R. E. BAKER.

METHOD OF CONSTRUCTING STORAGE RECEPTACLES.

APPLICATION FILED APR. 8, 1918.

1,338,484.

Patented Apr. 27, 1920.

3 SHEETS—SHEET 1.

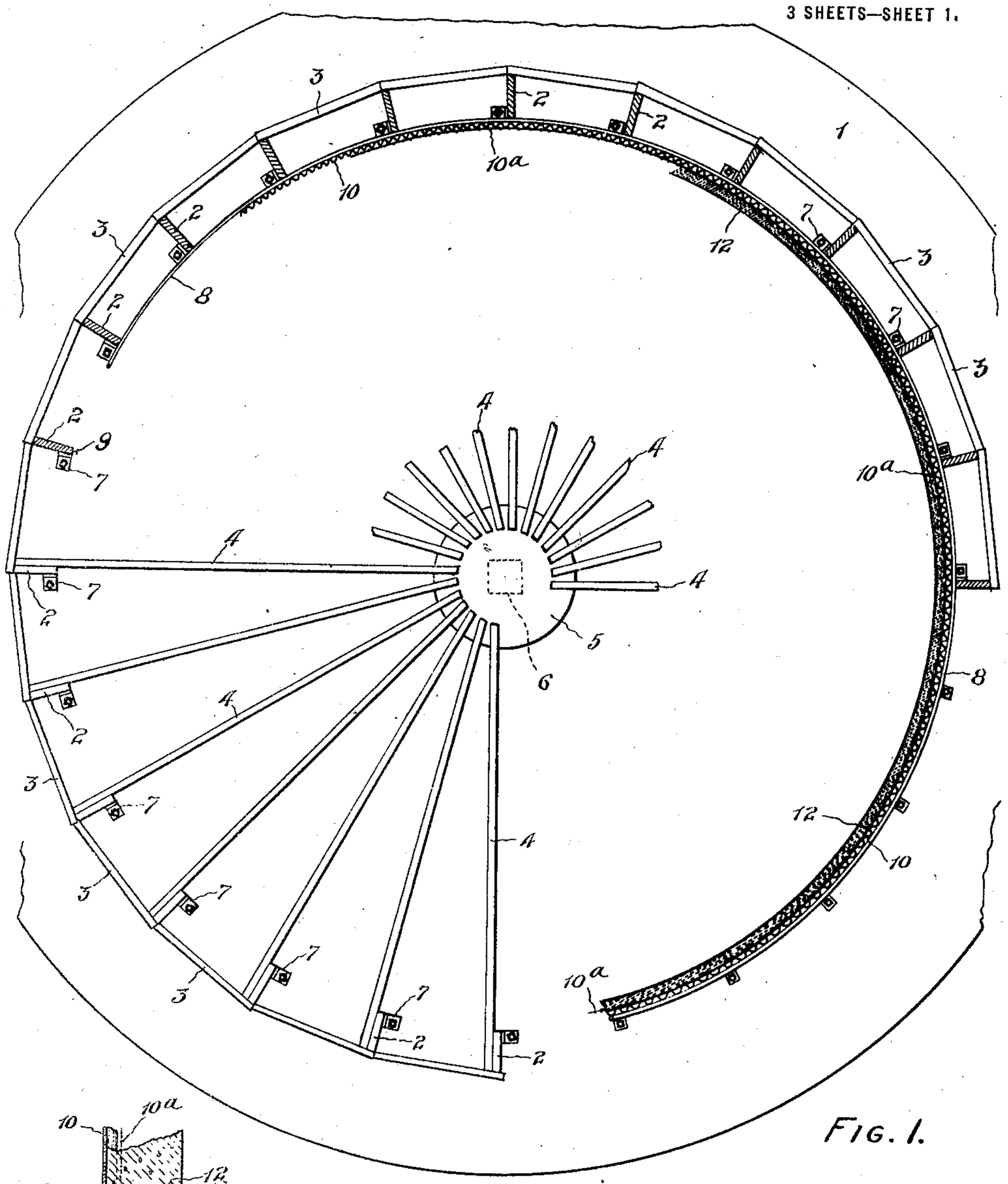

FIG. 1.

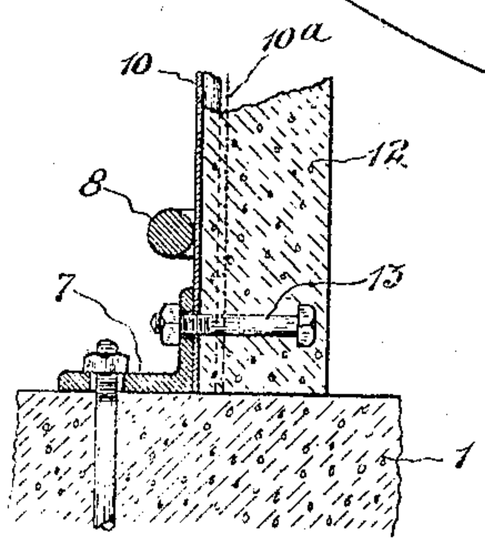

FIG. 14.

INVENTOR:
Robert E. Baker

BY
Merkel and Saywell
HIS ATTORNEYS

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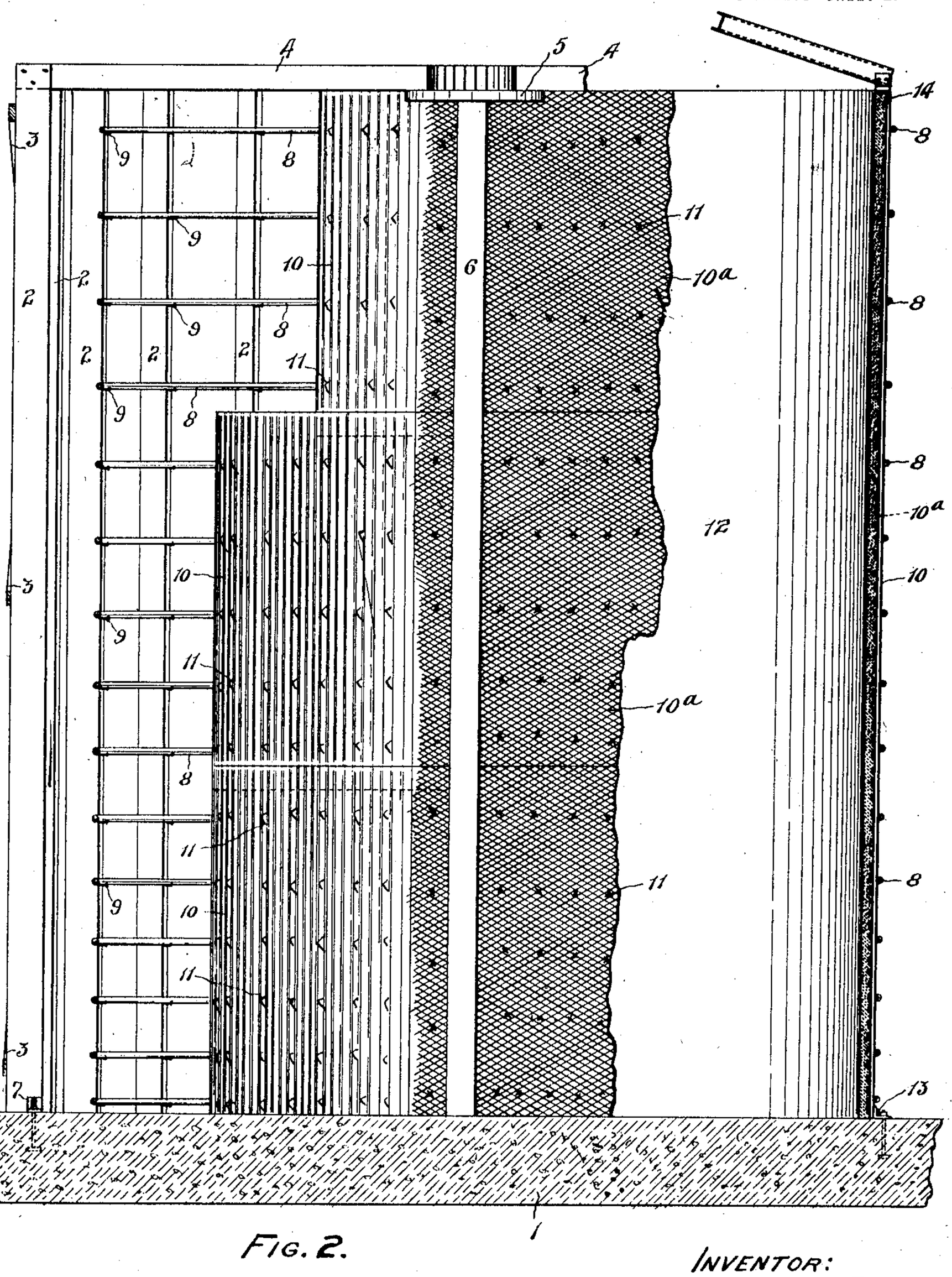

FIG. 2.

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BY
Merkel and Saywell
HIS ATTORNEYS

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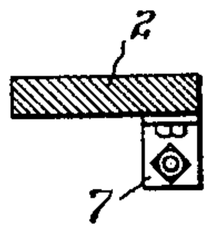

FIG. 3.

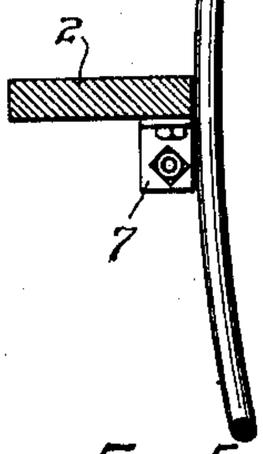

FIG. 5.

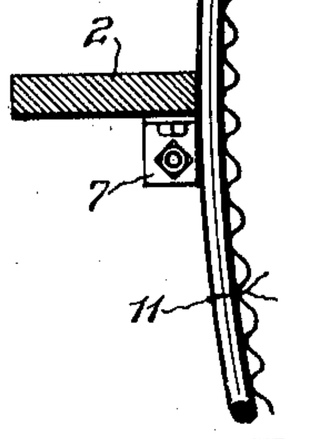

FIG. 7.

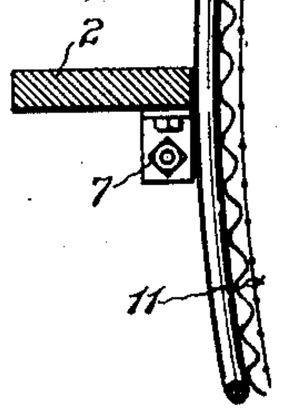

FIG. 9.

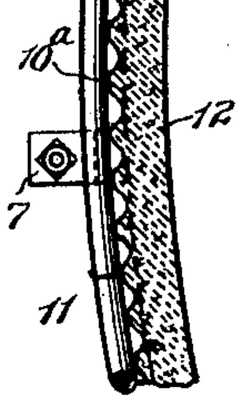

FIG. 11.

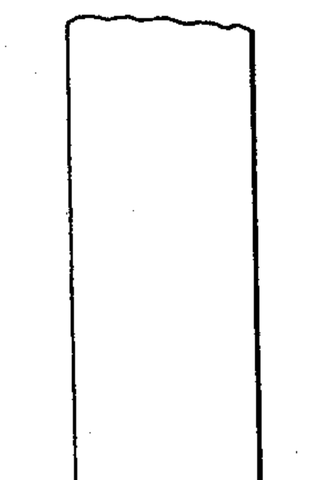

FIG. 4.

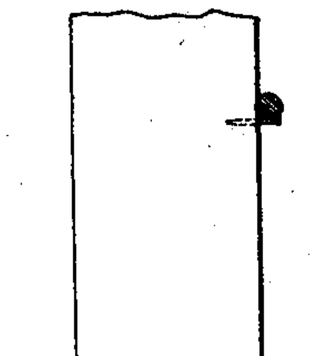

FIG. 6.

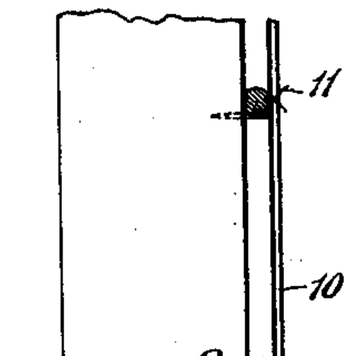

FIG. 8.

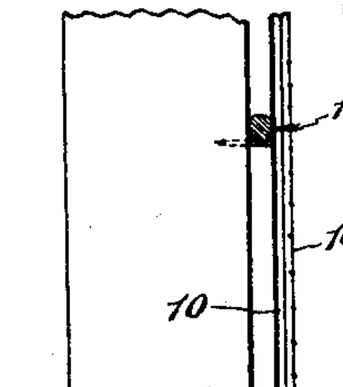

FIG. 10.

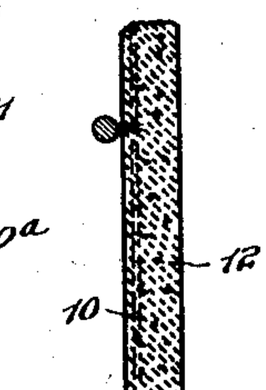

FIG. 12.

FIG. 13.

INVENTOR:

Robert E. Baker

BY Merkel and Saywell

HIS ATTORNEYS

UNITED STATES PATENT OFFICE.

ROBERT E. BAKER, OF CLEVELAND, OHIO.

METHOD OF CONSTRUCTING STORAGE-RECEPTACLES.

1,338,484. Specification of Letters Patent. Patented Apr. 27, 1920.

Original application filed February 2, 1916, Serial No. 75,678. Divided and this application filed April 8, 1918. Serial No. 227,291.

To all whom it may concern:

Be it known that I, ROBERT E. BAKER, a citizen of the United States, resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented new and useful Improvements in Methods of Constructing Storage-Receptacles, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle, so as to distinguish it from other inventions.

My invention relates to storage tanks and particularly to methods of constructing cylindrical tanks. The subject-matter of this invention has been divided out from my pending application for United States Letters Patent, Serial No. 75,678 filed February 2, 1916.

In the storage of bulk materials, particularly coal, it is a well known fact that cylindrical tanks, although having the disadvantage of not permitting complete discharge of their contents, are the least expensive form of construction per unit of materials stored. Cylindrical steel tanks are employed, under present practice, having a relatively high resistance to abrasion and can, therefore, be employed to good advantage where abrasive materials are to be stored. Steel, however, is objectionable for use in tanks intended for the storage of any materials containing moisture, and particularly so where such moisture is apt to be slightly acidulous as in the case of such materials as bituminous coal, because under these conditions steel corrodes rapidly. This is true to such an extent that in many instances where a steel tank construction is provided, it has been found necessary or desirable to provide an inner lining of concrete. In such cases, therefore, the cost of construction is largely increased, inasmuch as the steel plates of the tank construction must be of sufficiently heavy section to resist the outward thrust of the stored materials; each plate must be riveted to the adjacent plate; and, in addition, the inner protective concrete lining must be provided solely to eliminate the corrosive action of the contained material. If on the other hand, under present practice, it is desired to construct a circular concrete tank without the use of outer steel plates, the usual procedure is to provide inner and outer cylindrical forms, between which is placed the necessary reinforcement, say of bent rods, for giving the necessary tensile strength to the concrete, and the latter poured between said forms which are placed a distance apart required to give the necessary thickness which varies with the depth of the tank. Under these circumstances, the cost of construction is somewhat in excess of a tank made of steel alone. The object of my invention, therefore, is to provide a cylindrical containing member of concrete without resorting to the use of complicated forms and which shall be reinforced by tension rods which are not incorporated with the concrete but which are binding members positioned upon the exterior surface of the tank.

The annexed drawings and the following description set forth in detail certain means illustrating one of the various mechanical forms in which the principle of my invention may be employed. The description furthermore sets forth certain steps for carrying out my improved method, such steps, however, constituting but one of various ways in which the principle of the method may be employed.

In said annexed drawings:

Figure 1 represents a plan view of a storage tank, with parts broken away and showing said tank in partially completed form, constructed according to the principle of my improved method; Fig. 2 represents a vertical axial section of the structure shown in Fig. 1; Fig. 3 represents a horizontal section of one of the uprights and Fig. 4 a fragmentary side view thereof; Fig. 5 represents a horizontal section of one of the uprights, showing a fragmentary portion of one of the binding hoops or rods mounted thereon, and Fig. 6 represents a fragmentary side elevation of the same; Figs. 7 and 8 represent a horizontal section and side elevation, respectively, of the parts shown in Fig. 5, to which has been attached suitable sheathing; Figs. 9 and 10 represent, respectively, views similar to those of Figs. 7 and 8, to which has been attached suitable metal lathing; Fig. 11 represents a horizontal section of a fragmentary portion of the completed tank, and Fig. 12 represents a vertical section of a fragmentary portion thereof; Fig. 13 represents a plan view of the ends of one of the steel hoops or binding rods connected

by means of a binding lug; and Fig. 14 represents a detail showing the method of anchoring the lower portion of the tank to the base or foundation.

Referring now to the illustrated embodiment of a tank constructed in accordance with my improved method, I first provide a suitable base 1 of concrete. This base may be placed in any suitable position, either elevated or not as circumstances may require. It will be understood that my method of construction covers only the design of the cylindrical containing structure and has no reference to the method of construction of the tank bottom or roof. For example, the tank might be constructed at ground level upon a flat concrete base or might be constructed upon a flat concrete base supported by concrete columns. Similarly, it would be possible to provide a conical steel plate bottom, having a flanged lip at the upper edge, which lip would form the support for the cylindrical vertical structure. Upon the base 1, I erect a series of vertical uprights 2, these uprights being placed to coincide with the radii of a circle and their inner faces coinciding with the outer surface of a cylinder having a diameter equal to the outer diameter of the tension binding members or hoops which, as will be hereinafter explained, bind and form the tension members for the completed tank. These uprights 2 are secured to each other by cross pieces 3 and by radially placed timbers 4, the outer ends of the latter of which are secured to the upper ends, respectively, of the members 2 and the inner ends of which are secured to a circular piece 5 secured to a vertical center post 6 formed of steel or wood. The uprights 2 are placed at equal distances from each other, usually about four feet apart. The bottom of each upright 2 is secured to the concrete base 1 by means of an angle piece 7, one leg of which is bolted to the concrete base, as shown in Figs. 4, 6, 8 and 10, and the other leg of which is bolted to the lower part of the upright 2. It will thus be seen that by means of the cross members 3, the timbers 4 and the angle pieces 7, the uprights 2 are held securely in place. This above described structure is a simple and economical form within the space defined by which a cylindrical containing member is formed by my improved method, as will now be described.

Steel rods or strips 8 are bent in such a manner as to form rings or hoops of the required diameter, the latter being such that the outside diameter of the hoops will be equal to the distance between diametrically opposed uprights 2. The ends of these rods or strips 8 are secured in any suitable manner and preferably by means of a binder lug such as is shown in Fig. 13. It will be evident that several rods or strips 8 may be used to make one complete hoop, the ends of these rods being joined by the requisite number of binder lugs. These binding hoops 8 are then positioned horizontally upon the uprights 2, as plainly shown in Fig. 2, and are supported thereon in any suitable manner as, for instance, by means of ordinary nails 9, plainly shown in Fig. 6. The required number of tension binding members 8 are thus placed and they are spaced vertically the required distances apart, such distances being previously determined, the distance being the smallest at the bottom and increasing gradually toward the top, as is common and accepted practice.

Next, there is attached to the inner surface of the positioned rods 8 suitable sheathing, preferably but not necessarily, formed of sheet metal plates 10. These plates 10 are of proper thickness and weight and might be made of flat steel. I find it preferable, however, to use corrugated sheet steel plates and to use such plates as are provided with a protective coating of asphaltum, asbestos or similar material to render them proof against corrosion.

The employment of a corrugated or deformed sheet is preferable from a standpoint of economy in that it renders them rigid vertically. These sheets are ordinarily received from the maker of corrugated iron in flat sections but they are readily bent by hand during erection. During such erection they are placed upon the inside of the rod circles and compressed by hand against same until they assume the proper curvature to fit against the rods at all points. These sheets are then secured to the rods in any suitable manner and one convenient way of so securing them is to punch holes in the sheets adjacent to these rods through which short pieces of wire 11, Fig. 8, may be passed and tied upon the inside.

After the entire interior of the surfaces of the rods 8 has been so provided with the sheathing 10, the entire inner surface of said sheathing is provided with a lathing 10^a of any suitable character such as wire mesh, metal lath or expanded metal, and this lathing may be secured conveniently by means of the same short pieces of wire 11 which are used to secure the sheathing 10, as plainly shown in Fig. 10. After the lathing 10^a has been applied and secured as thus described, a concrete facing 12 is formed upon said sheathing 10^a, of the required thickness, such facing, as well as the sheathing and lathing extending to the bottom and in contact with the base 1, as plainly shown in Fig. 12.

During the formation of the facing 12, the bottom thereof is caused to have embedded therein a number of horizontally placed bolts 13 whose outer ends extend through the lathing 10^a and sheathing 10 and outwardly from same. These bolts 13

are equal in number to the number of angle pieces 7 and are placed directly opposite the bolts which secure these angle pieces 7 to the concrete base 1. After the concrete 12 has properly set, the uprights 2 and their attached parts, all of which form a temporary scaffolding or form, are removed, the angle pieces 7 are loosened from the base 1 by loosening the ends of the bolts which held them thereto and are turned around ninety degrees (90°) so as to engage the outer ends of the bolts 13, the bolt hole of the upper or vertical leg of these angle pieces being slotted for this purpose, as shown in Fig. 4. These angle plates 7, therefore, securely anchor the lower end of the lateral wall structure of the tank to the base. If desired, a steel angle section 14 bent to a circle may be fitted to the top of the tank wall, as shown in Fig. 2, which in addition to reinforcing said top will also form a support for any roof structure which it may be desired to place thereon. Instead of the angle piece 7 being used to anchor the structure to the base, a steel angle bent to a circle may be also employed for this purpose and bolted to the base and to the bottom of the lateral wall, respectively, as will be readily understood.

In the manner above described I form a tank construction of a cylindrical character, having a concrete lining constructed without forms and without integral reinforcement. I have also provided the necessary binding and tension members exteriorly of the concrete tank. The structure is one economically erected from the standpoint of character of materials used and labor of construction and embodies all of the physical characteristics required of this type of container.

What I claim is:

1. The method of constructing storage tanks, which consists, in erecting upon a suitable base a temporary support defining a cylindrical space; positioning on the inner face of said support and above said base a plurality of binding tension rods; securing a suitable sheathing to the inside surface of such rods; forming upon the inside of the space defined by such sheathing a concrete facing, secured to the latter and resting upon said base; and then removing said temporary support.

2. The method of constructing storage tanks, which consists, in erecting upon a suitable base a temporary support defining a cylindrical space; positioning on the inner face of said support and above said base a plurality of spaced binding tension rods; securing corrugated metal sheathing to the inside surface of such rods; securing a suitable wire mesh to the inside surface of said sheathing; forming a concrete facing upon the inside of the space defined by said corrugated sheathing and resting upon such base; and then removing the temporary support.

Signed by me this 20th day of March, 1918.

ROBERT E. BAKER.