

No. 639,884.

Patented Dec. 26, 1899.

S. K. BEHREND.

PILE.

(Application filed Apr. 18, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

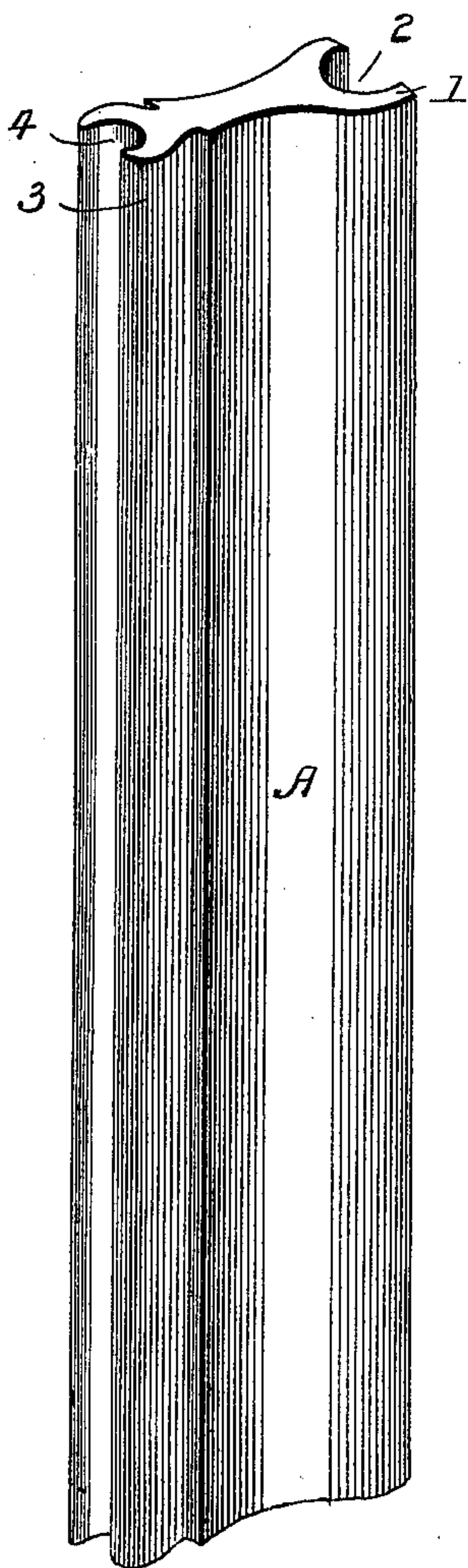


Fig. 2.

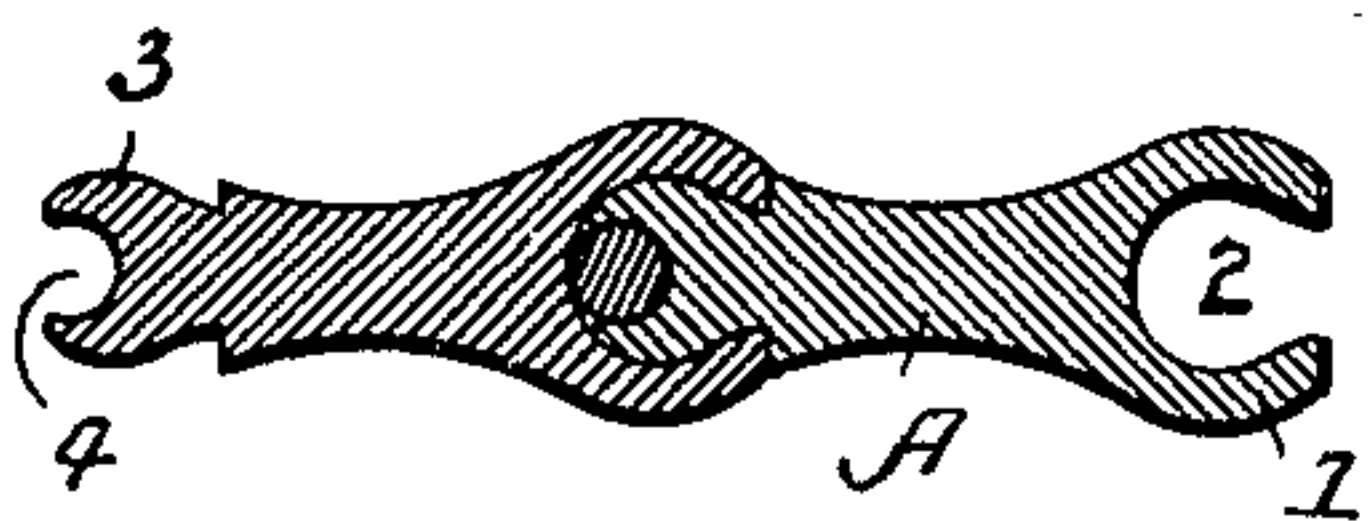
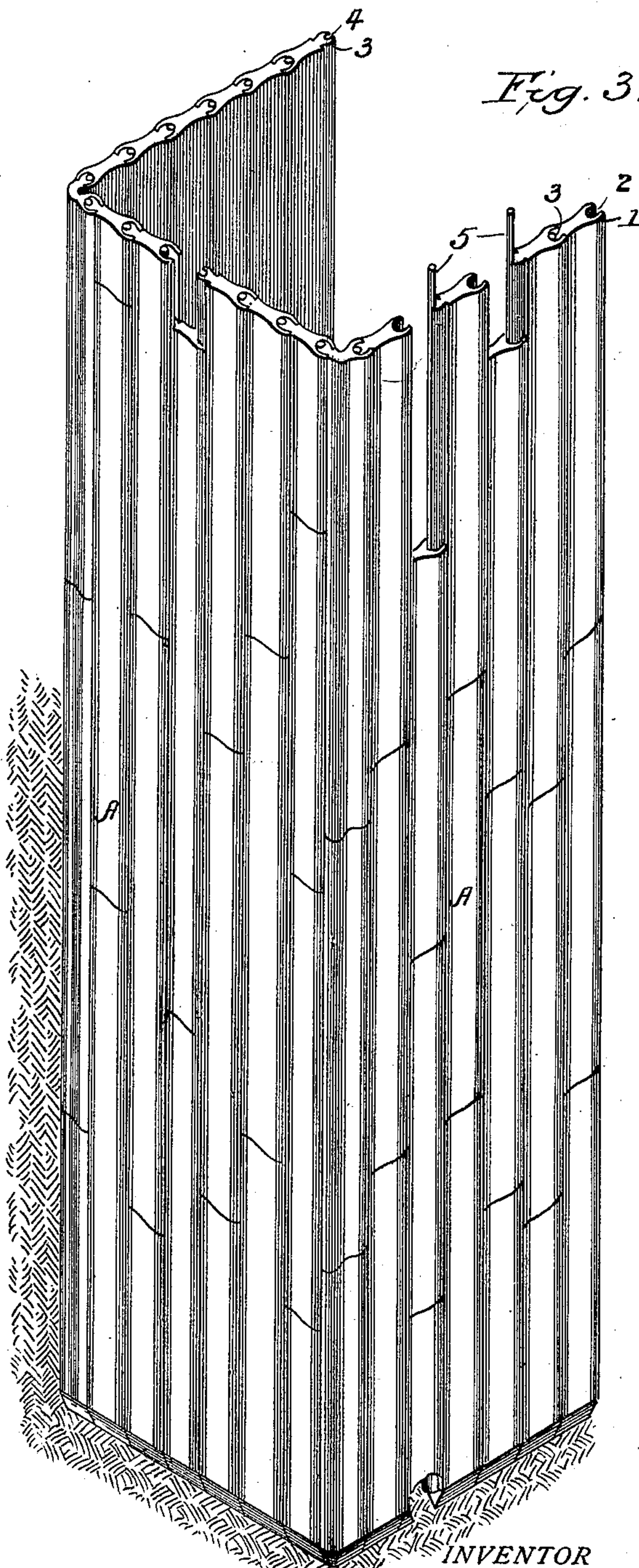


Fig. 3.



WITNESSES

John Enders, Jr.  
Vernon E. Hodge

INVENTOR

Samuel K. Behrend  
By Rhea & Co.  
his Attorneys

No. 639,884.

Patented Dec. 26, 1899.

S. K. BEHREND.

PILE.

(Application filed Apr. 18, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 4.

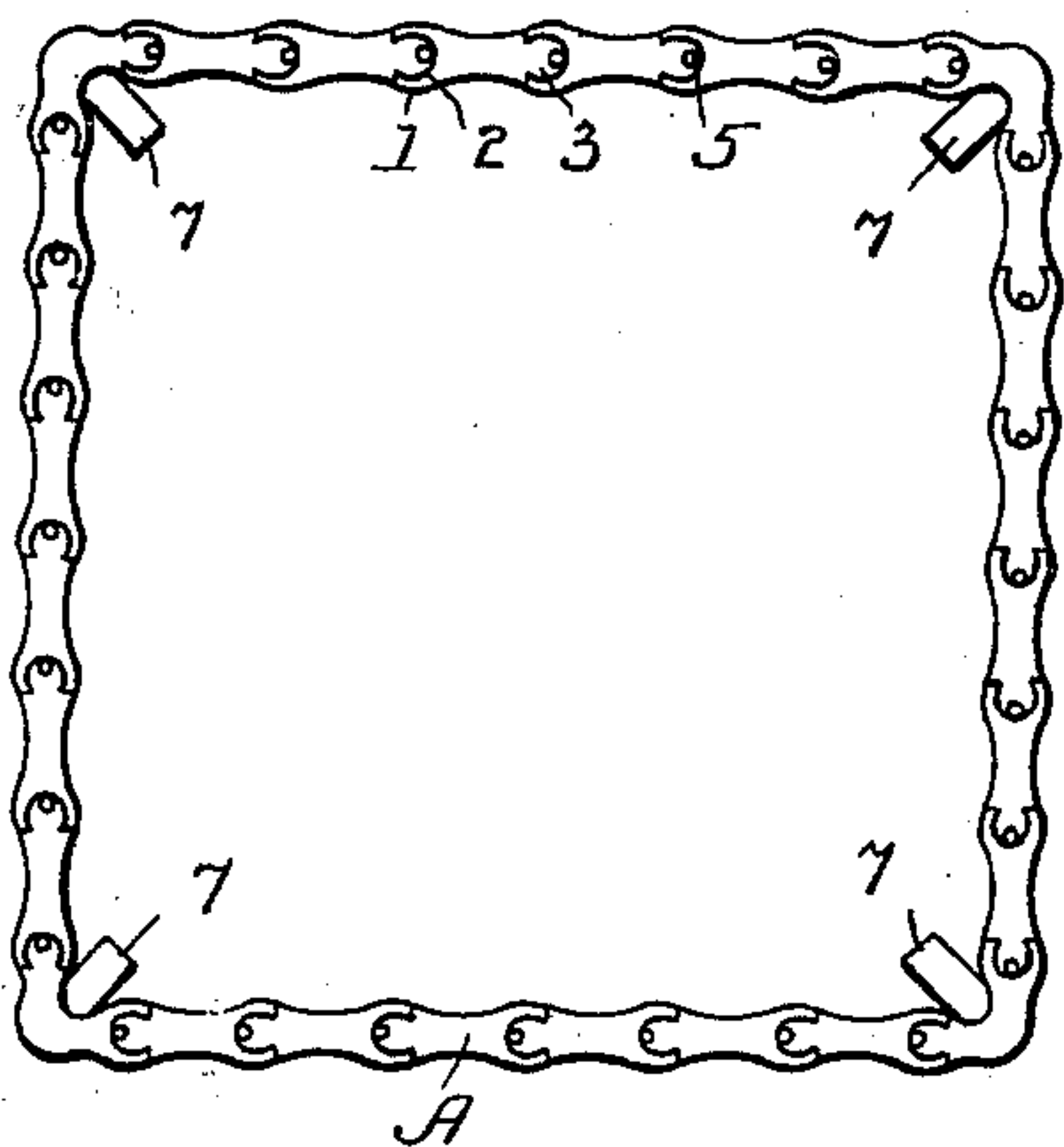


Fig. 8.

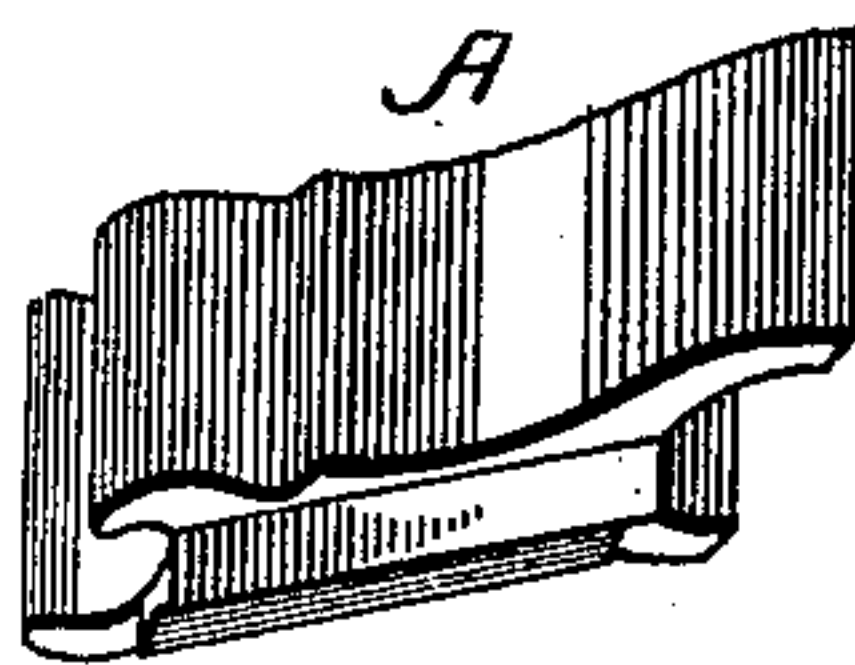
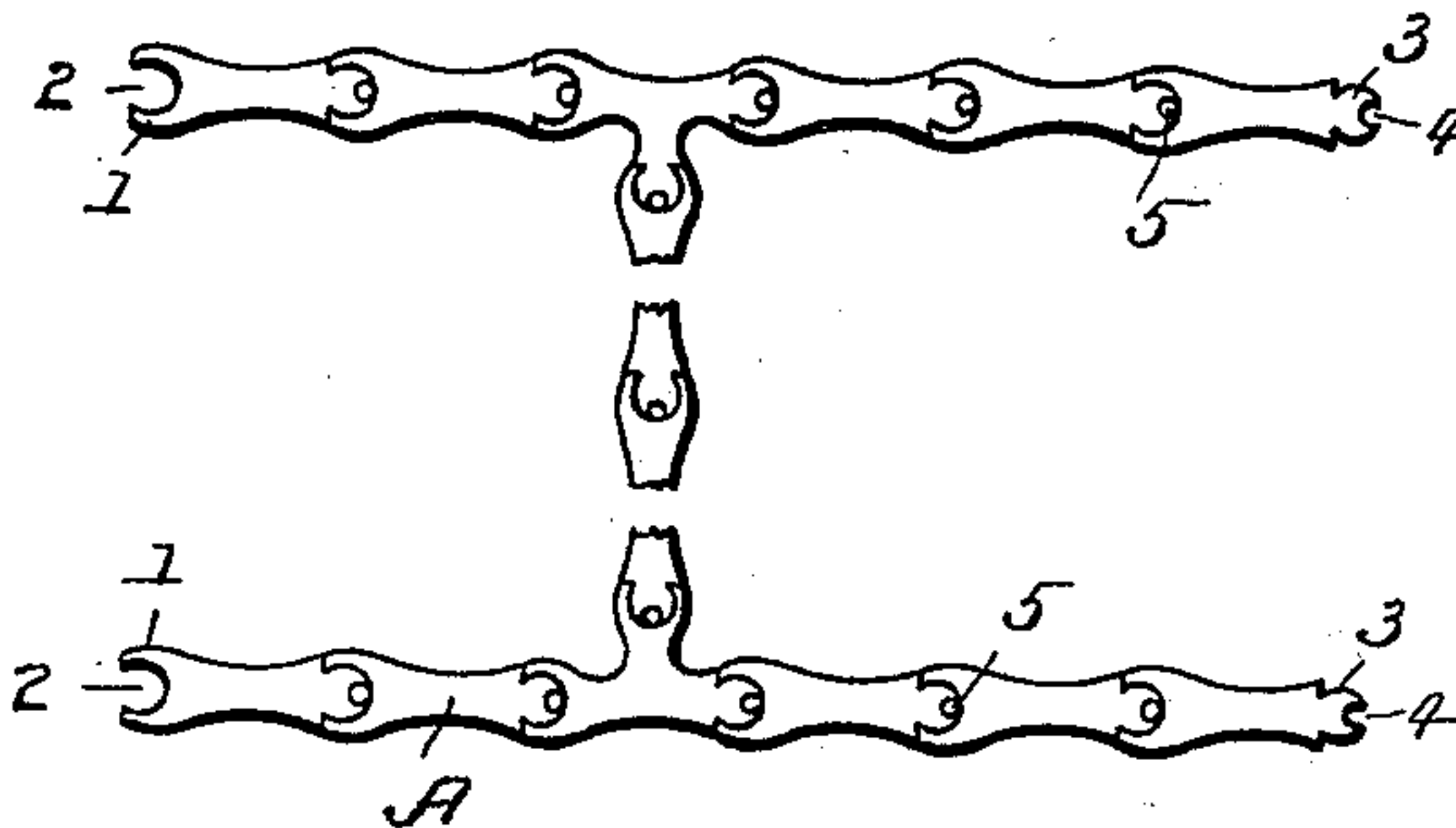


Fig. 7.

Fig. 5.

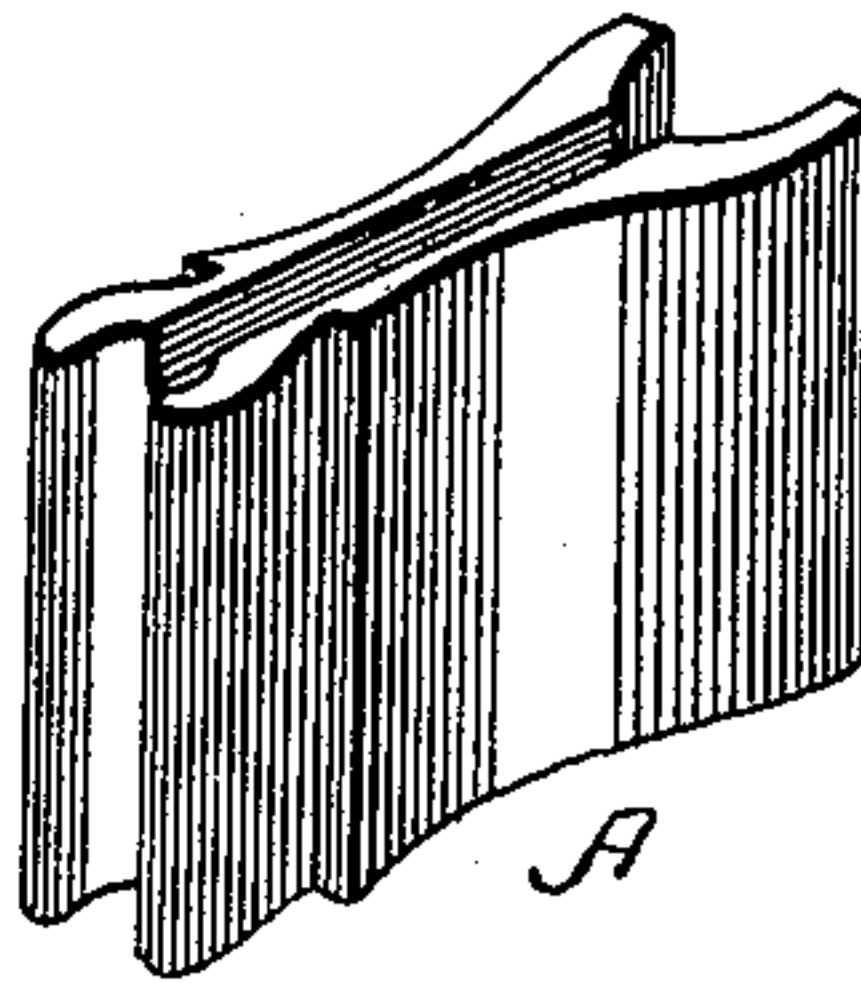
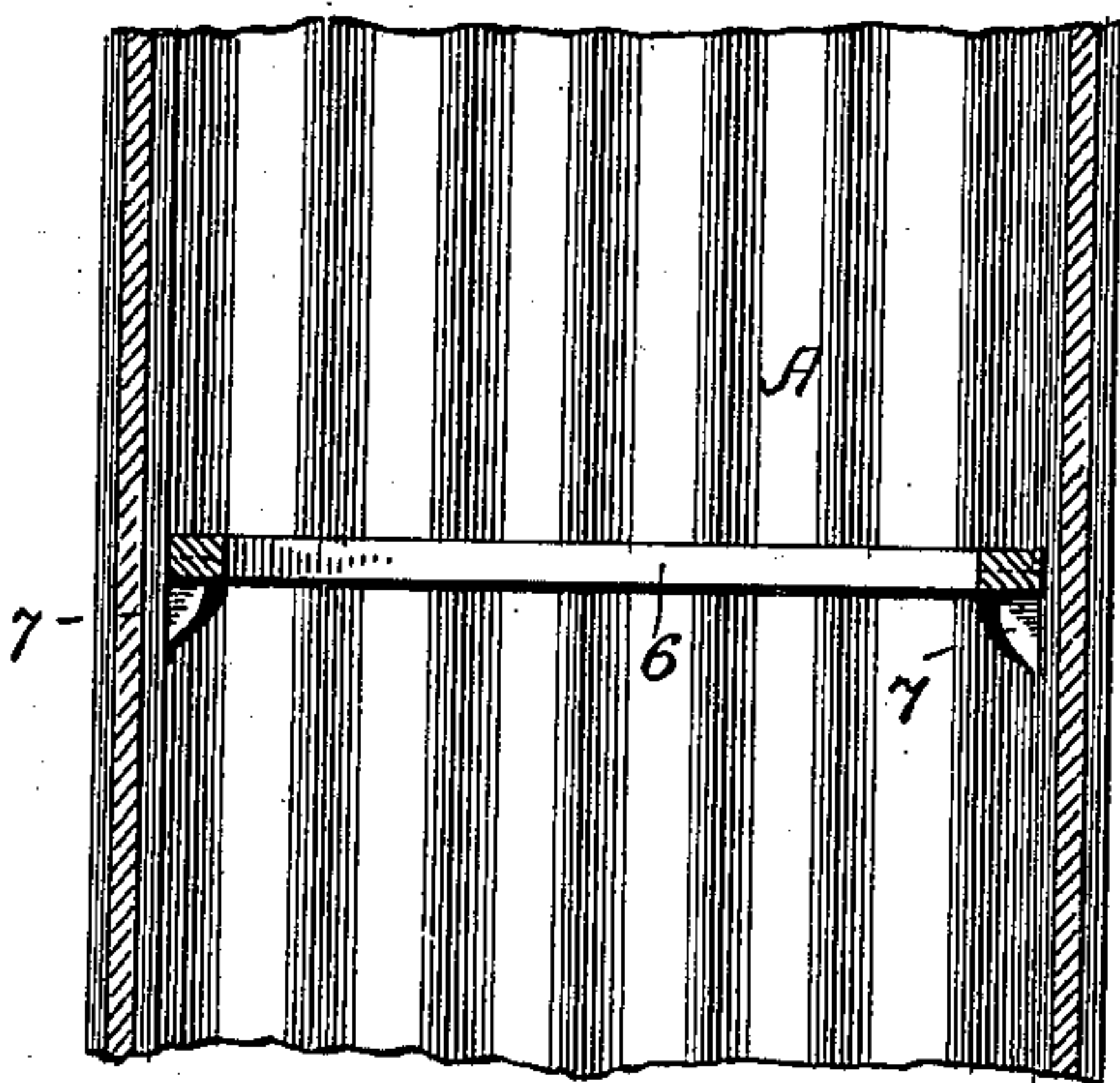


Fig. 6.

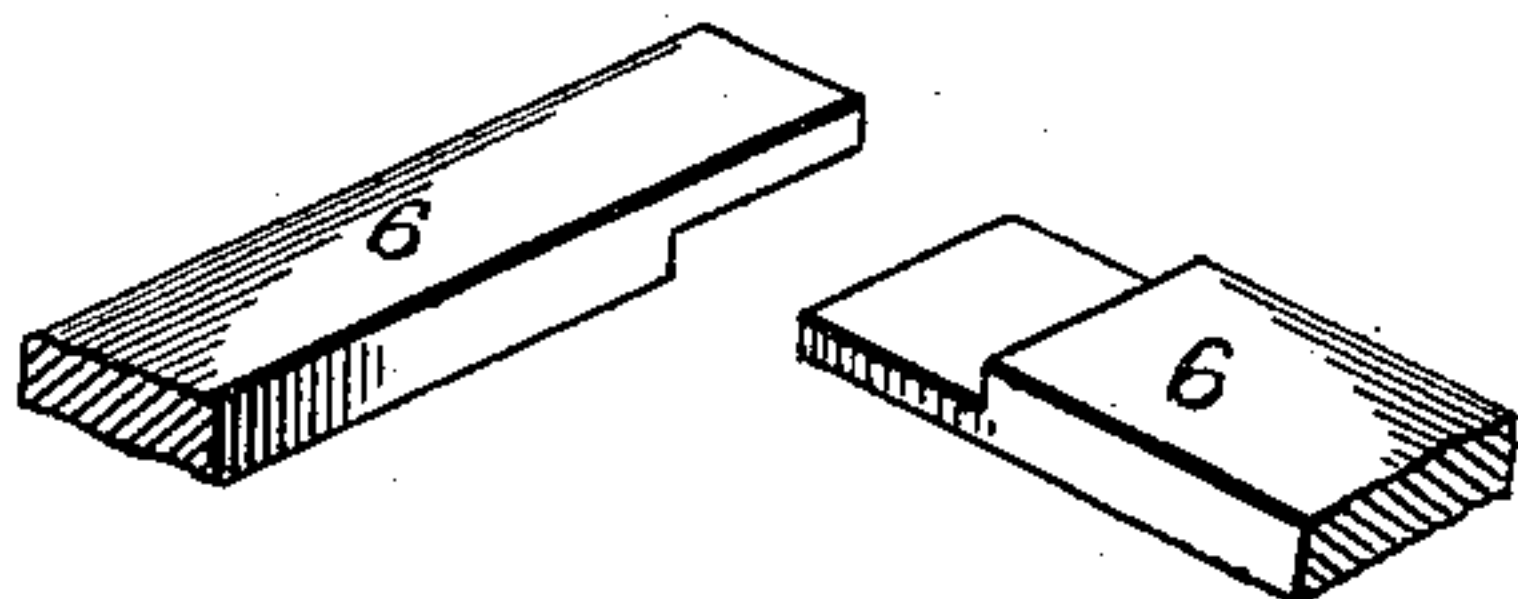
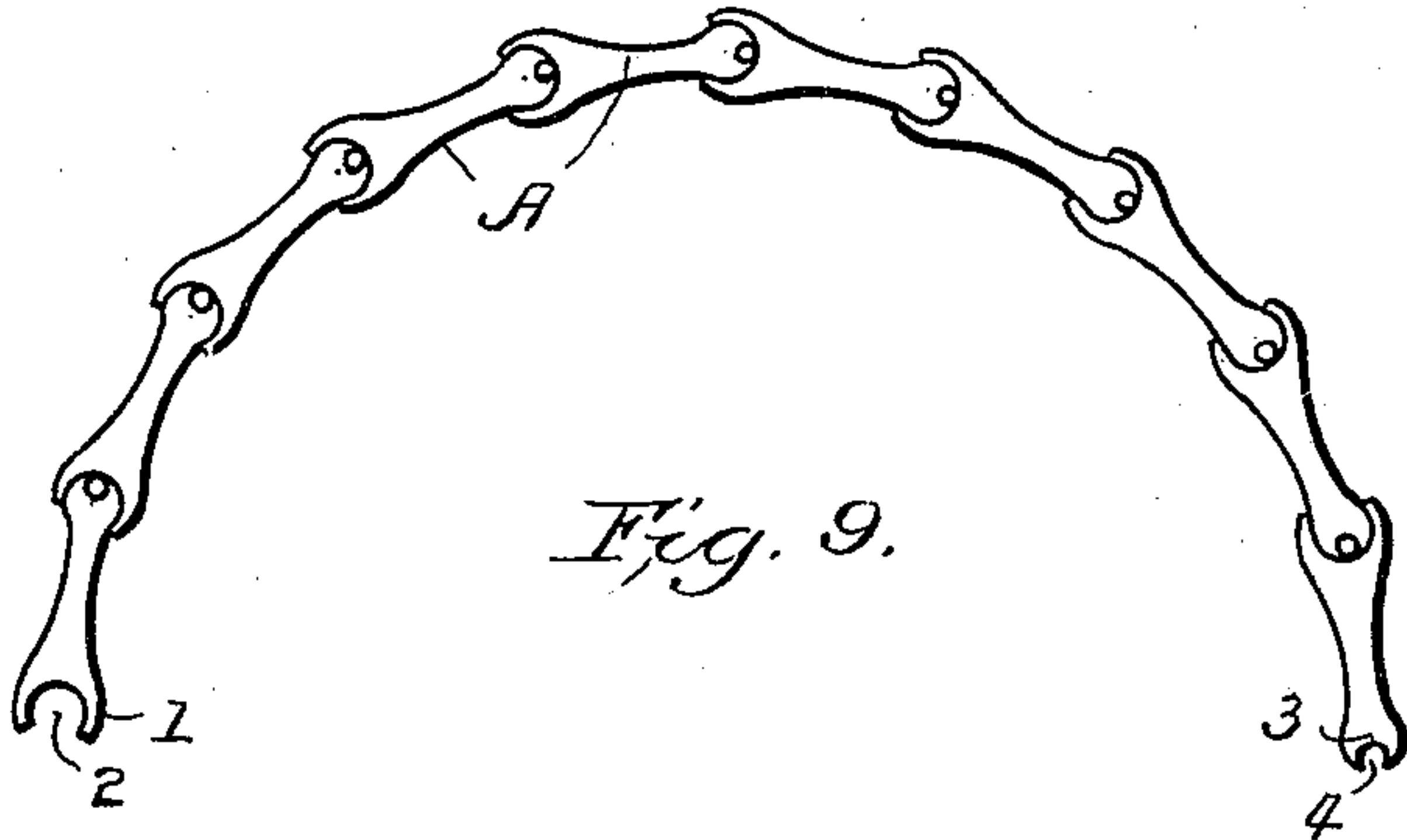


Fig. 9.



WITNESSES

John Enders Jr.  
Simon E. Hodges

INVENTOR

Samuel K. Behrend  
By Rhea H. Davis & Co.  
his Attorneys



# UNITED STATES PATENT OFFICE

SAMUEL K. BEHREND, OF WASHINGTON, DISTRICT OF COLUMBIA.

## PILE.

SPECIFICATION forming part of Letters Patent No. 639,884, dated December 26, 1899.

Application filed April 18, 1899. Serial No. 713,503. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL K. BEHREND, a citizen of the United States of America, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Piles, of which the following is a specification.

My invention relates to an improvement in piles, and it has to do more particularly with a pile adapted for the construction of cofferdams and similar means for facilitating the construction of sewers, open cuts, dikes, or the sinking of shafts in quicksands or soft earth; and it consists in a pile or piles constructed to fit each other at adjacent edges and have sliding relation, one with another, at such edges, but incapable of pulling apart sidewise or edgewise, and adapted to have a water-tight joint formed between their ends and edges, whereby the slightest leak into the inclosure formed by a series of piles employed is absolutely precluded. This provision is a most important one in constructions of this character for the reason that a small orifice affords an inlet for sufficient water and quicksand to make it dangerous, if not altogether impossible, to work in the inclosure. The present arrangement is such that a species of tongue-and-groove joint is made at the contiguous edges of the piles, and this joint is recessed to receive a suitable packing, and preferably one which expands by the action of moisture upon it. The piles are made so as to prevent pulling apart edgewise or any lateral turning with relation to one another. They are made of different lengths, so that joints are broken between adjacent piles, and if need be some means is provided for preventing a lateral collapse of the walls formed by the connected piles, although in this connection it may be said that it is perfectly possible to so form these individual piles that any tendency to collapse is avoided, especially in the circular or rectangular inclosures made up of these piles.

With these objects in view my invention consists in certain novel features of construction and combinations of parts, which will be more fully described hereinafter and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a detached view of one of the piles. Fig. 2

is a transverse section. Fig. 3 is a view of a series of these piles joined together to form a shaft or species of coffer-dam, and Fig. 4 is a plan view thereof. Fig. 5 is a vertical sectional view. Fig. 6 is a detail showing the ends of two of the brace-beams. Fig. 7 is a detail in perspective, showing the adjacent ends of two piles; and Figs. 8 and 9 are plan views illustrating two different arrangements of piling for different purposes.

A represents a pile. This is preferably made of steel from thirty to sixty feet in length, about ten or twelve inches wide, and from five-eighths to two and one-half inches thick in its different parts. These dimensions are merely mentioned to give an idea of the general proportions contemplated; but they are not at all essential, and the widest latitude is intended to be reserved for the construction of these piles; but they preferably differ in length in order to provide against any two adjacent ones ending upon a level, the purpose being to break joints at all points where ends meet for the obvious reason that greater strength is attained in that way than possibly could be in any other. One edge 1 of each pile is made large enough so that its groove 2 will embrace and form a sliding connection with the smaller or opposite edge 3 of the next adjacent pile. These edges embrace each other to such an extent as to prevent any lateral displacement, and by their abutment upon each other at their extreme outer edges any swinging or turning or lateral pull is absolutely prevented. Packing-groove 4 is made in one of the edges of each pile, preferably the smaller edge 3, although it may be formed in either edge or partly in both. This packing-groove is intended to receive some packing material, such as a rope 5, of cellulose or equivalent material, or, for that matter, a wooden strip or cement, the object being to fill the packing-groove with some material which will expand as soon as moisture comes in contact with it, so that a perfectly water-tight joint is formed throughout the length of the joints. Similar packing material is of course inserted between the adjacent ends of the piles.

The invention contemplates a variety of uses, and prominently among these is the provision for forming a well or shaft of great



depth—for instance, where mineral deposits are found under a deep strata of quicksand or soft earth in which it is impossible to make an excavation—and in reaching to such a depth a series of piles are driven their length, and they are arranged around an inclosure which may be rectangular in shape, circular, or in any other form, and after a circuit of piles is assembled and they are driven down their entire lengths then more piles are driven, one after another, the lower end of one upon the upper end of the other which it is to follow, and so on throughout the entire series, the piles being selected always so as to insure a breaking of joints, as previously explained.

As a means of insuring against the possibility of any collapse where the piles are put together in the form of an inclosure the inside brace-beams 6 are placed at intervals, they resting upon shoulders 7 or projections made upon the inner faces of certain of the piles. These braces are preferably made in sections, one for each side, and constructed to fit together at their ends.

The piles when thus constructed are well adapted to the construction of sewers through quicksands and other soft earth, and when thus applied, of course, a complete inclosure is not formed; but two rows of piles are driven a suitable distance apart through a street, for instance, and the material between these rows is pumped or excavated therefrom, whereupon the sewer is constructed, and the piles are in that instance pulled out, allowing the earth to close in over the sewer. In such construction the side branches and main branch and all may be inclosed and provided for by two continuous rows of these piles. In fact, it is obvious that they may be so directed as to adapt them for any purpose of this kind where it is impossible to excavate or build a sewer or foundation or reach to a great depth without the use of some sort of construction of this description.

It is evident that changes might be made in the form and arrangement of the several parts described without departing from the

spirit and scope of my invention, and hence I do not wish to limit myself to the exact construction herein set forth; but,

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

1. A pair of piles having a tongue-and-grooved connection, with a packing-groove formed between them.

2. A steel pile having an enlargement at each edge, one of which has a groove of sufficient size to receive an edge of another pile and the other edge having a packing-groove formed therein.

3. A rolled-steel pile having an enlargement at each edge, one of which has a groove of sufficient size to receive an edge of another pile and a packing-groove formed in one of the enlarged edges.

4. A pair of steel piles having sliding and locking connection with each other, and a packing-groove formed between them and a packing substance between the adjacent edges adapted to be expanded by moisture, whereby a water-tight joint is formed.

5. A series of piles having sliding and locking connection with each other, with a packing between their adjacent ends.

6. A series of piles having sliding and locking connection with each other and arranged to form an inclosure, certain of the piles having shoulders formed on their inner surfaces and brace-bars fitted to the inner walls of the inclosure and resting upon said shoulders.

7. A series of piles having sliding and locking connection with each other and arranged to form an inclosure, certain of the piles having shoulders formed on their inner surfaces and brace-bars fitted to the inner walls of the inclosure and resting upon said shoulders, said brace-bars having interlocking ends adapted to be superimposed upon each other, substantially as described.

SAML. K. BEHREND.

In presence of—

W. H. BADEN,

VERNON E. HODGES.