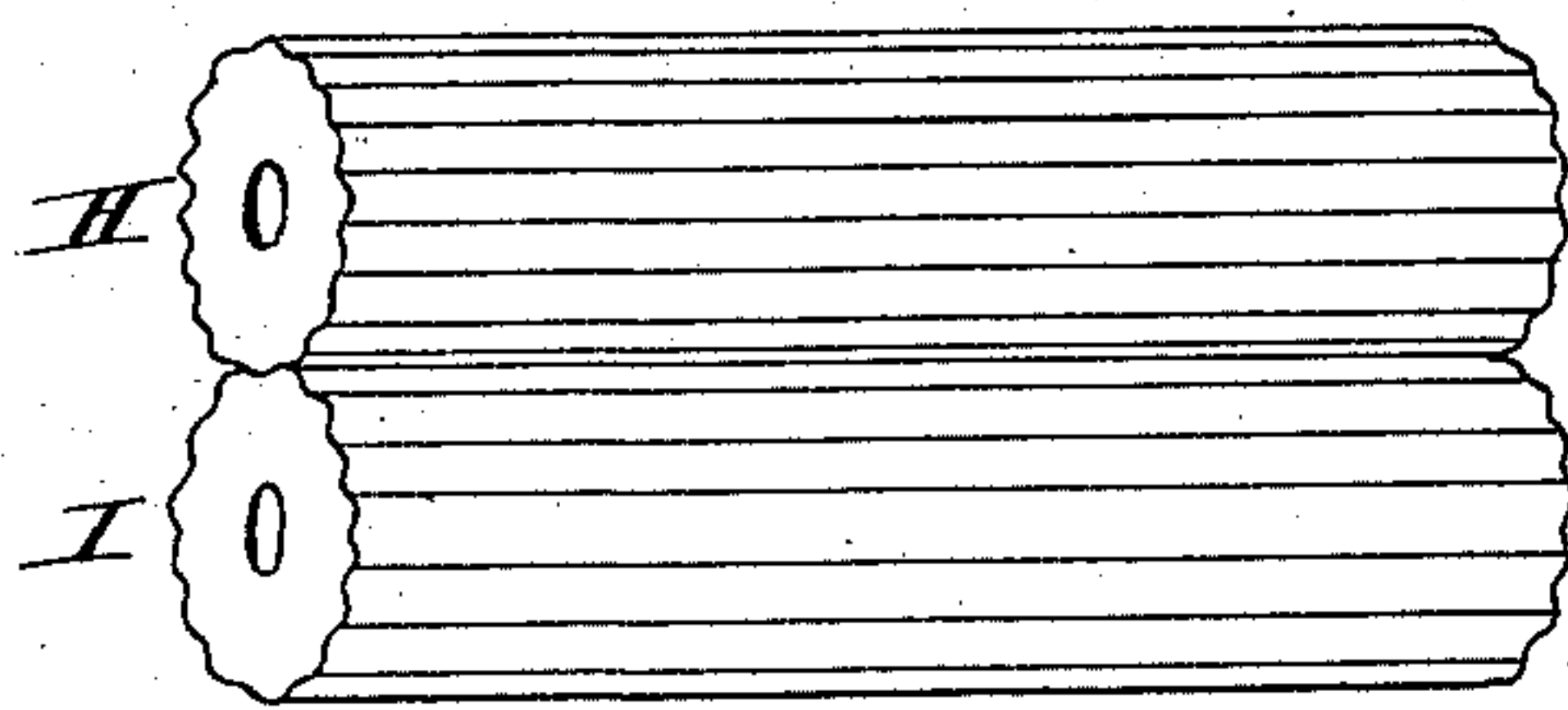
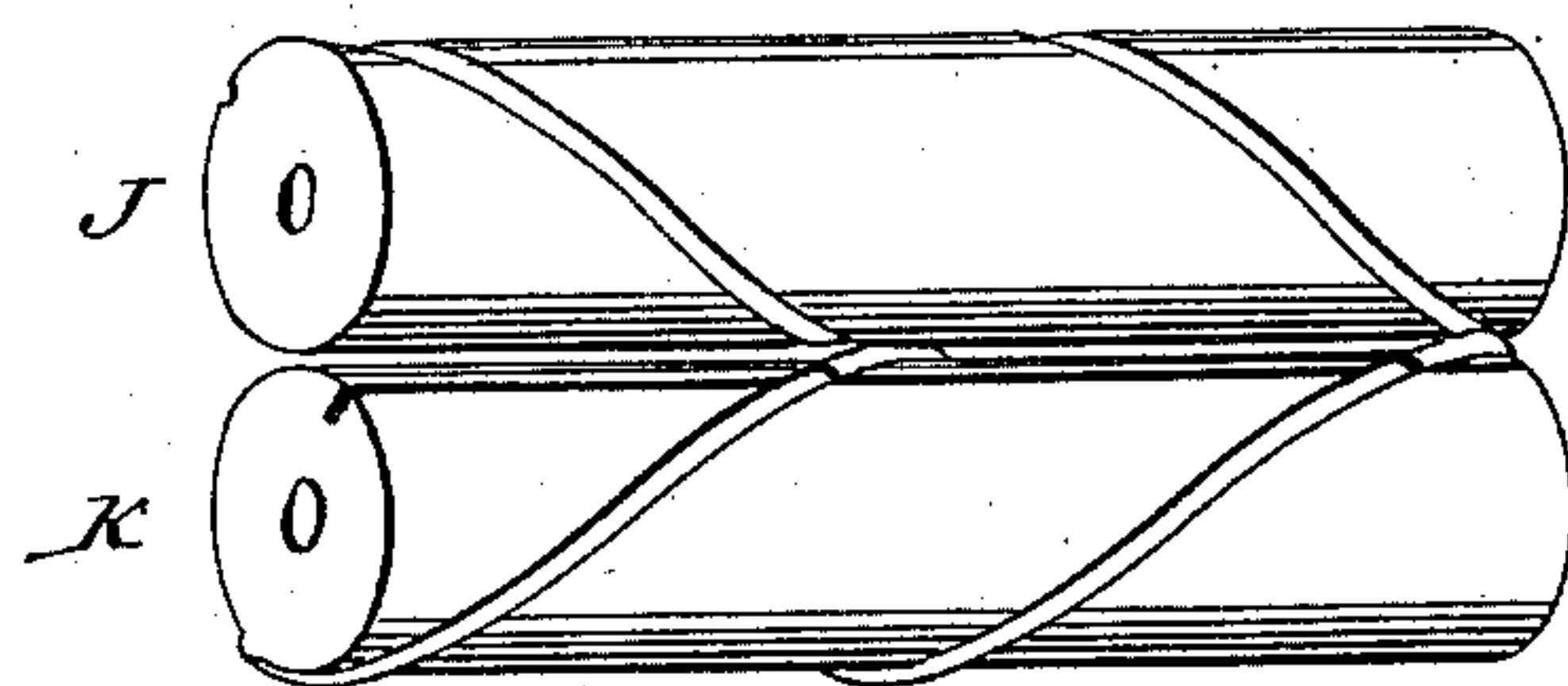


Fig. 9.



Attest

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UNITED STATES PATENT OFFICE.

WILLIAM AUSTIN, OF PHILADELPHIA, PENNSYLVANIA.

SHEET-METAL PIPE.

SPECIFICATION forming part of Letters Patent No. 290,659, dated December 25, 1883.

Application filed August 8, 1882. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM AUSTIN, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain Improvements in Sheet-Metal Pipe, of which the following is a specification.

The object of this invention is to produce a sheet-metal pipe more particularly adapted for use as a spout or water-conductor, which shall avoid the numerous objections which exist to the different forms of pipe as heretofore known in the art.

To this end it consists, essentially, in a sheet-metal pipe having its entire, or substantially its entire, surface provided with two sets of flutes or corrugations intersecting each other, as will be hereinafter described in detail.

Sheet-metal spouting as applied for practical use requires ordinarily to be attached to the flat surface of buildings and to be extended frequently in great lengths or to great height. When thus applied, the pipe is subjected to numerous influences tending to its destruction and disarrangement, more particularly its tendency to expand and contract lengthwise under the strains to which it is subjected, whereby it is caused to become disconnected or disengaged from its fastenings if securely applied; the liability of its being crushed or flattened by blows, strains, and pressures which it is liable to encounter; its liability to be burst by the expansion of water freezing therein; its liability, when used in great lengths, to become bent or swayed out of position. In addition to the above difficulties, another and serious difficulty encountered when the pipe is manufactured on a commercial scale for sale in the market is the liability of its becoming flattened and crushed by the strains and pressures to which it is subjected while in transit or in storage. After numerous experiments, I have found that all of the above difficulties may be completely overcome by constructing a sheet-metal pipe having the metal of which its body is composed indented, corrugated, or fluted in two or more directions, and this without materially adding to the expense of manufacture, and without materially increasing the amount of metal required for the production of the pipe. It is preferred to construct the pipe with one series of corrugations or flutes extending in line with its axis and arranged in close proximity to each other, and with a second cor-

rugation or series of corrugations extending spirally around the pipe from end to end and intersecting the corrugations first named. Good results are, however, secured when both corrugations or series of corrugations extend spirally around the pipe in opposite directions. The ribs or corrugations may be raised to a considerable height above the general surface of the pipe, in which event the intermediate portion of the pipe between its corrugations may be left plain or cylindrical; but it is preferred to use smaller corrugations or corrugations of less height, and to arrange them in close proximity to each other, so that the entire surface of the pipe presents a waved or corrugated appearance. The corrugations employed are ordinarily of a serpentine or zigzag form in cross-section; but they may be varied in form without departing from the limits of the invention, it being manifest that it is immaterial whether corrugations are more or less abrupt in cross-section. The pipe constructed on my plan is composed in every instance of a sheet or plate of metal, corrugated as above, curled into a tubular form, and united by seaming or otherwise securing its edges together in a longitudinal direction.

Referring to the accompanying drawings, Figure 1 represents a side elevation of my pipe in its preferred form. Fig. 2 is a cross-section of the same on the line *x x*. Fig. 3 is a side elevation of the pipe having its body or surface of modified form. Fig. 4 is a cross-section of the same. Fig. 5 is a side elevation of still another modification of the pipe. Fig. 6 is a cross-section of the same. Fig. 7 is a perspective of a pair of rolls which may be employed for the production of my pipe; Figs. 8 and 9, perspectives of rolls of modified form for the same purpose.

Referring to Figs. 1 and 2, *A* represents the pipe having its body formed of sheet metal in any ordinary or suitable manner, it being usually customary to construct each length or section of a single sheet of metal folded into a cylindrical form, and seamed together at the edges in a line parallel with the axis, as shown at *a*, Fig. 2. *b* represents a series of longitudinal flutes or corrugations formed in the metal composing the body of the pipe and extending from end to end therein. *c* represents the second corrugation or series of corrugations

winding spirally about the pipe from end to end and intersecting the corrugations *b*. The corrugations may be formed in the pipe prior to, during, or subsequent to the bending of the sheet into the tubular form, and the two series of corrugations may be formed simultaneously or successively, as desired. In Fig. 1 the spiral corrugation *c* is of narrow width and winds about the pipe, so that its successive convolutions are considerably separated from each other.

Referring to Figs. 3 and 4, *b* and *c* represent two series of flutes or corrugations, both extending around the pipe spirally in opposite directions from each other.

In Figs. 5 and 6, *a* represents the longitudinal flutes or corrugations, and *b* the transverse corrugations encircling the pipe at right angles to its axis.

Pipe constructed in each and all of the forms represented will be found to possess great stiffness and rigidity, so that it may be handled and subjected to severe strains without danger of crushing or losing form. It may also be applied, by rigid fastenings, and in great lengths, to exposed walls, without danger of its expansion and contraction causing it to sway out of line or become detached from the fastenings, or on the other hand of its tearing the fastenings loose from the wall, the flutes permitting the metal to yield to the full extent required. It is also found in practice that while the pipe will yield sufficiently to prevent rupture when subjected to the expansion of ice formed therein, it will readily resume its original form upon the disappearance of the ice.

Letters Patent have heretofore been granted to me for a sheet-metal pipe corrugated in a longitudinal direction; and I am aware that pipe has been ornamented, by hand or otherwise, by the production of fanciful designs therein, and these I do not claim.

The means and method employed for producing my pipe constitute no part of the present invention, the steps required to produce a pipe such as herein described being well understood by any person skilled in the art. The drawings, however, for the sake of illustration, represent two forms of apparatus which may be employed to produce the pipe.

In Fig. 7 the apparatus consists simply of two parallel rolls, E and F, one of which is provided with an operating-crank, and connected to its companion by intermediate gear, G, whereby the two rolls are caused to turn toward each other at equal speeds. The surfaces of the two rolls are corrugated or ribbed to conform precisely with the form which is to be given the pipe. The lower roll is also provided with a longitudinal slit, *g*, to receive the edge of the sheet from which the pipe is to be formed. In operating with this machine the edge of the blank or flat sheet of metal is inserted in the groove *g* and the rolls revolved in such manner as to pass the sheet between them. The result of the operation will be a

sheet which is crimped or corrugated in two directions and coiled into a cylindrical form around the lower roll. The blank thus produced may be removed from the roll and seamed together at its edges.

Figs. 8 and 9 represent two pair of co-operating rolls, which will be connected and driven in the manner indicated in Fig. 7. The rolls H and I of Fig. 8 are fluted or corrugated lengthwise, so that in passing a sheet of metal between them they will crimp or corrugate the same in one direction only. The rolls J and K (represented in Fig. 9) are provided, one with a spiral rib or ribs and the other with a corresponding groove. The lower roll, K, is also provided with a longitudinal slit, *g*, to receive and retain the edge of the sheet. The sheet, as it is delivered from the rolls of Fig. 8 corrugated in one direction, has one edge inserted in the slit *g* of the roll K, and is then carried by the rotation of said rolls J and K between them. By this operation said rolls are caused to produce in said sheet a series of oblique or spiral ribs extending across or intersecting those which were formed by the rolls H and I. At the same time that this is done the sheet is wound into cylindrical form around the lower roll. The resulting blank is seamed together at its edges, as in the preceding case. I do not claim as part of the present invention the means represented for producing the pipe, the right being reserved to make the same the subject of a separate application.

I am also aware that a description has been published of a thin seamless tubing of small diameter for the formation of pencil-cases, having quadrangular or "barleycorn" projections formed thereon by drawing the same successively through dies having spiral ribs and grooves therein in reverse directions, and this I do not claim, the method referred to failing to disclose a mode of construction practically applicable to water-pipe, and also failing to disclose the application of a pipe with double corrugations in such manner or for such purposes as to render available the properties possessed by the pipe constructed in accordance with my invention.

Having thus described my invention, what I claim is—

1. As a new article of manufacture, a water-conductor consisting of a sheet of metal curled into a tubular form, united longitudinally at the edges, and provided with corrugations or flutes extending in diverse directions therein, whereby the pipe is rendered stiff and rigid, and is permitted to expand in all directions.

2. A sheet-metal pipe provided with a series of longitudinal corrugations, and also with a spiral corrugation or corrugations, as described and shown.

WILLIAM AUSTIN.

Witnesses:

B. P. OBDYKE,
H. C. GARA.