H. W. SCHLUETER.

INTERLOCKING CONSTRUCTION FOR DOCKS, PIERS, JETTIES, BUILDING FOUNDATIONS, &c.

APPLICATION FILED FEB. 1, 1908.

910,421. Patented Jan. 19, 1909.

6 SHEETS—SHEET 1.

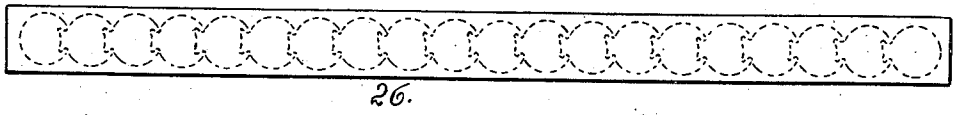

Fig. 2.

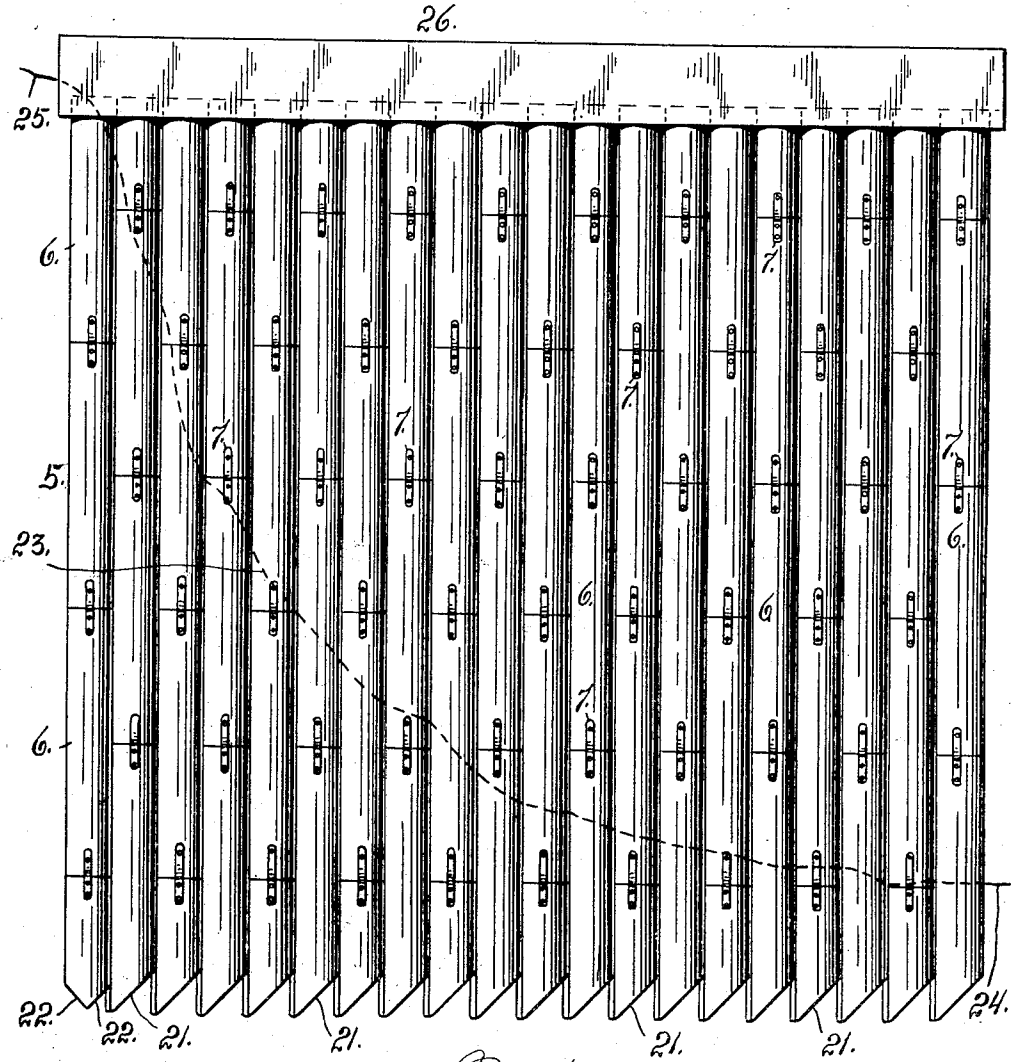

Fig. 1.

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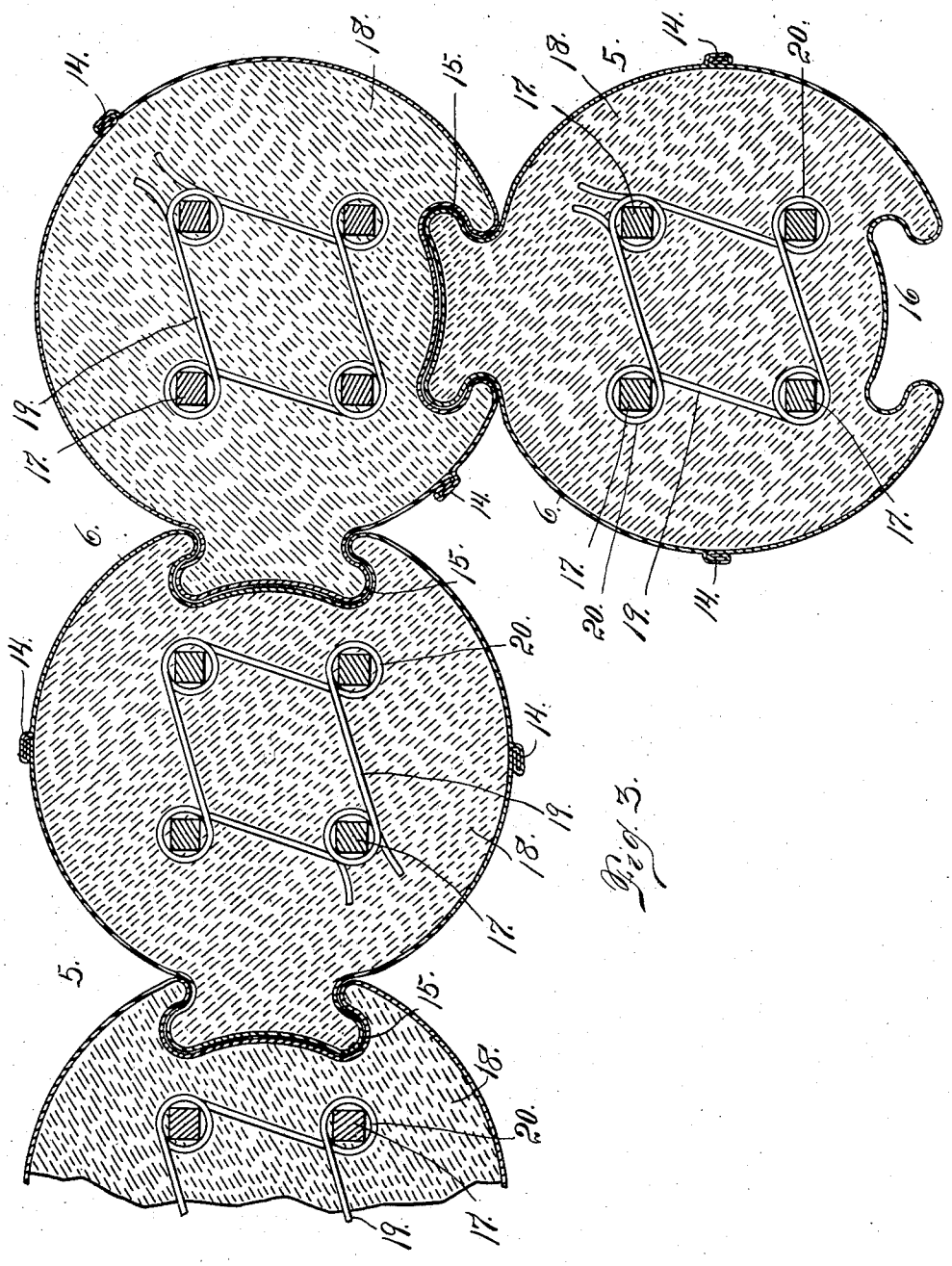

Fig. 3.

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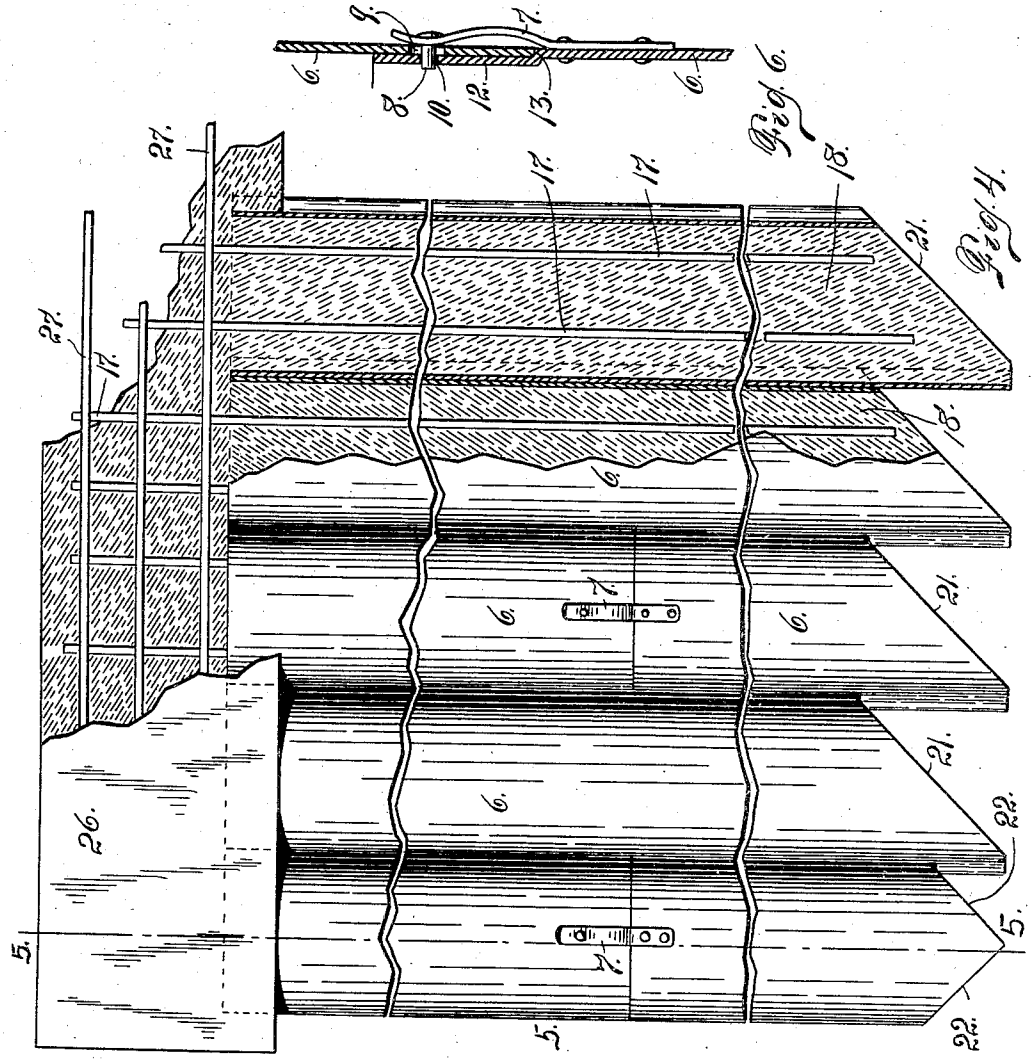

Fig. 4.

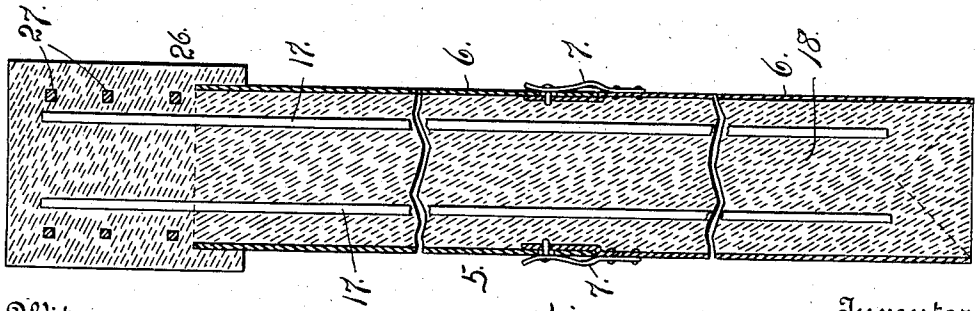

Fig. 5.

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6 SHEETS—SHEET 4.

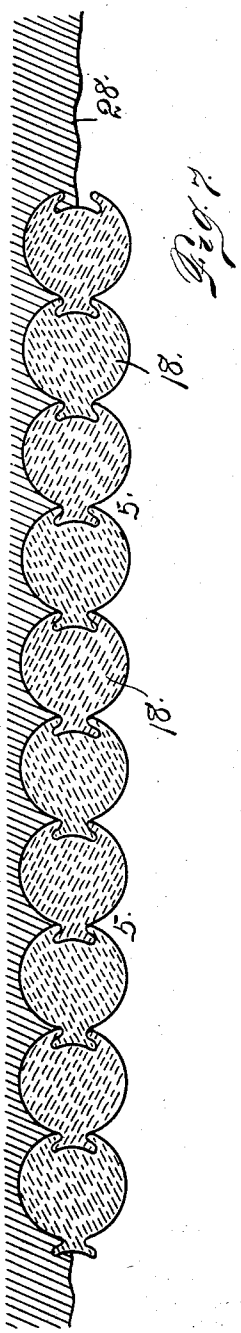

Fig. 7.

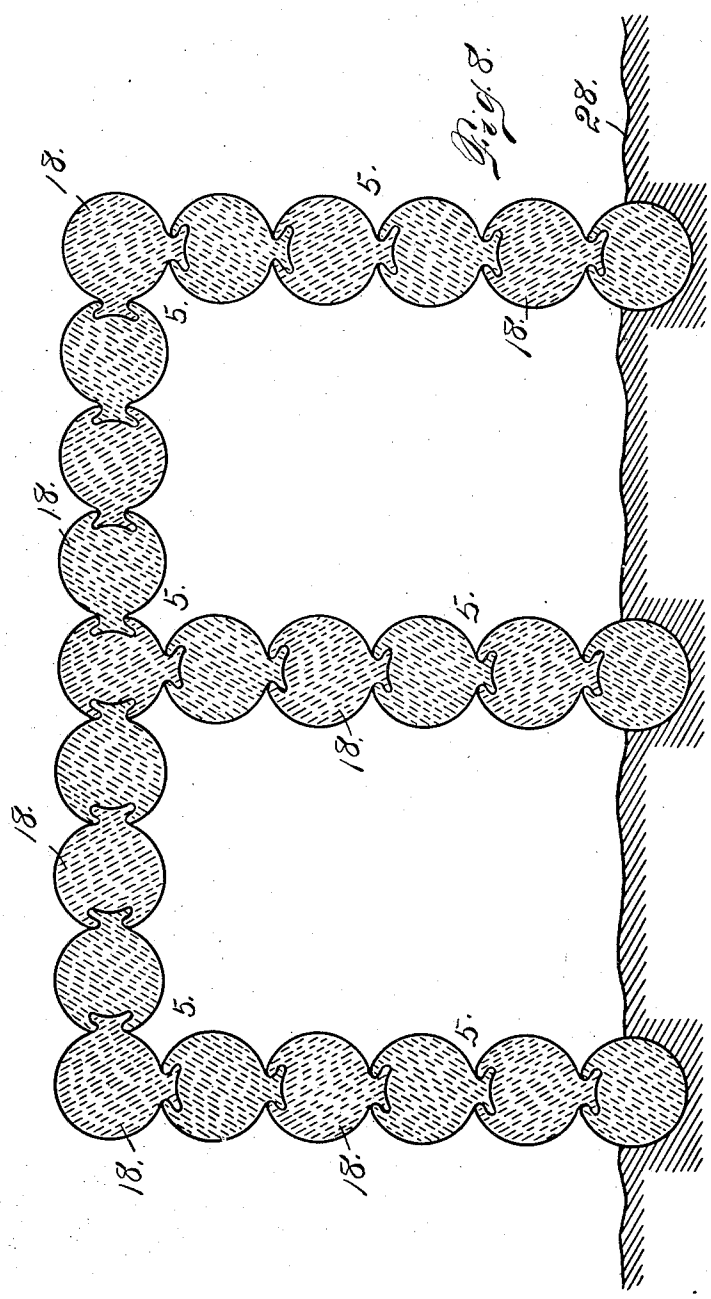

Fig. 8.

Witnesses
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6 SHEETS—SHEET 5.

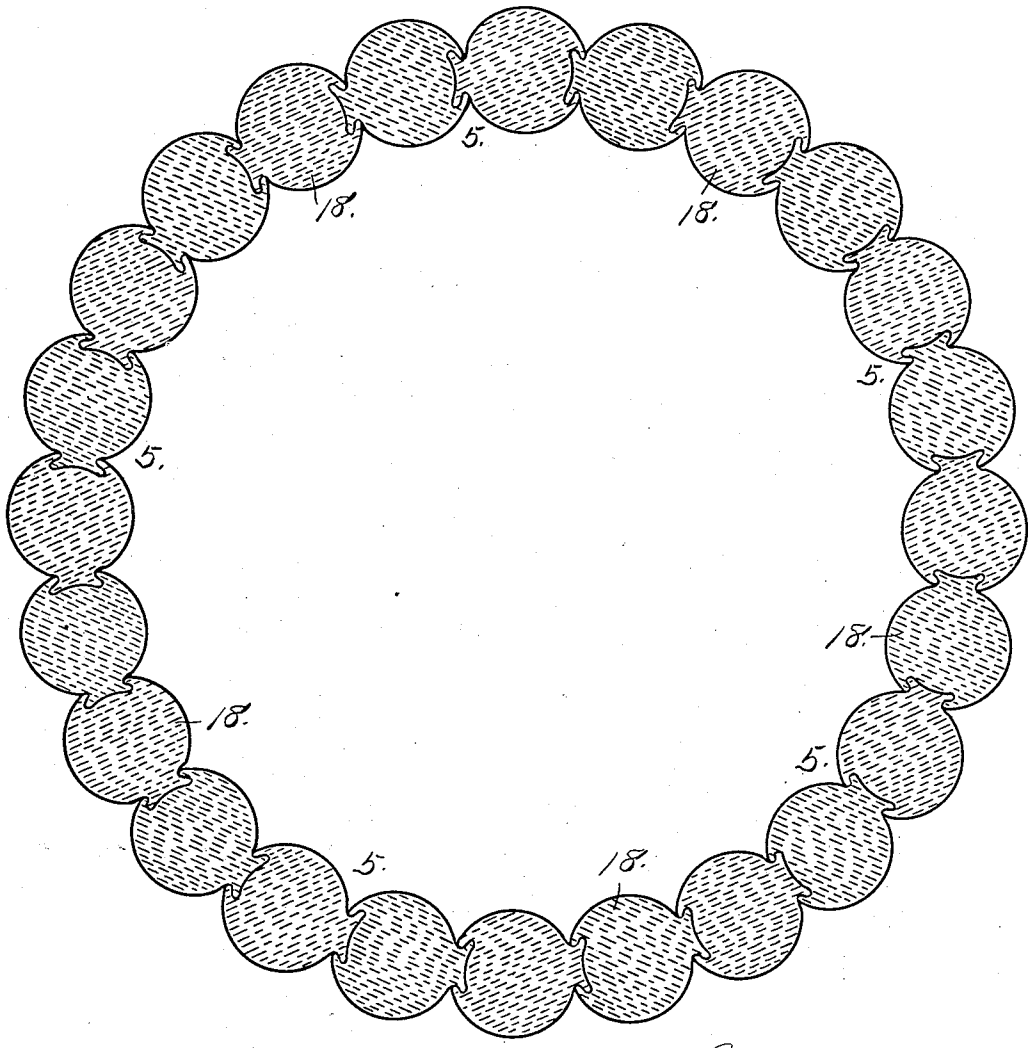

Fig. 9.

Witnesses
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6 SHEETS—SHEET 6

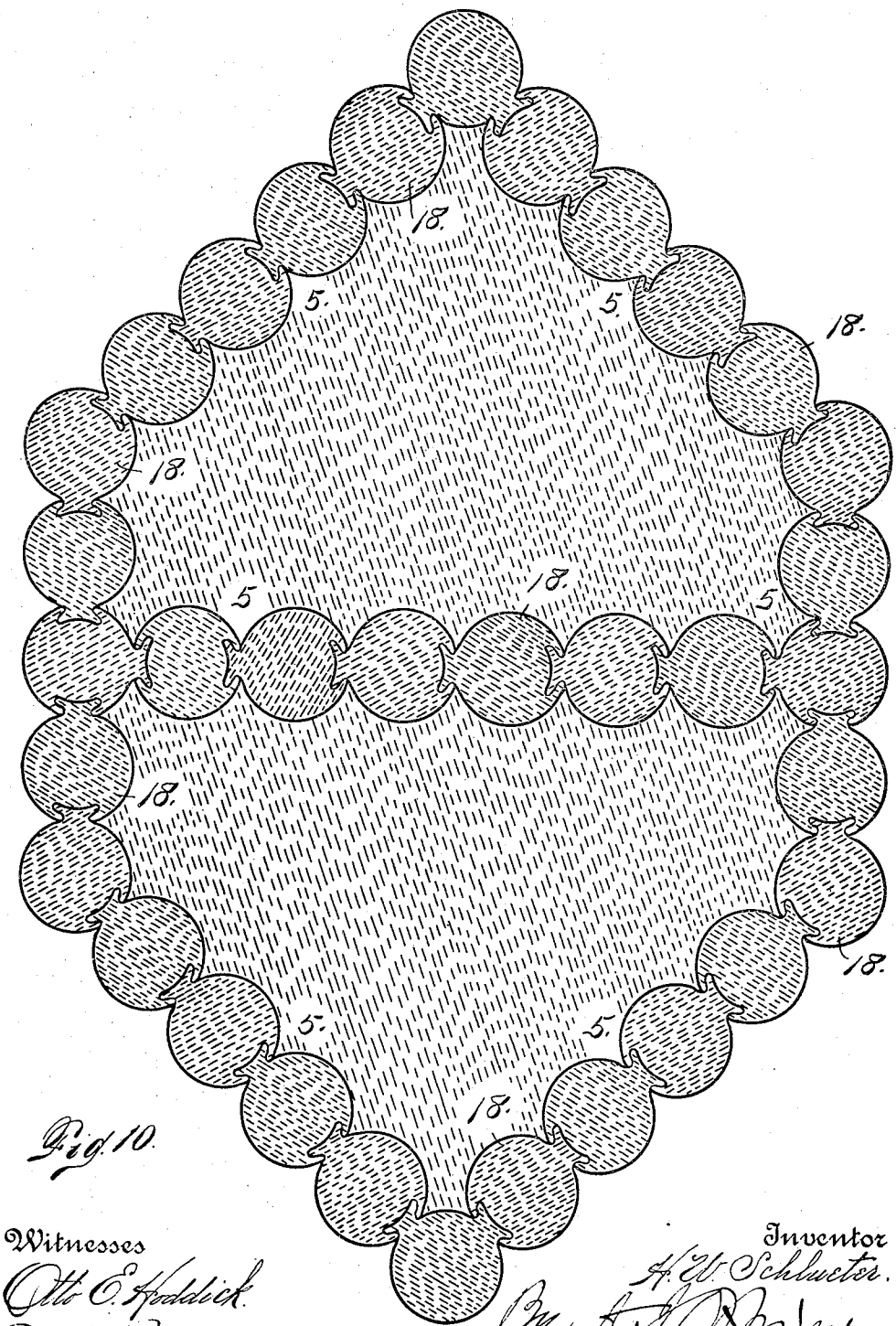

Fig. 10.

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UNITED STATES PATENT OFFICE.

HENRY W. SCHLUETER, OF DENVER, COLORADO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO INTERLOCKING TUBE COMPANY, A CORPORATION OF ILLINOIS.

INTERLOCKING CONSTRUCTION FOR DOCKS, PIERS, JETTIES, BUILDING-FOUNDATIONS, &c.

No. 910,421. Specification of Letters Patent. Patented Jan. 19, 1909.

Application filed February 1, 1908. Serial No. 413,731.

To all whom it may concern:

Be it known that I, HENRY W. SCHLUETER a citizen of the United States, residing at the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Interlocking Constructions for Docks, Piers, Jetties, Building-Foundations, &c.; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to an interlocking construction for use in forming wharves, piers, docks, sea-walls, jetties, groynes, coffer-dams and other similar constructions adapted for use in connection with various bodies of water as seas, lakes, rivers, etc. My improved construction may also be advantageously employed in building foundations and for use in the construction of bridges and wherever water is encountered.

The distinguishing feature of my improved construction consists of interlocking tubes or hollow piles. The adjacent sides of the tubes are provided with counterpart tongues and grooves of dove-tail or similar shape, whereby the interlocking connection can only be made at the ends of the tubular sections and when so connected cannot be detached by a lateral movement. These tubes may be arranged to form a wall of any shape by properly arranging the interlocking features. The tubes after being arranged in the desired form, are filled with cement or concrete whereby the water is expelled. When the tubes are so filled a cement or concrete wall is formed the same being exteriorly covered by sheet metal of which the tubes are preferably composed. The completed wall thus forms a water tight structure and even though the metal exterior may be worn away, the interlocking cement or concrete structure will remain permanently. I preferably locate within the tubes, metal bars which after the concrete is in place, form a reinforcement giving the structure great strength.

From the foregoing it will be understood that my improvement may be employed in a great variety of ways and it may be said that it completely overcomes the difficulty heretofore experienced in making absolutely water tight walls in coffer-dam and other similar constructions. The interlocking tubes may be made in sections of any length and their height may therefore be as great as desired. In sinking these tubes a vacuum or suction process is employed whereby the material directly below the tube is removed allowing the latter to drop by its own weight.

Having briefly outlined my improved construction I will proceed to describe the same in detail reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing, Figure 1 is a side elevation illustrating my invention and showing a series of interlocking tubes connected at the top by a concrete beam which forms a sort of cap for the tubes or columns. This view shows the construction in the form of a jetty or a wall projecting from the bank of a stream or other body of water outwardly thereinto. Fig. 2 is a top plan view of the same. Fig. 3 is a cross section taken through a number of interlocked composite columns composed of metal tubes filled with cement or concrete and metal reinforced. Fig. 4 is a fragmentary view partly in elevation and partly in section similar to Fig. 1 but shown on a much larger scale. Fig. 5 is a vertical longitudinal section taken on the line 5—5 Fig. 4. Fig. 6 is a fragmentary detail view illustrating the manner of interlocking the tube sections. This is a section taken through two of the connected sections but shown on a larger scale than in the other views. Fig. 7 is a top plan diagrammatic view illustrating my improved construction shown in the form of a sea-wall or break water. Fig. 8 is a similar view illustrating the support or foundation for a wharf or landing. Fig. 9 is a similar view showing the composite columns arranged in the form of a circle illustrating the manner in which a coffer-dam or other similar construction may be formed. Fig. 10 is a similar view showing the composite piles or columns arranged in polygonal form, a central or transverse row of columns forming a partition wall being located within the inclosure formed by the outer construction. In this view the space inclosed is filled with cement or con-

crete illustrating the manner of forming a solid pier adapted to support a structure of any kind.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate tubes or pipes which in order that they may be of any desired length and that it may be practicable to employ them for the purpose herein explained, are composed of sections 6 connected together by suitable fastening devices. One form of connecting these sections is illustrated in Fig. 6 in which 7 is a spring riveted to the upper portion of the lower pipe section and carrying a pin 8 adapted to pass through an opening 9 formed in the upper section and also through a registering opening 10 formed in the upper part 12 of the lower section, this part being offset as shown at 13 to allow the lower extremity of the upper section to pass around it, the lower edge of the upper section engaging the offset of the lower section. It will of course be understood that these sections may be connected in any suitable manner. As each section is applied, it is connected with the section next below before sinking the pipe further. In this way the place of connecting the pipes is always accessible at a suitable point above the water. The pipes or tubes 5 may be formed in two parts having the parts interlocked as shown at 14 (see Fig. 3) or they may be otherwise formed without a protruding joint as may be found practicable or as may be desired. An important feature of these tubes is that they are provided with tongues 15 and grooves 16. The tongues and grooves of any two adjacent pipes or tubes are of counterpart shape whereby the tongue of the one pipe slips into the groove of the other pipe, the end of the tongue of one pipe being inserted at the end of the groove of the other pipe after which the tongue slides in the groove until the pipes are interlocked their entire length. While the general construction of these tongues and grooves is of dove-tail form, any interlocking construction which will prevent the device from becoming detached by a lateral or transverse movement, will perform the required function. Within each pipe one or more rods 17 may be introduced for the purpose of reinforcing the cement or concrete filling 18. As shown in Fig. 3 of the drawing, four rods 17 are introduced, the same being connected together by a wire 19 which is given one or more coils 20 around each rod, the extremities of the wire being finally fastened together whereby the rods are caused to maintain their position within the pipe during the introduction of the concrete or cement filling.

The lower extremities of the pipes are preferably beveled as shown at 21 on the side remote from that where the last pipe introduced is located whereby there is a tendency for the pipe that is being lowered or introduced to crowd toward the introduced or stationary pipe thus obviating any lateral or separating tendency since the latter would cause the pipes to bind and retard freedom of introduction. For instance referring to Fig. 1, the pipe 5 farthest to the left being the pipe first introduced or lowered at the brink of the stream or other body of water, is beveled on opposite sides as shown at 22 since there is no necessity that this pipe should have a tendency to move laterally in either direction during the driving or lowering operation. By beveling it on opposite sides it becomes pointed which facilitates its introduction. The next pipe 5, however, is beveled as shown at 21 on the side remote from the first pipe whereby there is a tendency for the second pipe to move toward the first pipe. For the same reason the third pipe and each other pipe successively introduced is beveled on the side remote from the last pipe introduced, to prevent the binding of the interlocking parts of the pipes during the formation of the jetty or other form of structure for which my improved interlocking device may be employed.

In Fig. 1 of the drawing the extremity 24 of the dotted line 23 indicates the bed or bottom of the stream or other body of water; while the extremity 25 of the same line designates the earth at the brink or margin of the stream. The dotted line intermediate these two points designates the contour of the bank below the surface of the water thus indicating the usual conditions existing at streams and other bodies of water, whereby the depth gradually increases from the brink to the bottom or maximum depth of the water. This line also indicates the depth to which the pipes or composite columns are introduced or lowered into the earth.

As shown in the drawing it is preferred to place a cement or concrete beam 26 (see Figs. 1, 4 and 5) upon the top of the columns, the upper extremity of each column being embedded in the said beam a suitable distance as indicated by the dotted lines in Fig. 1 and also by full lines in Figs. 4 and 5. This horizontally disposed beam forms a cap and gives the structure a finished appearance. It also adds to the strength and durability of the structure. Where this cap is employed the reinforcing rod 17 may extend upwardly beyond the composite columns and project into the horizontal beam 26, the latter being molded or formed after the columns have been completed. Horizontal reinforcing rods 27 may also be employed, these rods being placed in position during the introduction of the cement or concrete to the mold (not shown). It will be understood that in the formation of this horizontal beam a mold of any suitable construction must be

made in order to support the plastic material until the latter has become hardened.

In Figs. 7 and 8 of the drawing, the numeral 28 designates the earth at the brink or margin of the stream or other body of water. Attention is called to the fact that in Figs. 7 to 10 both inclusive, no attempt has been made to show the specific construction except in a general way. Hence these views may be termed diagrammatic views in which the pipe or tube 5 is designated by a single heavy line surrounding the cement or concrete filling 18. It has not been necessary in these views to designate the pipe or tube by cross hatching since this is illustrated in Figs. 3, 4 and 5. The views 7 to 10 inclusive are only intended to show or illustrate some of the constructions for which my improved composite columns may be advantageously used.

From the foregoing description the use of my improvement will be readily understood. The tubes or pipes may be composed of sections of any desired length. The sections may be successively introduced. Each succeeding section is connected with the uppermost end section of the pipe, after which the pipe is further lowered by the vacuum or suction process, that is to say by removing the earth or other material by suction from its position immediately below the tube whereby the latter simply settles by its own weight and is held in place by the surrounding formation. In forming a jetty or wall which extends outwardly into a stream or other body of water, the pipe close to the bank is introduced first, after which the other pipes are successively introduced, the tongue of one pipe entering the counterpart groove or longitudinal recess of the other pipe whereby when the wall is formed the entire construction is locked together. The pipes are then filled with cement or concrete whereby the water is expelled, the metal reinforcing rods being first placed in position. In the case of a jetty or other wall, the cap beam 26 may then be placed in position if desired giving the same a finished appearance and increasing its strength and durability.

In the case of a coffer-dam or other similar construction, after the composite columns are put in place in the form shown in Fig. 9, the water may be pumped out of the inclosure if desired whereby the latter is entirely free from water thus permitting the workmen to pursue their labors at the bottom of the stream or other body of water either in connection with tunneling or other work.

It will be understood that the space surrounded by the columns in Fig. 9 may also be filled with concrete if desired.

It will also be understood that when the inclosure surrounded by the composite columns is filled with concrete as shown in Fig. 10, that a concrete or cement slab forming a cap or cover for the entire structure may be molded in place thereon, in the same manner as illustrated in Figs. 4 and 5. It will of course be understood that a cement cap or cover over the entire structure disclosed in Fig. 10 may be molded thereon as herein described when speaking of Figs. 4 and 5. It has therefore not been thought necessary to illustrate the cap or slab in connection with Fig. 10.

Having thus described my invention, what I claim is:

1. Pipes or tubes provided with interlocking tongues and grooves, the tongues being hollow and in communication with their respective pipes and the grooves being interiorly located.

2. Pipes or tubes provided with interlocking tongues and grooves of dove-tailed form, whereby the interlocked elements are capable of longitudinal movement but locked against lateral displacement when assembled, the tongues being hollow and in communication with the said pipes and the grooves being interiorly positioned.

3. A composite column composed of a pipe or tube having an exteriorly protruding hollow dove-tailed tongue in communication with the pipe, the said pipe or tube together with its hollow tongue being provided with a filling the pipe or tube forming the exterior wall of the column, substantially as described.

4. A composite column composed of a pipe having an exteriorly protruding tongue and a groove of counterpart shape, the pipe being filled with cement or concrete, and provided with a metal reinforcement, substantially as described.

5. A wall composed of a series of pipes or tubes provided with interlocking tongues and grooves, the tongues being hollow and in communication with their respective pipes and the grooves being interiorly located the interlocking elements being constructed to permit longitudinal movement but to prevent lateral displacement when assembled, substantially as described.

6. A wall composed of a number of pipes or tubes having interlocking dove-tailed tongues and grooves, the tongues being hollow and in communication with their respective tubes, and the grooves being interiorly located the tubes being filled with cement or concrete, substantially as described.

7. The combination of a series of pipes or tubes provided with interlocking dove-tailed tongues and grooves, the pipes being filled with cement or concrete and provided with a metal reinforcement, substantially as described.

8. The combination of a series of pipes or tubes provided with interlocking tongues and grooves of dove-tail form, the grooves being formed integral with the pipes and in communication with the latter, the pipes or tubes

being filled with cement or concrete which also enters the tongues and surrounds the grooves of the interlocking members whereby the cement or concrete columns are correspondingly interlocked, substantially as described.

9. A composite column composed of a pipe or tube provided with a dove-tailed tongue formed integral with the body of the tube and communicating with the latter, the tube being provided with a filling of cement or concrete which enters the tongue as well as the body of the pipe the latter forming the exterior wall of the column, substantially as described.

10. A composite column composed of a pipe or tube provided with a longitudinally disposed dove-tailed groove, the groove being formed by bending the metal of the pipe inwardly to give it the groove contour, the pipe forming the exterior wall of the column which is filled with cement or concrete, substantially as described.

11. The combination of a series of tubes provided with longitudinally disposed interlocking tongues and grooves, the tongues being hollow and in communication with the body of the pipe or tube, and the grooves being interiorly located, the tubes being arranged to inclose a suitable space, the tubes as well as the inclosure surrounded by the columns being filled with cement, concrete or similar plastic material, substantially as described.

12. A pair of pipes or tubes, one of which is provided with a hollow exteriorly protruding dove-tailed tongue in communication with the body of the pipe or tube, and the other being provided with an interiorly located counterpart groove, the two pipes being interlocked by the insertion of the tongue of one in the groove of the other, substantially as described.

13. A composite column composed of a pipe or tube provided with an exteriorly protruding hollow-dove-tailed tongue in communication with the body of the tube, forming the exterior wall of the column and the said tube being provided with a suitable filling, substantially as described.

14. A composite column composed of a pipe or tube whose wall protrudes into the hollow of the tube, forming an interiorly located groove open at the outer surface of the pipe, the latter forming the exterior wall of the column, substantially as described.

15. A composite column composed of a pipe or tube provided with an interiorly located groove, the said pipe forming the exterior wall of the column having a filling engaging the walls of the groove, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY W. SCHLUETER.

Witnesses:

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A. J. O'BRIEN.