No. 860,391. PATENTED JULY 16, 1907.

S. H. LEA.

REINFORCED CONCRETE STRUCTURE.

APPLICATION FILED SEPT. 22, 1906.

2 SHEETS—SHEET 1.

Fig 1

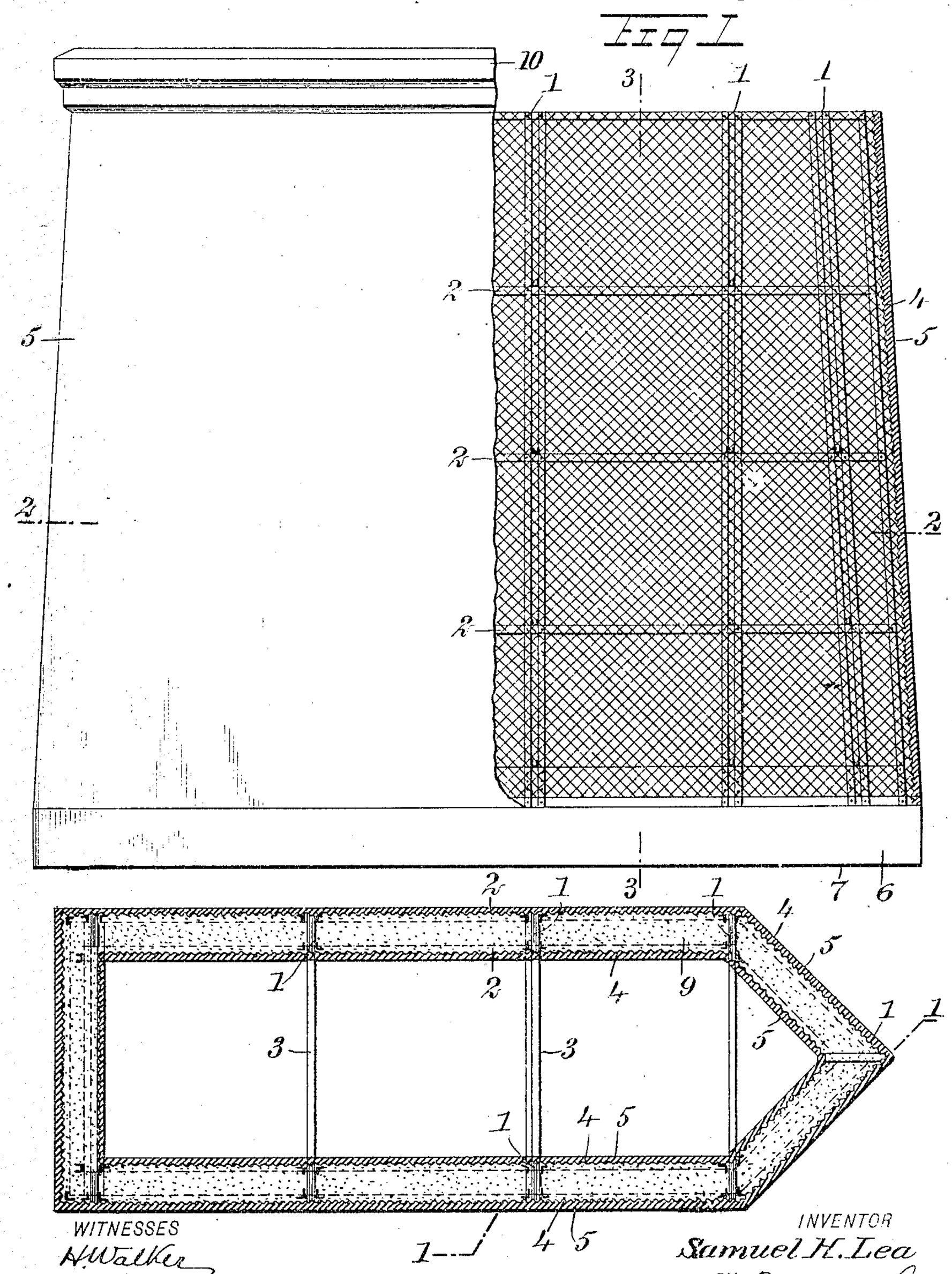

Fig 2

WITNESSES

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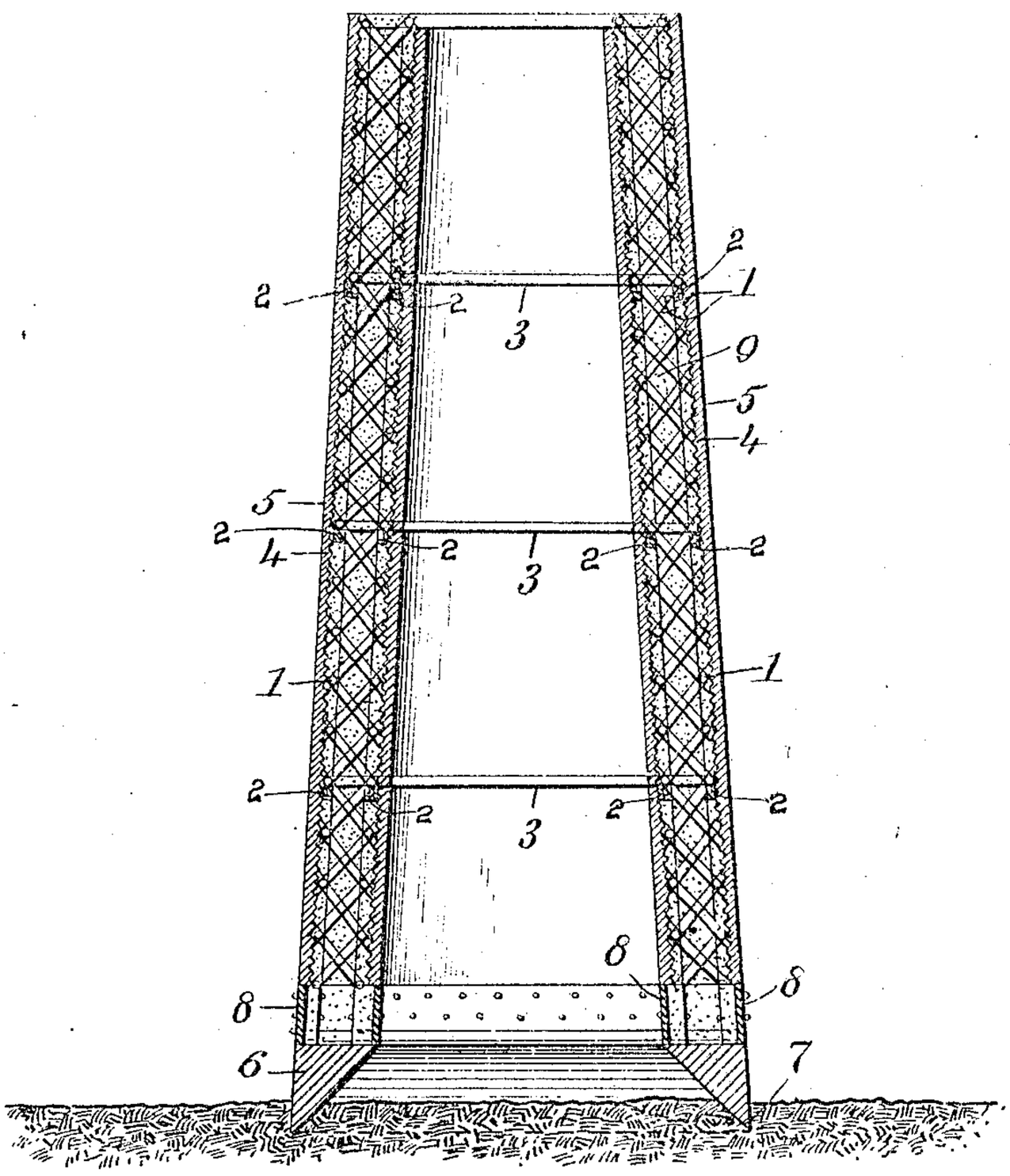
Fig 3



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UNITED STATES PATENT OFFICE.

SAMUEL H. LEA, OF PIERRE, SOUTH DAKOTA.

REINFORCED CONCRETE STRUCTURE.

No. 860,391. Specification of Letters Patent. Patented July 16, 1907.

Application filed September 22, 1906. Serial No. 335,730.

To all whom it may concern:

Be it known that I, SAMUEL H. LEA, a citizen of the United States, and a resident of Pierre, in the county of Hughes and State of South Dakota, have invented a new and Improved Reinforced Concrete Structure, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in concrete structure, particularly adaptable for use as bridge piers, caissons, or the like, and comprises a strong skeleton frame of steel having its inner and outer faces covered with expanded metal or wire mesh and the annular space filled with concrete. When this structure hardens, it becomes a strong shell of the exact shape required and can be transported and sunk in place without the use of coffer-dams or sheet piling.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, in which

Figure 1 is a side elevation of a bridge pier involving my improved construction, a portion thereof being broken away on the line 1—1 of Fig. 2; Fig. 2 is a horizontal section on the line 2—2 of Fig. 1; and Fig. 3 is a vertical section on the line 3—3 of Fig. 1.

This invention comprises essentially a hollow structure consisting of a double framework of iron or steel bars bolted or riveted together in a substantial manner and forming when complete a structure which may be either circular, oblong, polygonal or any required shape in cross section. The inner and outer surfaces are covered with expanded metal, wire, lath, wire fabric or other suitable metal construction, so as to form diaphragms over the inner and outer surfaces. These are covered with cement mortar to present smooth outer surfaces and later the annular space between the two diaphragms is filled with concrete. The sides of the structure are held at the proper distance apart by iron or steel braces, and the lower part of the framework is preferably bolted or otherwise securely fastened to a steel or iron shoe, designated as the cutting edge.

In the specific form of my invention which I have illustrated in the drawings and which is designed for use as a bridge pier, I employ a metal framework made up of small angle irons and channels. The inner and outer walls are spaced apart by metal lattice-work frames 1, and these are connected together by channels or angle irons 2, extending along the inner and outer sides. To give the structure a greater rigidity bracing-bars 3 of any suitable character may extend across the pier from opposite sides as shown in Figs. 2 and 3. The hollow framework thus constructed has its entire inner and outer surfaces covered with wire fabric, lath, or other suitable means 4, and has the inner and outer layers 5 of the best quality of cement mortar. The iron or steel shoe 6, secured to the lower end of the structure, has its outer surface in alinement with the outer surface of the body portion and its lower side terminates in a sharp edge 7 adapted to cut into the sand or other material upon which the structure is supported. This shoe 6 may be secured to the body portion in any suitable manner but preferably has two upwardly-extending flanges 8 in alinement with the inner and outer surfaces of the body portion and firmly bolted or otherwise secured to the main metal framework. The annular space within the walls may be filled with concrete 9 at the time the structure is built up, or it may be inserted after the structure has been sunk in the desired location, and after the space is entirely filled, a suitable coping of reinforced concrete 10 or cut stone may be placed upon the upper end to give the structure a finished appearance.

This form of structure may be used for a bridge pier, an abutment, a bulkhead, or for other similar purposes, and may also be used as an open caisson, or as a pneumatic caisson, in the latter case an airtight cover being necessarily placed at the top or at any height between the top and bottom and provided with the necessary valve and air lock. When used as an open caisson, the structure is sunk at the required place and the material within the open interior space may be removed by a derrick, dredge, bucket, or by centrifugal or other form of pump, the same as in the case it is used as a bridge pier; but in the latter case this interior space may be filled with earth, broken rock, or concrete, while in the former it would remain open and permit of the placing of any suitable foundation work upon the bed of the river. This form of construction possesses strength, durability and portability as compared with such forms as are in general use. The steel framework affords the necessary strength and rigidity and is thoroughly protected from rust by the concrete which is practically indestructible and which affords weight and solidity. The structure can be either previously made as a whole and put in place at once, or it may be made in sections and put together as it settles in place. In the case of a small pier, abutment, or bulkhead, required for use in an isolated place where labor and material are scarce, the structure can be made at the factory and shipped to the place of use where it may be placed in position with the minimum of labor. The structure can be settled in place by its own weight, or if this is not sufficient, additional weight to the required amount may be applied. The material inside is excavated or pumped out as may be most convenient, and when the structure rests securely on the bottom the lower interior portion is filled with concrete out to the cutting edge of the shoe to afford a firm bearing. If no bed rock or other firm foundation is found, piles may be driven inside the structure to afford a good foundation, there being sufficient clear space for this. After the foundation has been properly arranged the entire

space inside the hollow pier may be filled with concrete, stone, gravel, or with ordinary earth, as may be preferred. If it is desired to save weight on the foundations the interior space may be left vacant or only partially filled. The coping upon the upper edge may be secured to the sub-structure by means of iron or steel bars or bolts, or cemented thereto, as may be most suitable, the whole forming a complete pier or other structure of good appearance, strong, substantial and lasting.

For foundations under water the structure may be put together on a barge or platform directly over the place where it is to be used and built up to the full height, or to such height as will allow the top to project above the water when the cutting edge rests on the bottom. The structure in this form is placed in the exact position required and is settled in its place by the weight of the top portion as it is built up, or if this weight is not sufficient additional weight is put on as required.

If desired, the cement mortar coating may be placed only on the outer side previous to the sinking of the structure, while the inner coating may be supplied after the material within the central portion has been excavated or pumped out.

In case the structure is employed as a caisson, the upper portion may be of a great deal smaller area in cross section than is the lower portion, as a large area of cross section is only essential to a height of approximately seven feet, thus allowing room for the workmen to stand.

By covering the structure with inner and outer layers of cement mortar embedded in the diaphragms of wire lath, it is entirely unnecessary to provide molds for the main body of the wall. The inner and outer coatings of cement mortar constitute walls forming a mold and no outside form or boxing is required; thus all expense and work required to provide and employ the former box or walls of the molds is entirely obviated.

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

1. A portable reinforced concrete structure, comprising a hollow body formed of a suitable metal frame, inner and outer walls of reticulated metal secured to said frame, layers of cement mortar secured to each of said metal walls, and a metal shoe secured to the lower end of the structure and closing the space between said walls, said shoe terminating in a cutting edge.

2. A portable reinforced concrete structure, comprising a hollow double-walled body formed of a suitable metal frame, inner and outer walls of reticulated metal secured to said frame, braces connecting opposite sides of said frame and extending across the body portion, layers of cement mortar secured to said metal walls, and a metal shoe secured to the lower end of the structure and closing the space between said walls, said shoe terminating in a cutting edge in alinement with the outer walls of the body.

3. A portable reinforced concrete structure, comprising a hollow body rectangular in cross section and having inner and outer walls of reticulated metal, a suitable frame for supporting said walls, braces extending across said body, layers of cement mortar secured to each of said metal walls, a metal shoe secured to the lower end of the structure and closing the space between said walls, said shoe terminating in a cutting edge in alinement with the outer walls of the body, and a filling of concrete between said walls and held in place by cement mortar.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL H. LEA.

Witnesses:
JOANE ROBINSON,
M. A. LANGE.