

E. C. LAWRENCE & O. F. LACKEY.  
 REINFORCED CONCRETE CONSTRUCTION FOR PIERS AND DOCKS.

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Patented Jan. 5, 1909.

2 SHEETS—SHEET 1.

908,783.

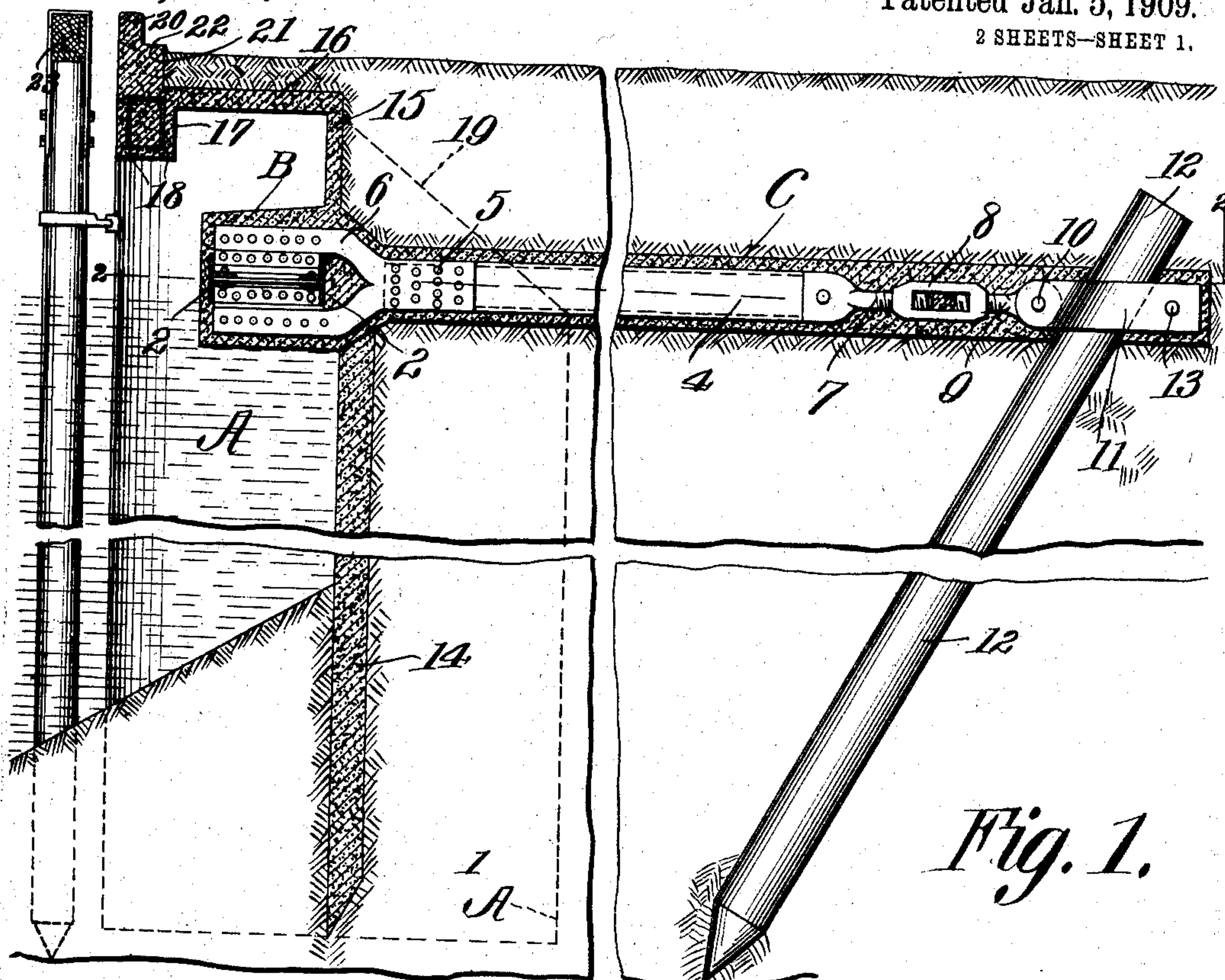


Fig. 1.

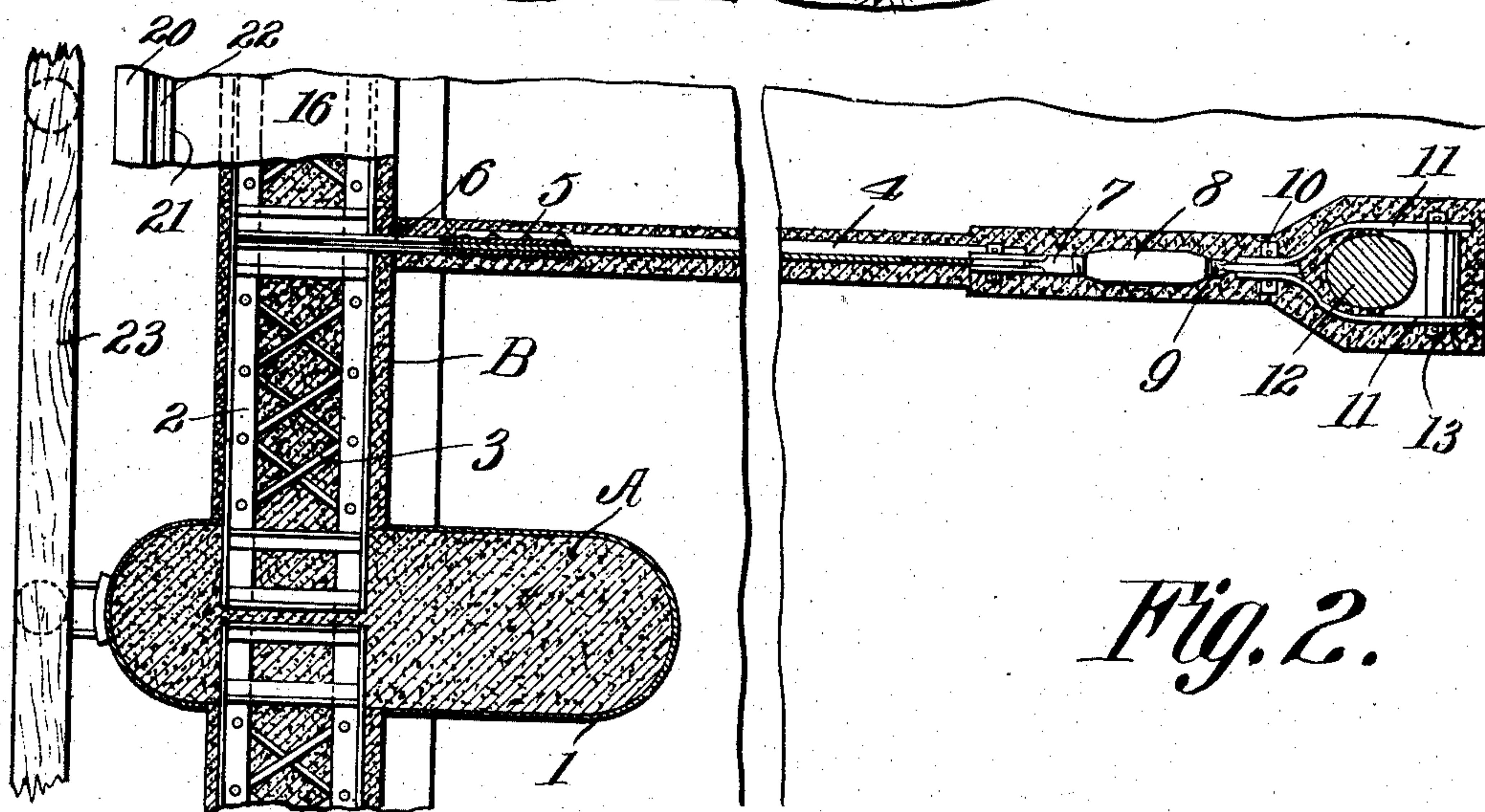


Fig. 2.

WITNESSES

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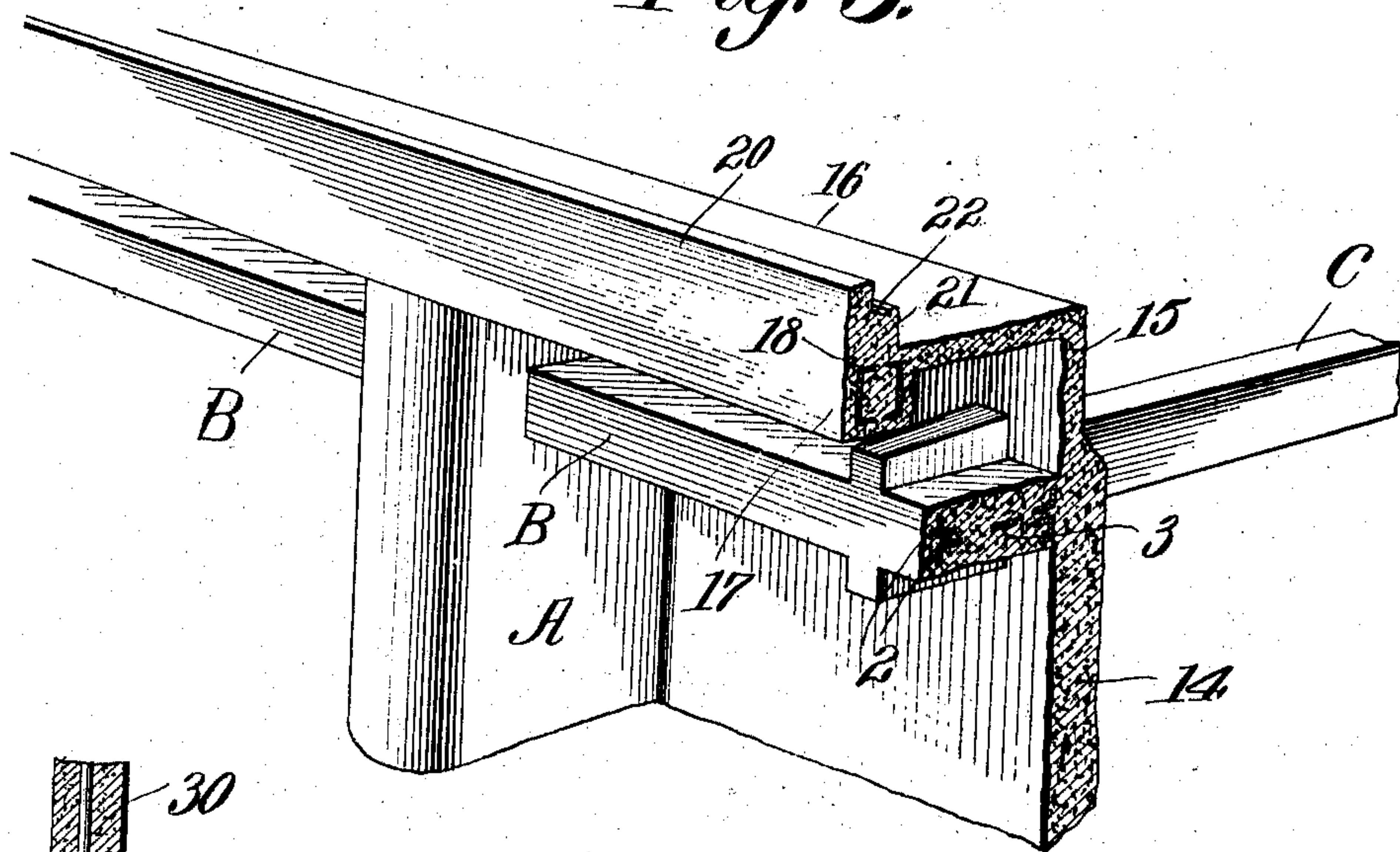
Engelbert C. Lawrence  
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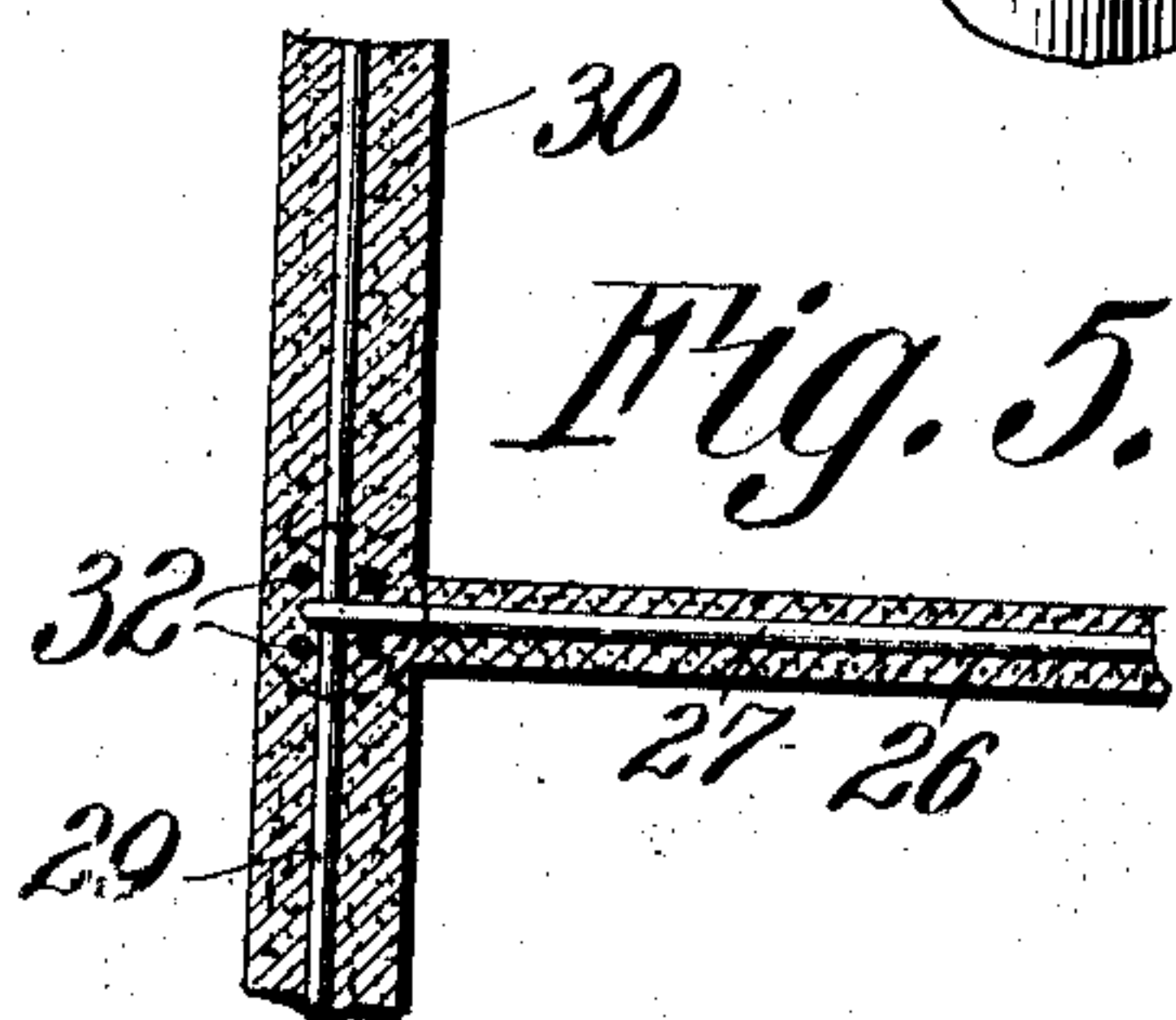
**908,783.**

2 SHEETS—SHEET 2.

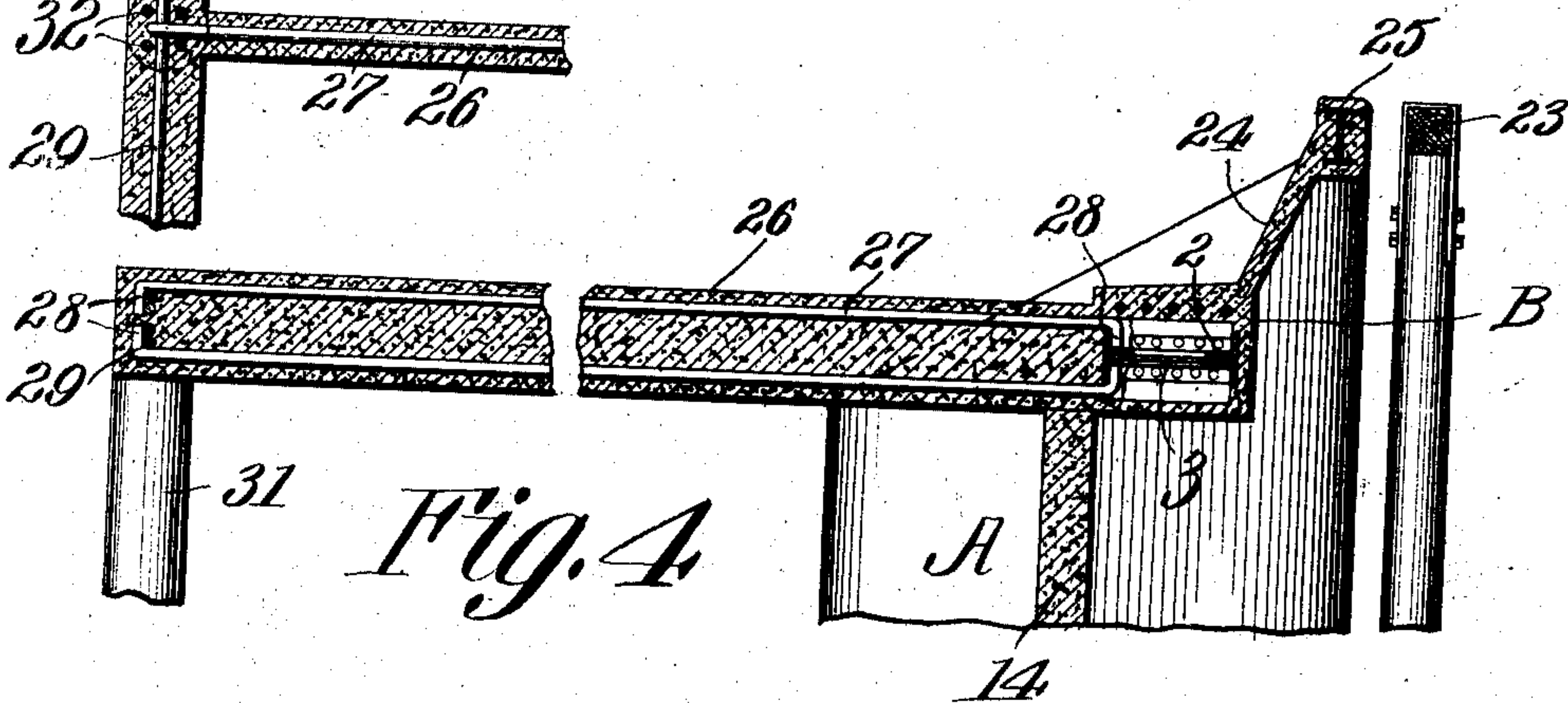
*Fig. 3.*



*Fig. 5.*



*Fig. 4*



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# UNITED STATES PATENT OFFICE.

ENGELBERT C. LAWRENCE AND OSCAR F. LACKEY, OF BALTIMORE, MARYLAND.

REINFORCED CONCRETE CONSTRUCTION FOR PIERS AND DOCKS.

No. 908,783.

Specification of Letters Patent.

Patented Jan. 5, 1909.

Application filed August 3, 1908. Serial No. 446,543.

*To all whom it may concern:*

Be it known that we, ENGELBERT C. LAWRENCE and OSCAR F. LACKEY, citizens of the United States, residing at Baltimore city, State of Maryland, have invented certain new and useful Improvements in Reinforced Concrete Construction for Piers and Docks, of which the following is a specification.

Our invention relates to reinforced concrete construction used in the building of piers or wharves, buildings, abutments for bridges, bulkheads, or for the support of embankments, and is shown in the present instance as applied to the construction of docks or piers.

It has for its object to provide a construction which may be adapted to the particular place and conditions incident thereto, also to provide a structure easily constructed, capable of withstanding any strains or weights to which it may be subjected, at a minimum cost.

With the foregoing object in view, our invention consists in certain novel features of construction and combinations of parts, which will be hereinafter described and pointed out in the claims.

In the drawings Figure 1 is a sectional elevation of a pier constructed in accordance with this invention. Fig. 2 is a sectional plan view of the same on the line 2—2 of Fig. 1. Fig. 3 is a sectional perspective view of a portion of the concrete construction. Fig. 4 is a sectional elevation of a modified form of pier construction, and Fig. 5 is a sectional plan view of a portion of Fig. 4.

Referring to the drawings, like numerals being applied to corresponding parts throughout the several figures, in which A represents a column or pillar of masonry of sufficient cross sectional area, sunk to a depth sufficient to insure stability under load, these columns are spaced at determined distances. Although shown in the drawing as oblong in cross section, they may be of any shape or inclined to any angle as occasion may require. In the drawings there is shown a casing 1 which is first sunk, forming a shell or mold for the concrete which is afterward introduced. Embedded in these columns A, is one end of a reinforced concrete girder or tie B, consisting of a steel beam made up of a number of angles 2 tied by a lattice work 3, the whole being surrounded by concrete and extending to the next adjacent column A.

Interposed between the adjacent columns

A is one or more tie beams or girders C consisting of a channel iron or other beam 4, one end of which is securely riveted at 5 between a pair of bifurcated plates 6, said plates straddling the angles 2 and securely riveted thereto, the other end of the channel 4 is secured to one end 7 of a turnbuckle 8, the other end 9 is secured by means of a pin 10, to a pair of straps 11, said straps surrounding a pile 12, and connected at their outer ends by a pin 13, there being ample space allowed for the expansion or constriction of the beam C. The said pile 12 may be of any desired material and placed vertical or driven at any angle. As shown in the drawing, the channel 4, together with its connections are incased in concrete.

Connecting the columns A is a wall 14, which may be of concrete, as shown, or of other sheet piling, such as steel or timber, and forms the facing of the dock below the water line. The outer end of the tie beam C rests on this wall 14, and above this rests a wall 15, on top of which rests one edge of the floor or deck 16, the other edge being supported by a longitudinal beam 17, reinforced by channel bars 18 or other forms of reinforcement.

It will be observed that the floor 16 rests directly on the top of the columns A, said column sloping from the floor line toward the rear, as indicated at 19. Provision is made for the safety of pedestrians and vehicles by placing above the beam 17 the guard rail 20, which may be stepped as indicated at 21, said step being provided with a gutter 22 for the purpose of conveying the water to a point of discharge.

Mounted on piles is the usual fender rail 23, anchored in any approved manner to the columns A.

In the modified construction shown in Figs. 4 and 5, the floor or deck is dispensed with and the wall 24 is inclined from the top of the girder B, to the guard rail 25, which is shown in this case formed of a T beam incased in concrete, resting on columns A and spanning the space between said columns. The tie beam 26 in this case is reinforced by ordinary round reinforcing iron 27, the ends of which are bent, forming hooks 28, which engage at one end of the vertical side of the angles 2, and the other end engages the reinforcing rods 29 of a longitudinal tie beam 30, which may extend the full length of the structure or simply form T heads to the



beams 26 as conditions require. The said beams 30 being supported on piles 31, which may also be, if desired, reinforced concrete, as indicated at 32. In other respects, the construction is similar to that shown in the preferred form.

Attention is here called to the fact that in practice either of the above forms have been found to be economical in construction and maintenance and particularly adapted to the most exacting requirements.

Slight changes and alterations might be resorted to in the form and arrangement of the several parts described without departing from the spirit and scope of our invention, and hence we do not desire to limit ourselves to the exact construction as herein set forth, but,

Having fully described our invention, what we claim as new and desire to secure by Letters Patent, is:

1. A structure for piers and docks comprising a wall, a plurality of concrete columns adjacent thereto, reinforced concrete girders embedded and connected with the said columns, a plurality of piles, a plurality of tie beams connecting the said girders with the said piles, channel irons secured within and reinforcing the said tie beams, straps secured to the said piles, turnbuckles connecting the said straps with the said channel irons, substantially as described.

2. A structure for piers and docks comprising a wall, a plurality of concrete columns adjacent thereto, casings surrounding the said columns, reinforced concrete girders connecting the said columns, tie beams, channel irons reinforcing the said beams, a plurality of piles, straps secured round the piles, turnbuckles securing one end of the tie beams to the said straps, and means for securing the opposite ends of the said tie beams to the said girders, substantially as described.

3. A structure for piers and docks comprising a wall, a plurality of concrete columns adjacent thereto, concrete girders, a steel beam angled and latticed as a reinforcement for the said girders, tie beams, channel irons provided within the said tie beams, angle irons secured to one end of the channel irons, bifurcated plates secured thereto for securing the said tie beams to the said girders, turnbuckles secured on the opposite end of the said tie beams, a plurality of piles, straps surrounding the said piles, and means for connecting the said straps with the said turnbuckles, substantially as described.

4. A structure for piers and docks comprising a wall, a plurality of concrete columns

adjacent thereto, reinforced concrete girders embedded in and connecting the said columns, a plurality of piles, a plurality of concrete tie beams connecting the said girders with the said piles, one end of which is supported by the said wall, a beam, channel irons reinforcing the said beam, an additional wall, and a deck supported by the said wall and beam, a plurality of piles, a plurality of tie beams connecting the said girders with the said piles, channel irons secured therewithin reinforcing the said tie beams, straps secured to the said piles, turnbuckles connecting the said straps with the said channel irons, substantially as described.

5. A structure for piers and docks comprising a wall, a plurality of concrete columns adjacent thereto, concrete girders, metal lattice beams forming a reinforcement within the said girders, tie beams, channel irons secured within and reinforcing the said tie beams, a plurality of piles, straps secured around the piles, turnbuckles connecting the said straps with one end of the said channel irons, means for connecting the opposite free ends of the said channel irons with the said girders, substantially as described.

6. A structure for piers and docks comprising a wall, a plurality of concrete columns adjacent thereto, casings surrounding the said columns, reinforced concrete girders connecting the said columns, a plurality of piles, a plurality of tie beams, channel irons within and reinforcing the said tie beams, means for securing the tie beams to the girders, straps secured around the said piles, turnbuckles connecting the free ends of the channel irons with the said straps, substantially as described.

7. A structure for piers and docks comprising a wall, a plurality of concrete columns adjacent thereto, fender rails secured to the said columns, concrete girders connecting the said columns, metal latticed beams forming a reinforcement within the said girders, tie beams, channel irons secured within and reinforcing the said tie beams, a plurality of piles, straps secured around the said piles, turnbuckles connecting the said straps with one end of the said channel irons, means for connecting the opposite free ends of the said channel irons with the said girders, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

ENGELBERT C. LAWRENCE.

OSCAR F. LACKEY.

Witnesses:

E. WALTON BREWINGTON,  
MARY M. MAGRAW.