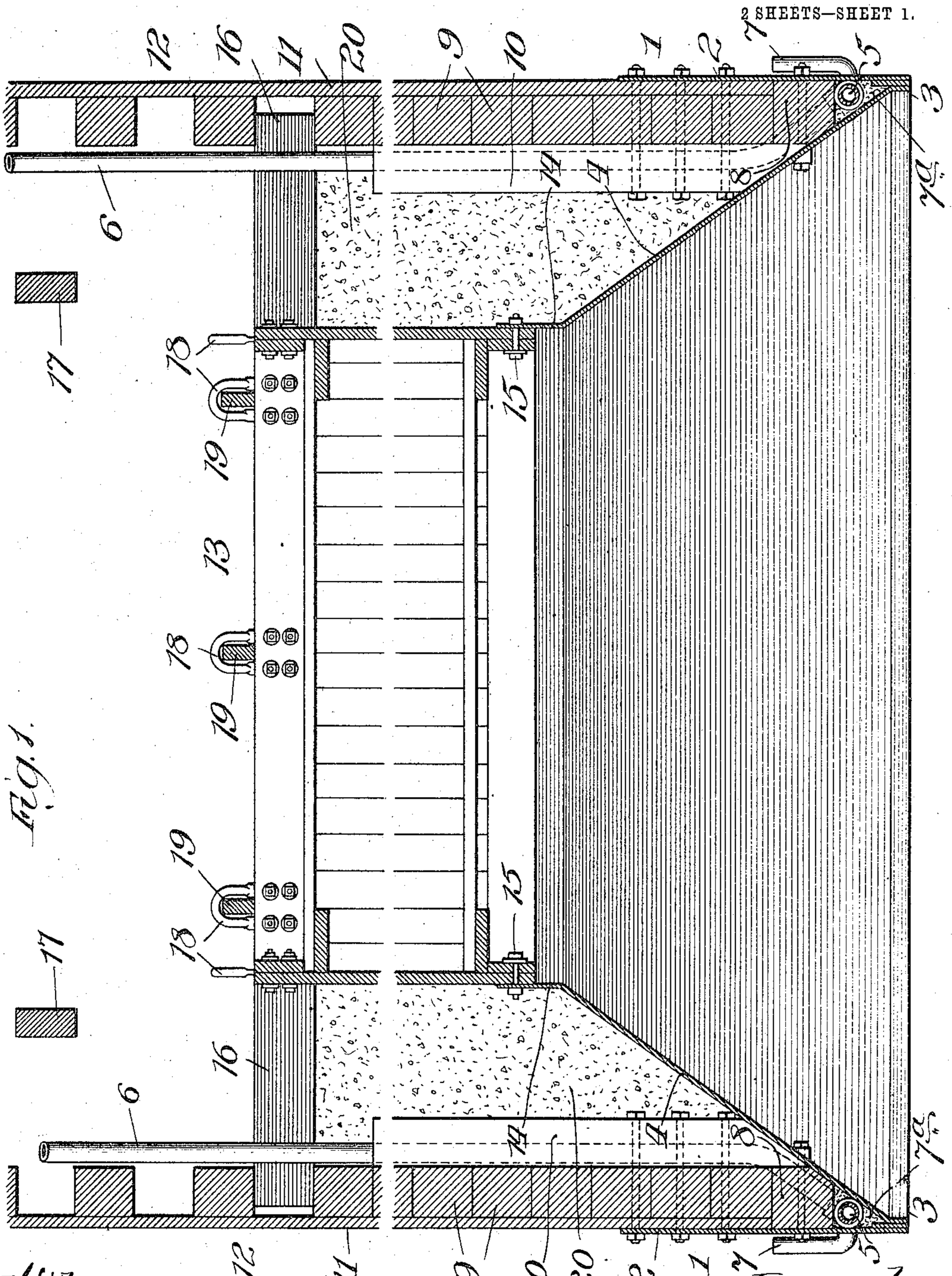
No. 862,284. PATENTED AUG. 6, 1907.

J. W. SCHAUB.

METHOD OF CONSTRUCTING SUNKEN STRUCTURES.

APPLICATION FILED MAR. 5, 1906. RENEWED APR. 5, 1907.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 4.

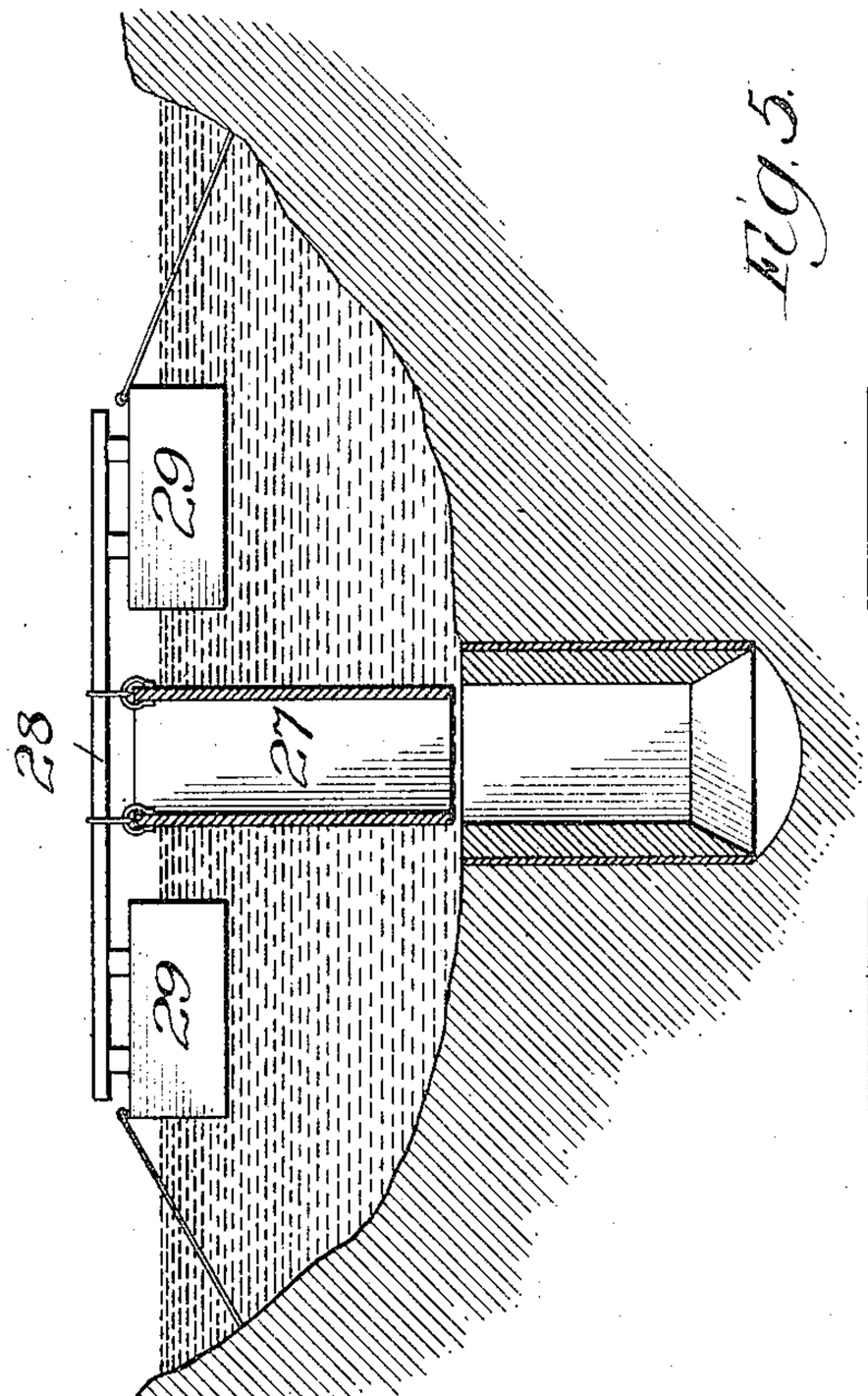


Fig. 5.

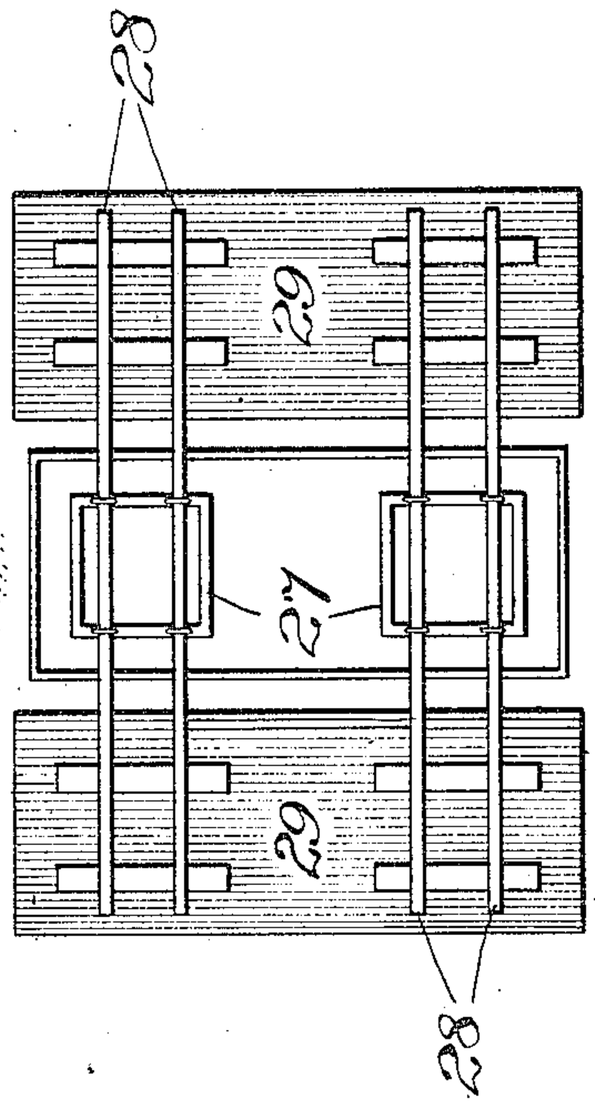


Fig. 2.

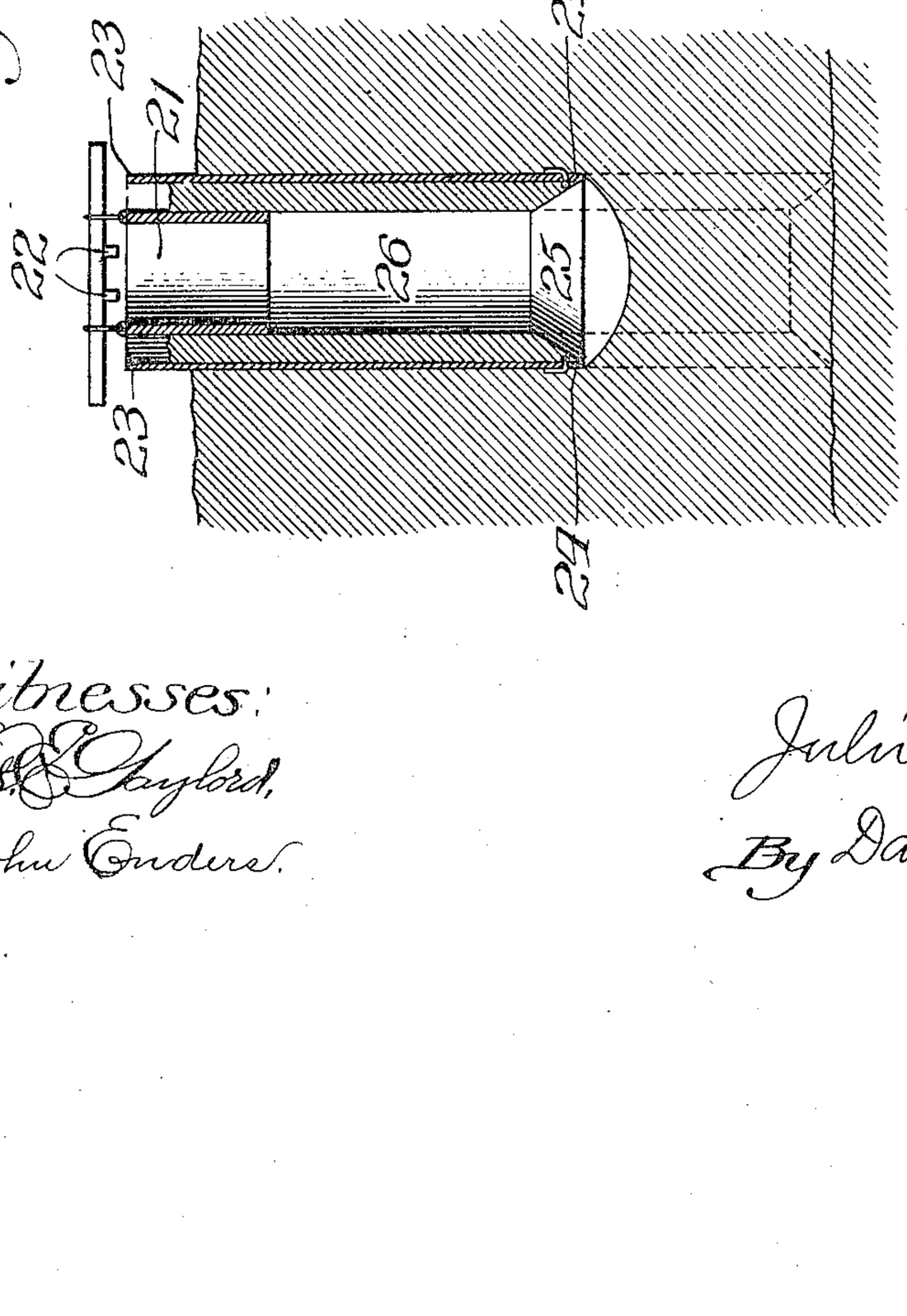
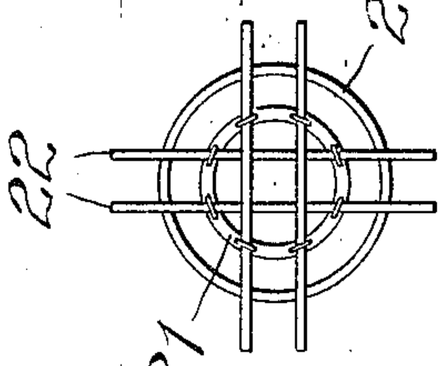


Fig. 3.



Witnesses:
E. L. Gaylord,
John Enders.

Inventor:
Julius W. Schaub.
By David A. Fletcher.
Atty.

UNITED STATES PATENT OFFICE.

JULIUS W. SCHAUB, OF CHICAGO, ILLINOIS.

METHOD OF CONSTRUCTING SUNKEN STRUCTURES.

No. 862,284. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed March 5, 1906 Serial No. 304,266. Renewed April 5, 1907. Serial No. 366,624.

To all whom it may concern:

Be it known that I, JULIUS W. SCHAUB, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new, useful, and Improved Method of Constructing Sunken Structures, of which the following is a description, reference being had to the accompanying drawings, forming a part of this specification, in which corresponding reference-numerals in the different figures indicate like parts.

The object of my invention is to provide an improved method of constructing coffer-dams, piers, abutments, dams, retaining walls, hollow shafts and other analogous sunken structures from concrete or other plastic material, whereby a complete hollow structure or monolith, as may be desired, may be formed, either entirely in the earth or partly in the earth and partly in the water, without the use of compressed air, except in the rare and peculiar instances, and without leaving in the finished structure any timbers or other material which it may be found necessary to employ in forming the structure.

To these ends, my invention consists in the several method steps hereinafter more particularly described and definitely set forth in the claims.

In the drawings, Figure 1, is a central vertical sectional view of a cutting support or shoe with a crib and inner mold showing the means which I would ordinarily employ for carrying out my method in sinking such a structure as a rectangular pier. Fig. 2, is a central vertical sectional view of a modified means for applying my improved method in sinking a shaft entirely in earth, Fig. 3, is a plan view thereof, Fig. 4, is a view, partly in vertical section, of a cofferdam, showing the manner of sinking the same in the bottom of a stream, and Fig. 5, is a plan view thereof.

I will first describe the details of the preferred form of structure shown in Fig. 1, which I would recommend in carrying out my improved method, after which, I will refer to the other views which are intended to illustrate the carrying out of said method under different conditions, said latter views being largely diagrammatic in character.

Referring to the drawings, 1, Fig. 1, represents generally a cutting support or shoe consisting of an outer vertical shell 2, formed from the sheet-steel, the lower part of which is extended downwardly, as shown at 3, to form a cutting edge, from whence a portion is extended upwardly and inwardly at an angle to the part 2, as shown at 4. Within the lower portion of the shoe is placed a horizontal pipe 5 which extends around the circuit of said shoe, of whatever shape, said pipe being connected with one or more vertical pipes 6, leading to any available source of water-supply, with intervening means, such as a force-pump, for placing the same under pressure. A series of nozzles 7 are connected with the pipe 5, said nozzles being extended outwardly through the shoe, and thence upwardly as shown, so that whenever desired, a number of water jets may be forced upwardly between the walls of the structure and the surrounding earth for the purpose of forming a lubricant for reducing the frictional resistance which might otherwise impede the descent of the structure.

While I have shown but one horizontal pipe and but one set of nozzles for producing water jets I do not wish to be confined thereto as it is obvious that said pipes and jets may be placed at such varying levels in the structure as might be found necessary to meet varying conditions.

The pipe 5 should be embedded in cement mortar 7^a, after which there should be fitted within the shoe heavy sills 8, upon which is superimposed a crib composed of squared horizontal timbers 9 reinforced by means of lagging timbers 10, the whole being rigidly bolted to each other and to the shoe as shown. Vertical sheeting 11 is secured to the outer face of the crib as the structure is built.

Within the crib formed by the timbers and sheeting, and generally designated by 12, I provide a mold 13, which consists of a casing formed, in the instance shown, of planks arranged vertically, the outer faces of the walls of which casing are smooth, the side of said casing corresponding substantially to the area within the flanges 14, which are formed upon the shoe 1. I prefer to form the mold 13 so that in certain cases, where desirable, as hereinafter stated, the lower edge of the mold may be detachably connected by means of the bolts 15, to the flanges 14 of the shoe. The mold 13 would, ordinarily, be about ten feet in height and may be supported in position within the crib and in substantial alinement with the flanges 14 by any approved means, it being understood that the mold should be movable with respect to the outer crib and should, ordinarily, be maintained in a stationary position while the crib descends. One, and the preferable means, for accomplishing this result, may consist of removable cross-beams 16, 17, the ends of which may be loosely inserted between the timbers 9 of the crib, which latter may, after a certain height, be built up alternately in the manner shown. Bails 18 may be attached to the upper part of the mold through which bars 19 may be inserted and allowed to rest upon the cross-beams 16 as shown.

The method of forming and sinking the concrete structure is as follows: Assuming the shoe to be located in the desired position for sinking and the mold 13 to be supported, as described, and also to be detached at the bottom from the shoe, the space between the mold and the crib is filled with concrete 20 in a plastic condition, to the level near the top of the mold. The earth within the shoe is then excavated, whereupon the weighted structure is caused to descend by its own gravity, the

cutting edges 3 of the shoe serving to penetrate the earth as the excavation proceeds. At the same time the concrete filling is continued, and as rapidly as it hardens and becomes self-supporting, the outer crib is built up at the top and the cross timbers 16, 17 are removed from the spaces between the crib timbers and placed higher up, so as to support and center the mold and enable the same to be retained in a substantially stationary position while the structure surrounding it descends.

In Figs. 2 and 3, I have illustrated my improved method as it would be applied in sinking a circular shaft in the earth. In that case the mold 21 may be suspended directly from cross-timbers 22 resting directly upon the outer wall or casing 23 which may be of sheet steel built up directly from the circular cutting shoe 24. As the excavation shown at 25 is continued, the casing and shoe with the inclosed hardened and molded hollow shaft 26 of concrete continues to descend while the mold 21 is retained substantially in the position indicated. When the structure is sunk to a predetermined depth, such, for example, as that indicated in dotted lines in Fig. 2, the inner mold 21 may be withdrawn from the top, thus leaving an integral hollow shaft of concrete surrounded by an outer casing.

In Figs. 4 and 5 I have illustrated one means of applying my improved method to the building of a sunken structure, such, for example, as a retaining wall in the water. Assuming the water to be of considerable depth, as indicated, I prefer to connect the bottom of the mold to the top of the shoe, as described in connection with Fig. 1, when the structure may be floated to position and sunk. When enough of the concrete filling is in place to cause the cutting edge of the shoe to enter the earth at the bottom of the water, the mold and shoe may be disconnected and the mold retained in a substantially stationary position, while the surrounding structure is caused to descend. In the figures referred to I have indicated an elongated structure with two wells and two molds. The molds 27 may be supported by means of timbers 28 arranged to rest upon barges 29 anchored in any approved way.

If it should be desired to place the sunken structure in the bed of a stream with its top substantially flush with said bed as indicated in Fig. 4, only enough of the outer crib or mold need be built up to correspond to the height of the structure when ultimately submerged. In that case the inner mold may be maintained in place and the concrete conveyed through pipes to the space to be filled, until the requisite amount is supplied. The inner mold may then be floated away, leaving the top of the sunken structure flush with the bed of the stream. I do not wish to limit myself to any specific construction of mold or casing, provided it is such as will enable my improved method to be carried out; nor do I wish to be confined to any specific means for maintaining the inner mold in the desired position, which, for all practical purposes may be said to be stationary although for special reasons, in connection, for example, with the removal or introduction of a dredge, it may, temporarily, be taken out entirely. When working in water the mold may even be permitted to float upon the top of the water instead of being suspended from any special object.

If desired, after the structure is well started in its descent, a portion of the outer casing of any predetermined length, may be disconnected from the preceding portion with the inner mold; in which event it is obvious that the hollow descending portion would be composed entirely of concrete. I prefer, however, to build the outer casing throughout the entire length of that portion of the structure which is actually submerged. As soon as the structure shall have been sunk to the proper depth, the inner mold may be removed and, if desired, the entire well or wells, as the case may be, may be filled with plastic concrete, thereby forming a monolith. Should the outer casing be formed of timbers and built above the water-line, it may, as soon as the material shall have become hard, be removed to such depth below the water-line as may be desired and the remainder left in position.

It is obvious that by means of my improved method, a sunken concrete structure, either of plain or reinforced concrete, may be made of any form in cross section, either circular, oval, square or polygonal, with one or more open wells therein extending from the bottom to the top, and this without the use of compressed air and its attendant dangers and objections and without leaving any material in the finished structure excepting the shoe itself and, if preferred, a portion of the outer crib or form.

My improved method is applicable to the sinking of shafts of various kinds, to the building of piers, abutments, dams and other analogous structures either solid or hollow. For great penetration or depth, it is cheaper and more desirable than any method heretofore employed, inasmuch as it requires neither skilled labor nor any extensive plant.

Having thus described my invention, I claim:—

1. The method of constructing piers, hollow shafts and other analogous sunken structures from plastic material, which consists in providing inner and outer molds supporting the latter upon a cutting support arranged to surround a predetermined space, excavating within said space, supplying the space between the molds with plastic material as the cutting support descends, and maintaining the inner mold in a predetermined position during the downward movement of the molded structure.

2. The method of constructing sunken structures from plastic material consisting in supporting inner and outer moldes upon a cutting support arranged to surround a predetermined space, excavating within said space, supplying the mold with plastic material as the cutting support descends, projecting jets of water upwardly under pressure upon the outside of the descending body and maintaining the inner mold in a predetermined position during the descent of the molded material.

3. The method of constructing sunken structures from plastic material, which consists in supporting inner and outer molds upon a cutting support arranged to inclose a predetermined space, filling the mold with plastic material as the cutting support descends, maintaining the inner mold in a predetermined position during the descent of the molded material, removing the inner mold when the bottom of the structure shall have reached its downward limit, and finally filling the inner space with plastic material.

4. The method of constructing sunken structures from plastic material, which consists in supporting inner and outer molds upon a cutting support arranged to inclose a predetermined space, excavating within said space, filling the mold with plastic material as the cutting support descends, building up the outer mold simultaneously, disconnecting the inner mold from the cutting support and maintaining the same in a predetermined position during the descent of the structure.

5. The method of constructing sunken structures from plastic material, which consists in supplying a filling of plastic material upon and above a cutting support between suitable molds, excavating beneath said cutting support to permit the structure to descend by gravity, maintaining the molds at the upper portion of the structure and gradually filling the plastic material between them as the material hardens and the structure sinks.

6. The method of constructing sunken structures from plastic material, which consists in supporting an outer mold of predetermined height upon a cutting support adapted to surround a predetermined space, placing an independent inner mold within said outer mold, supplying the intervening space between the molds with plastic concrete, excavating within said cutting support to permit the descent of the latter, maintaining the inner mold in a stationary position, and continuing the excavation and supplying plastic material until the outer mold is filled and sunk to the desired depth.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses, this 28th day of February, 1906.

JULIUS W. SCHAUB.

Witnesses:
D. H. FLETCHER,
C. E. JORDAN.