

Nov. 8, 1960

V. J. HOOVER

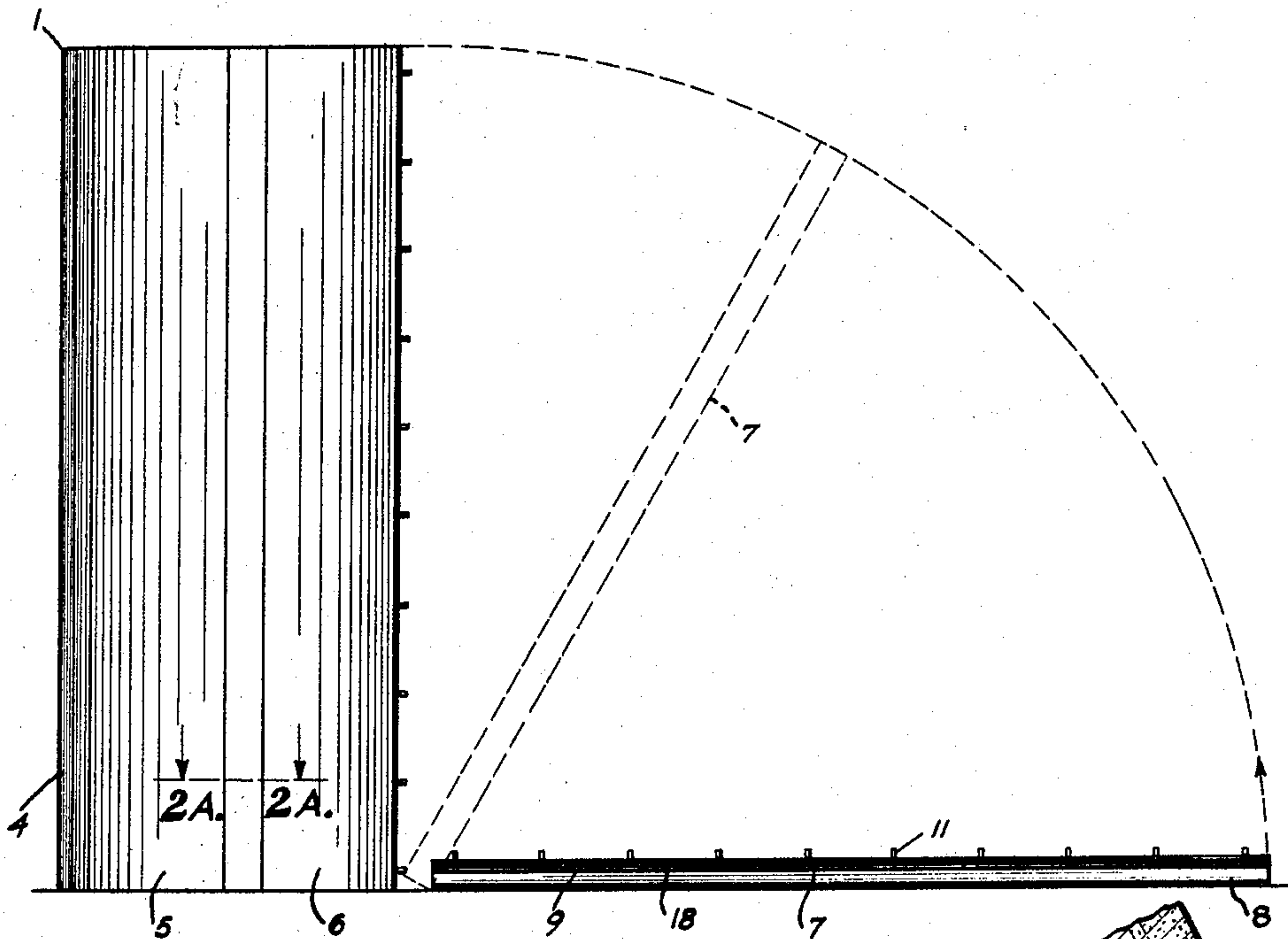
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CONCRETE STORAGE STRUCTURE

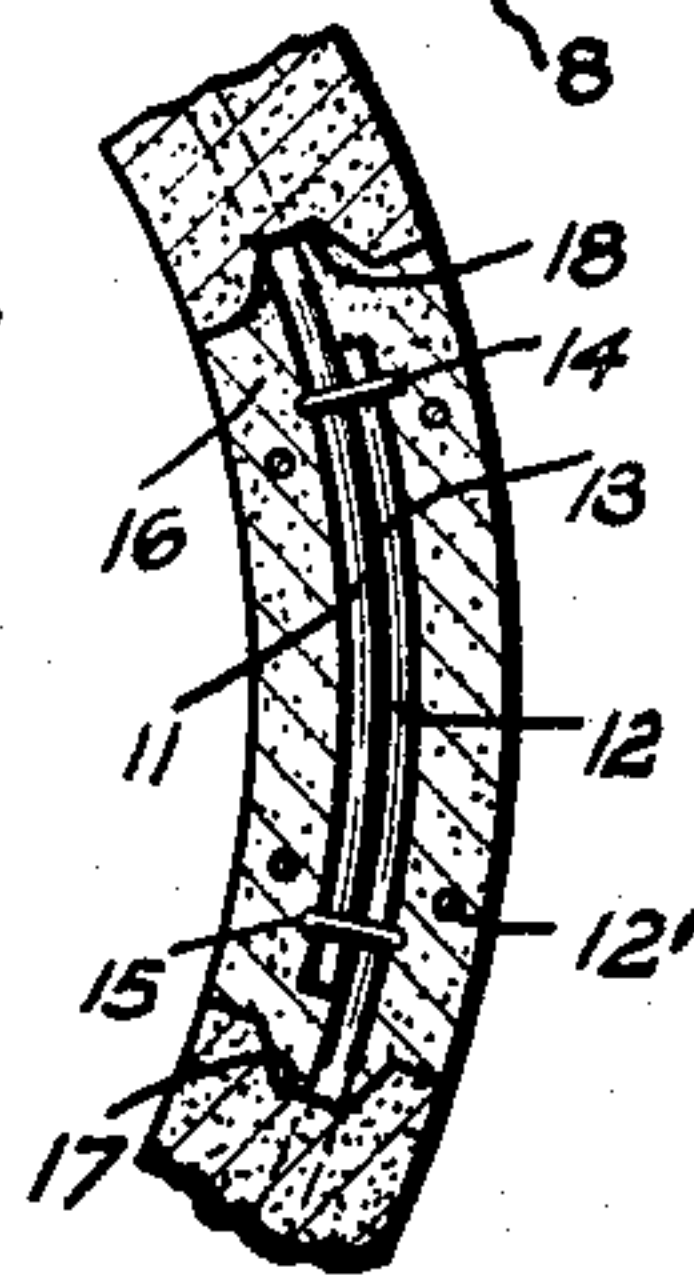
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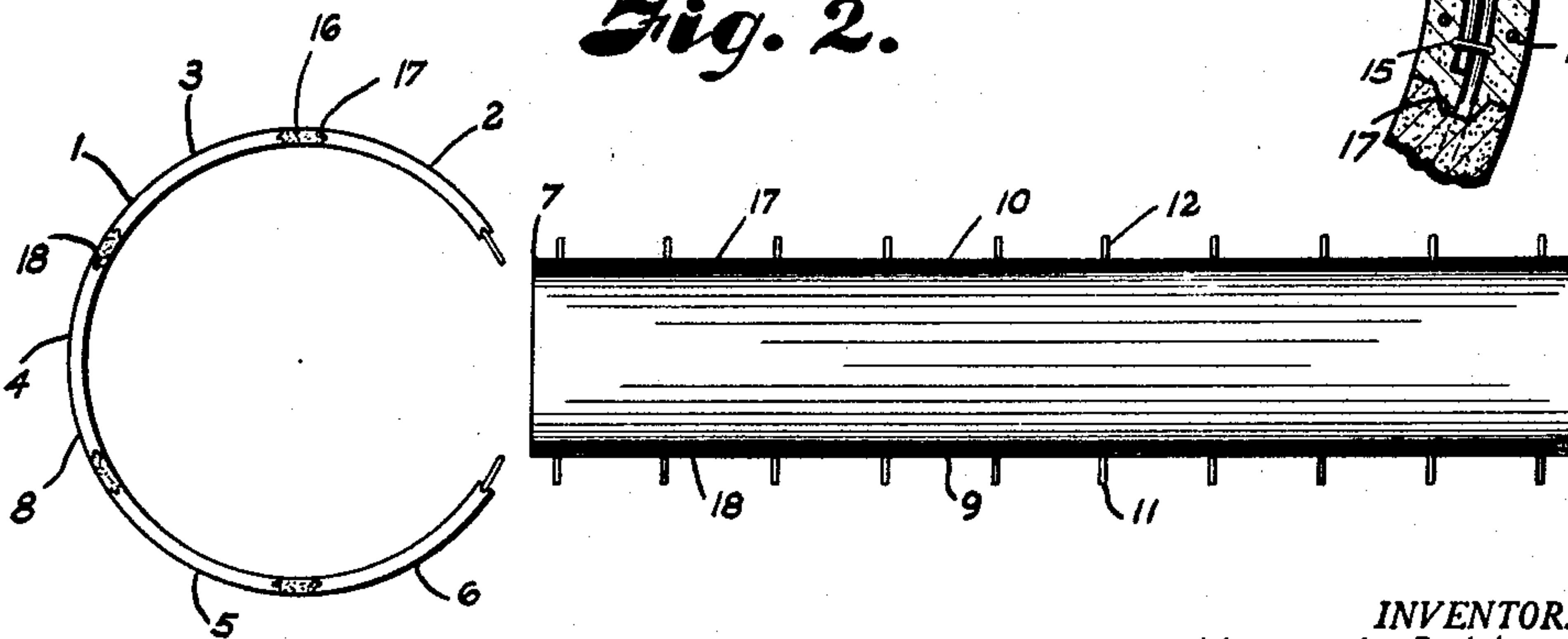
*Fig. 1.*



*Fig. 2A.*



*Fig. 2.*



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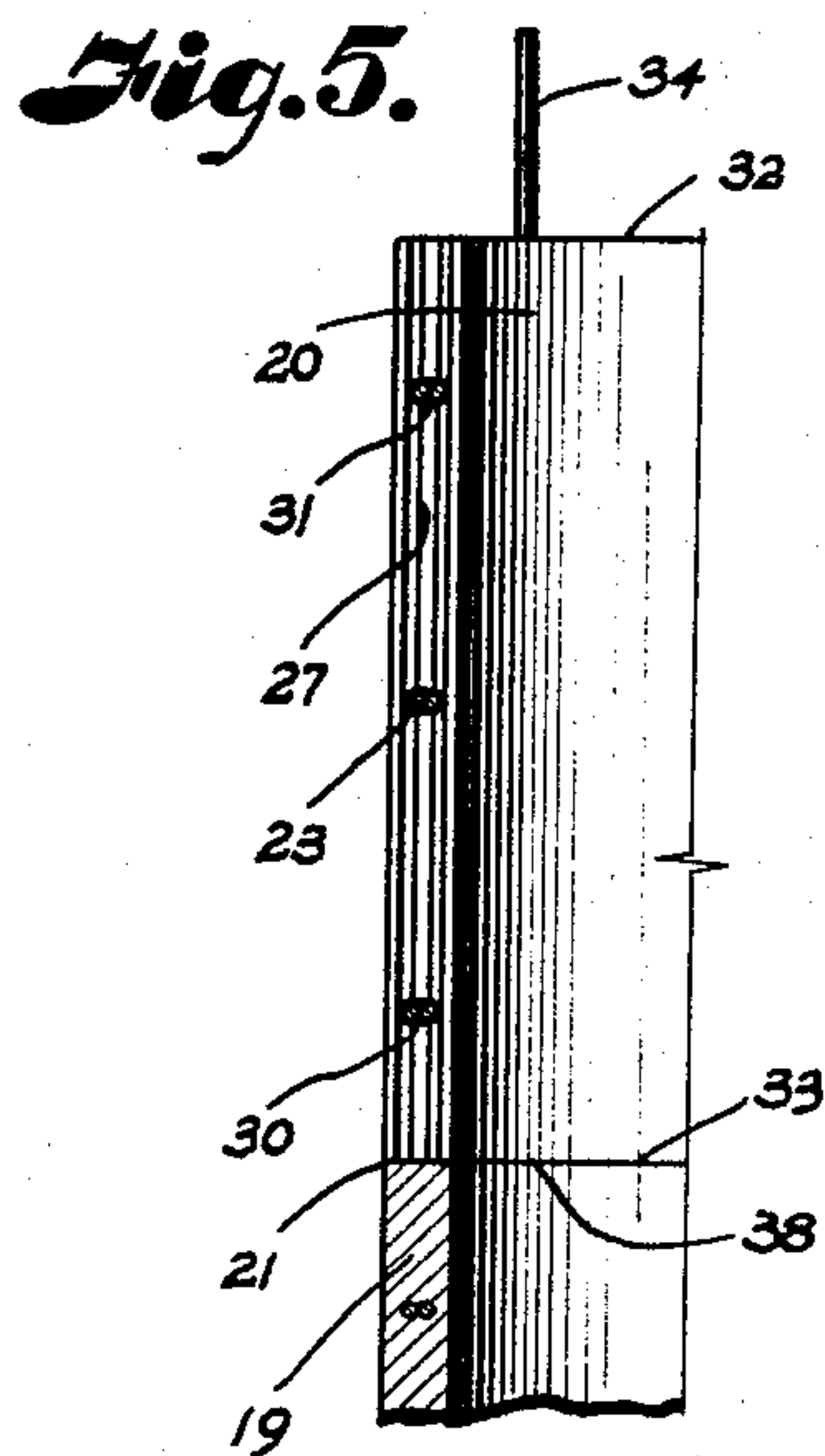
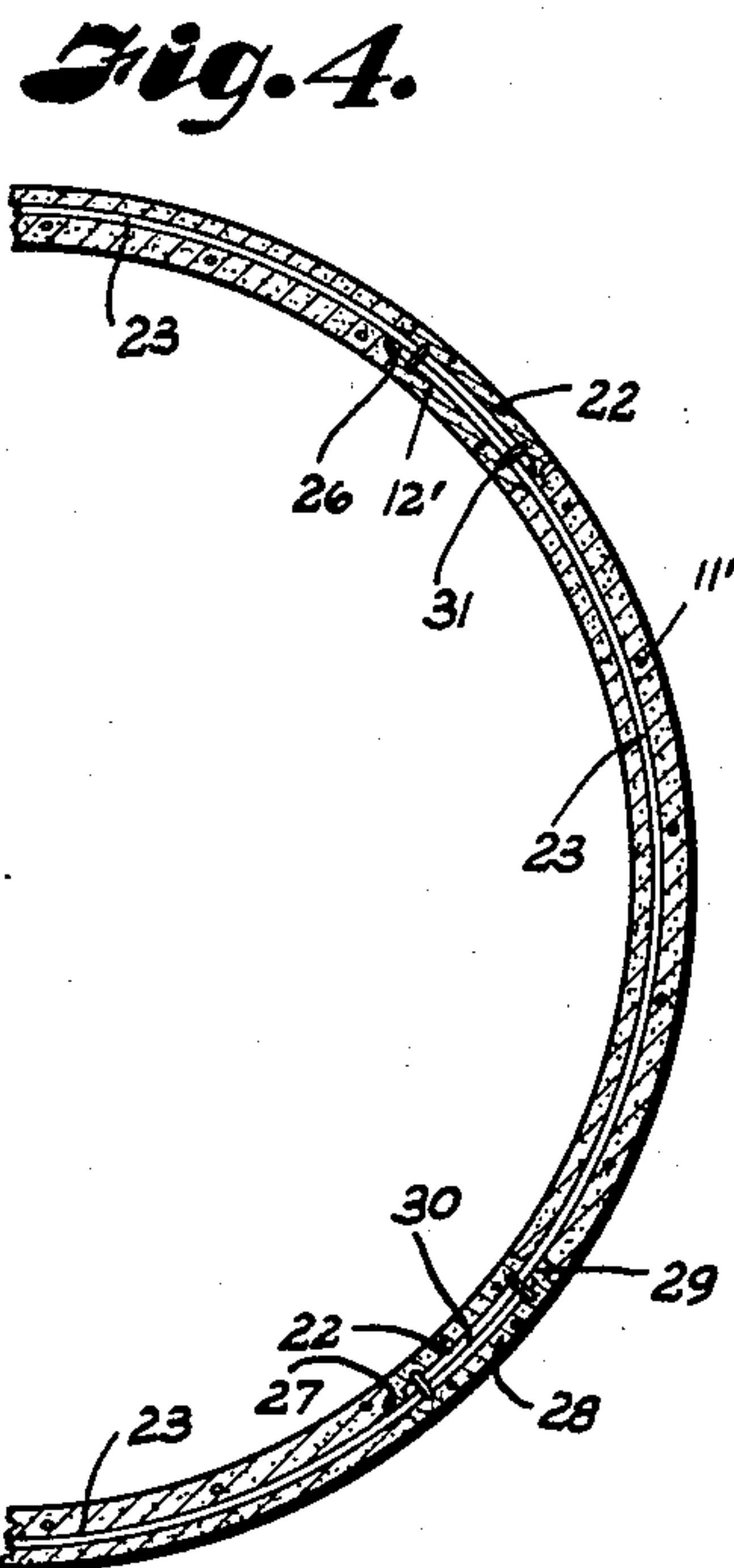
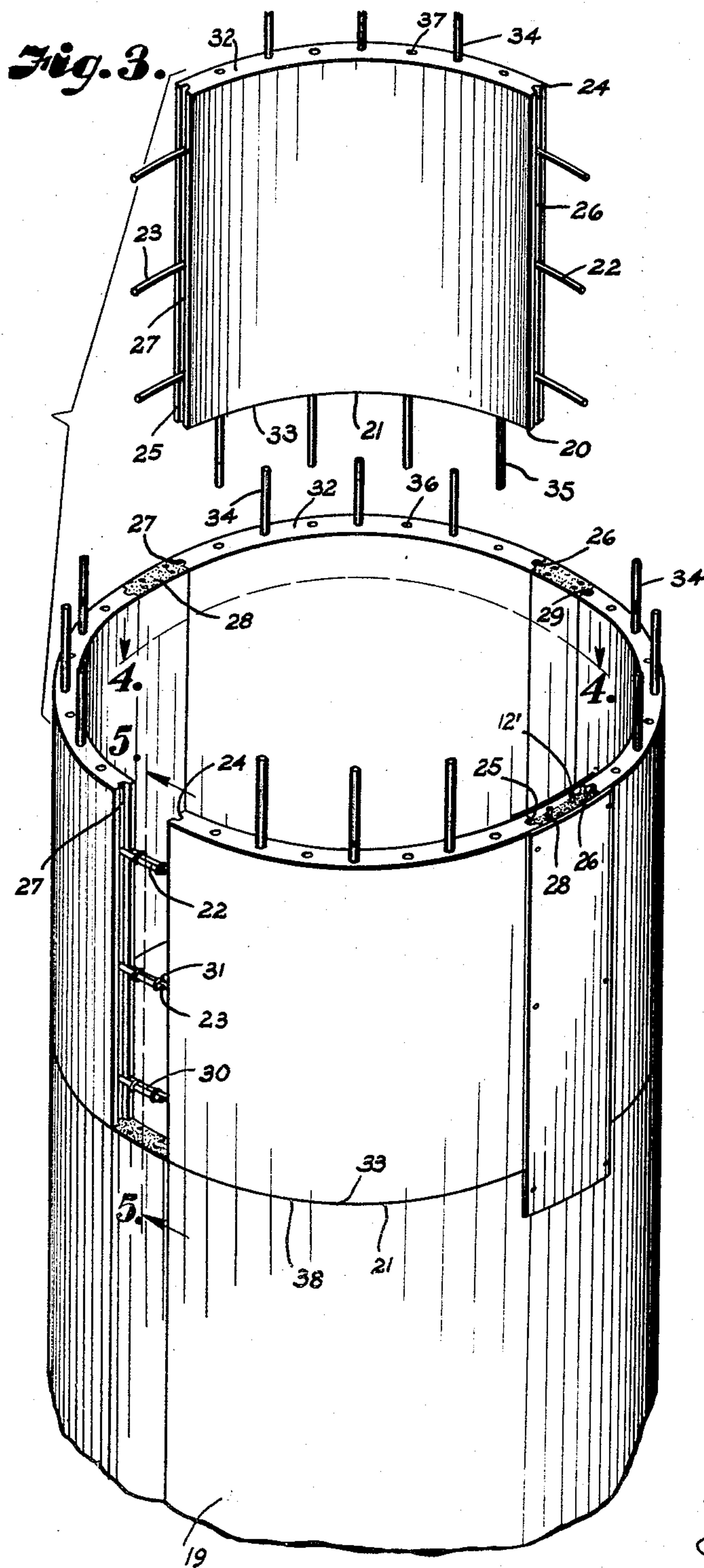
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## CONCRETE STORAGE STRUCTURE

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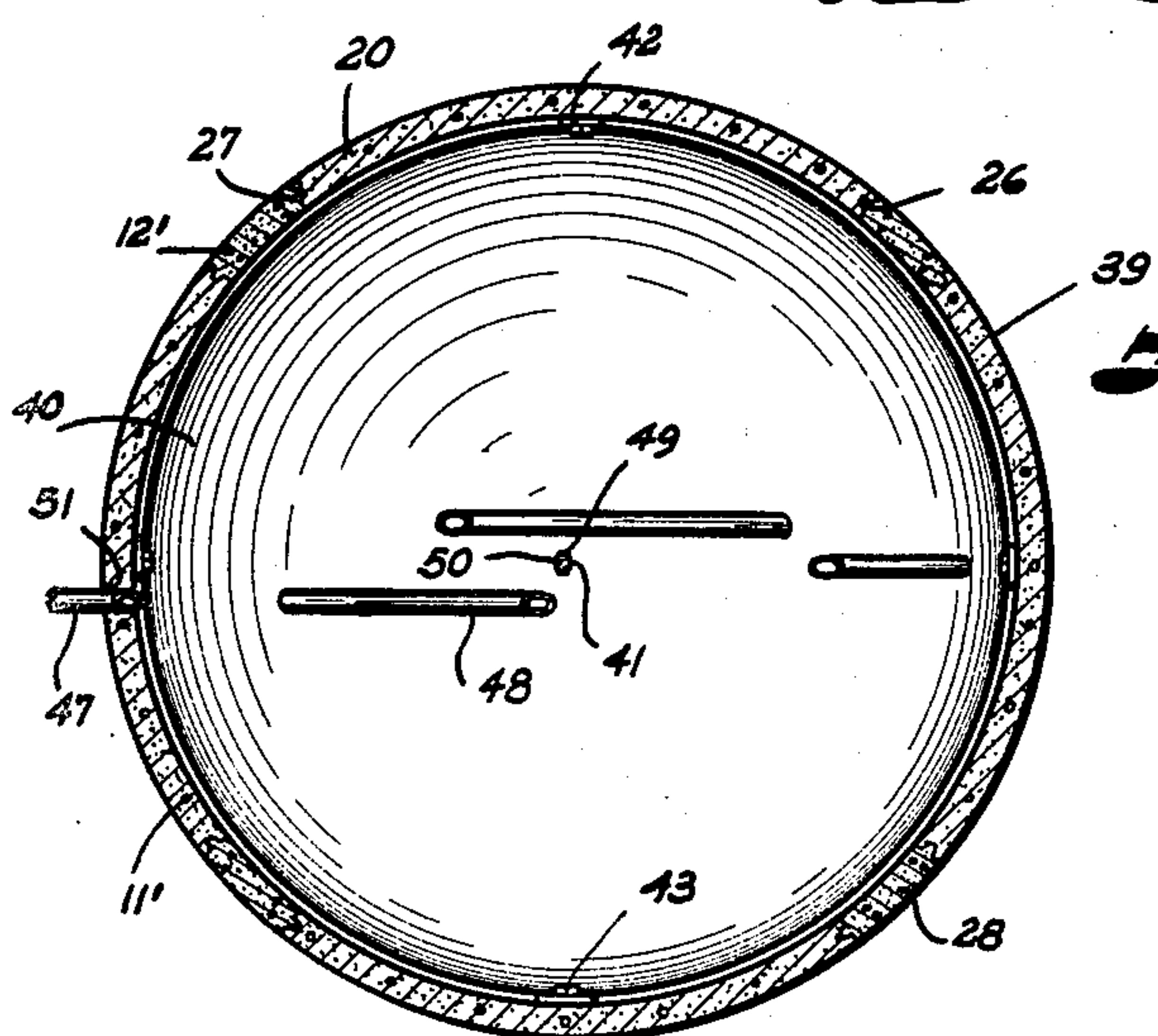
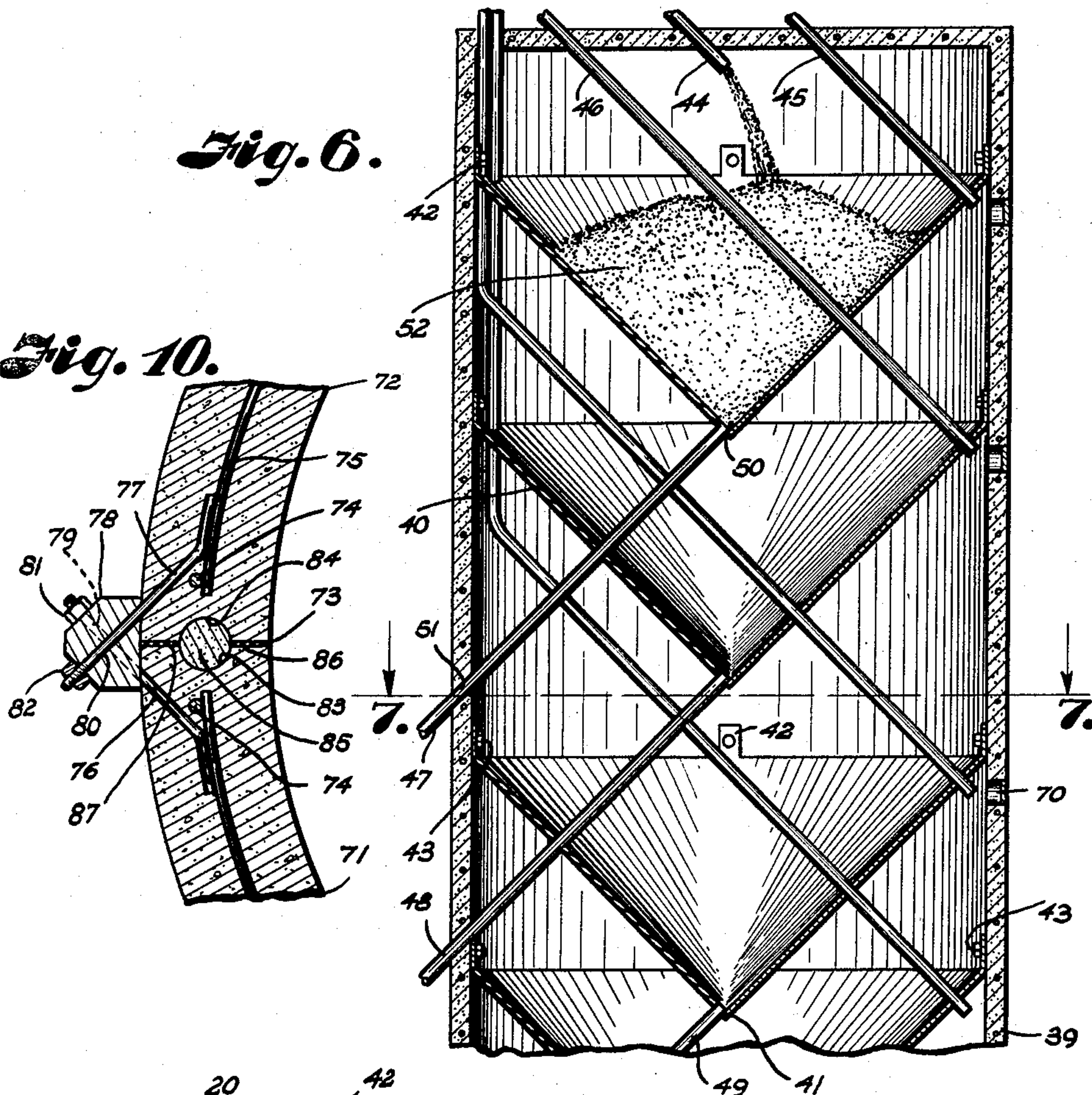
CONCRETE STORAGE STRUCTURE

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*Fig. 6.*

*Fig. 10.*



*Fig. 7.*

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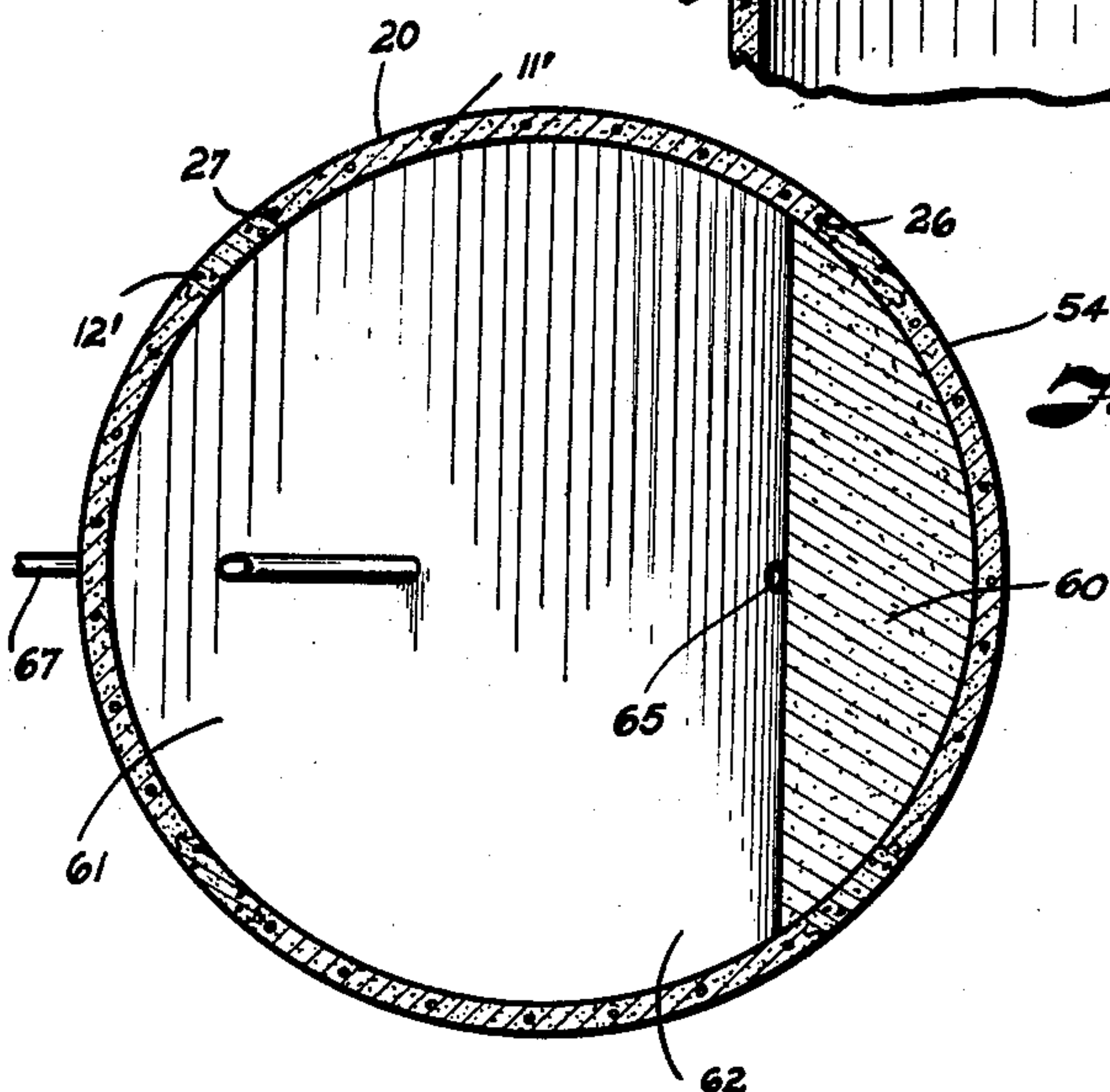
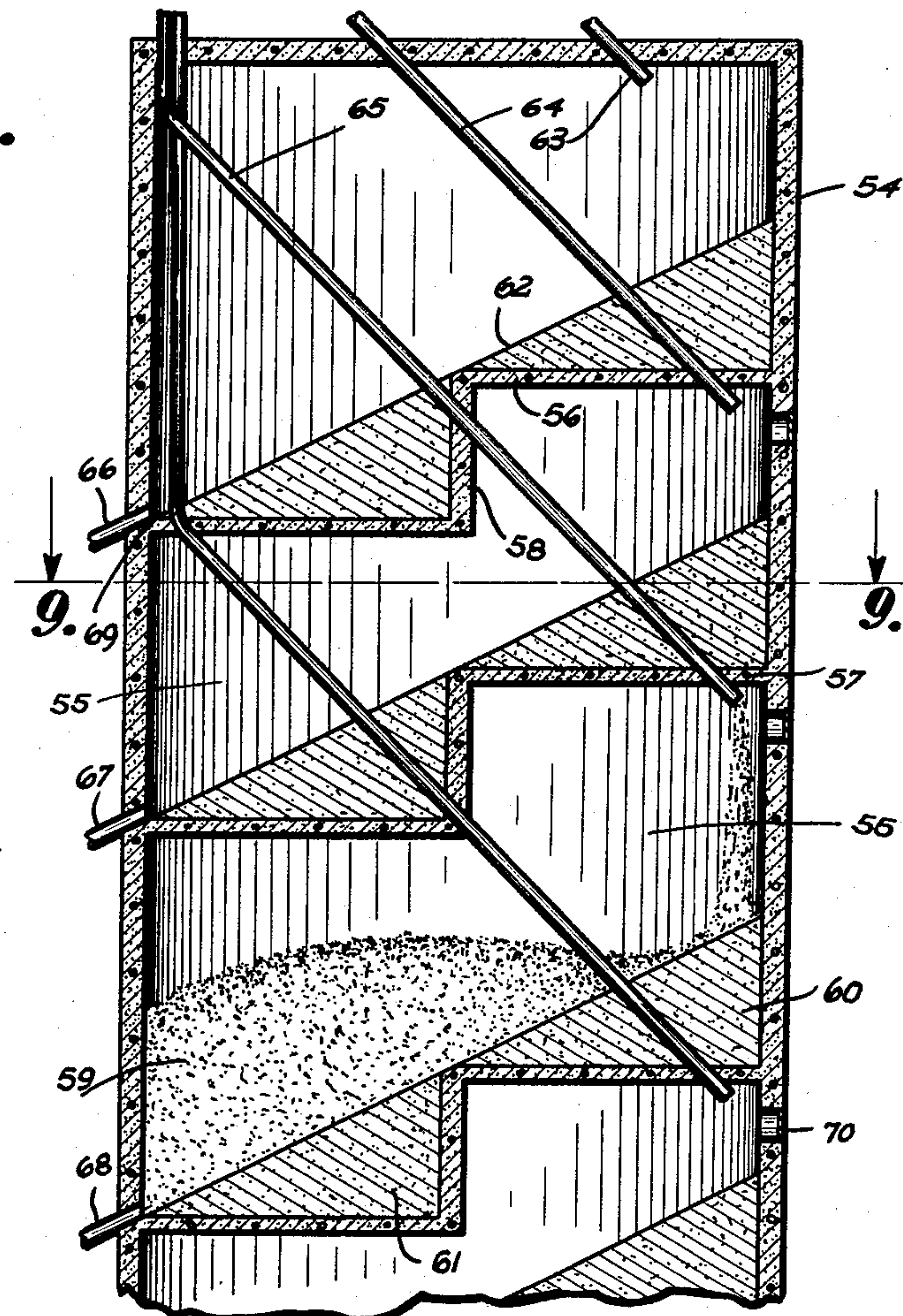
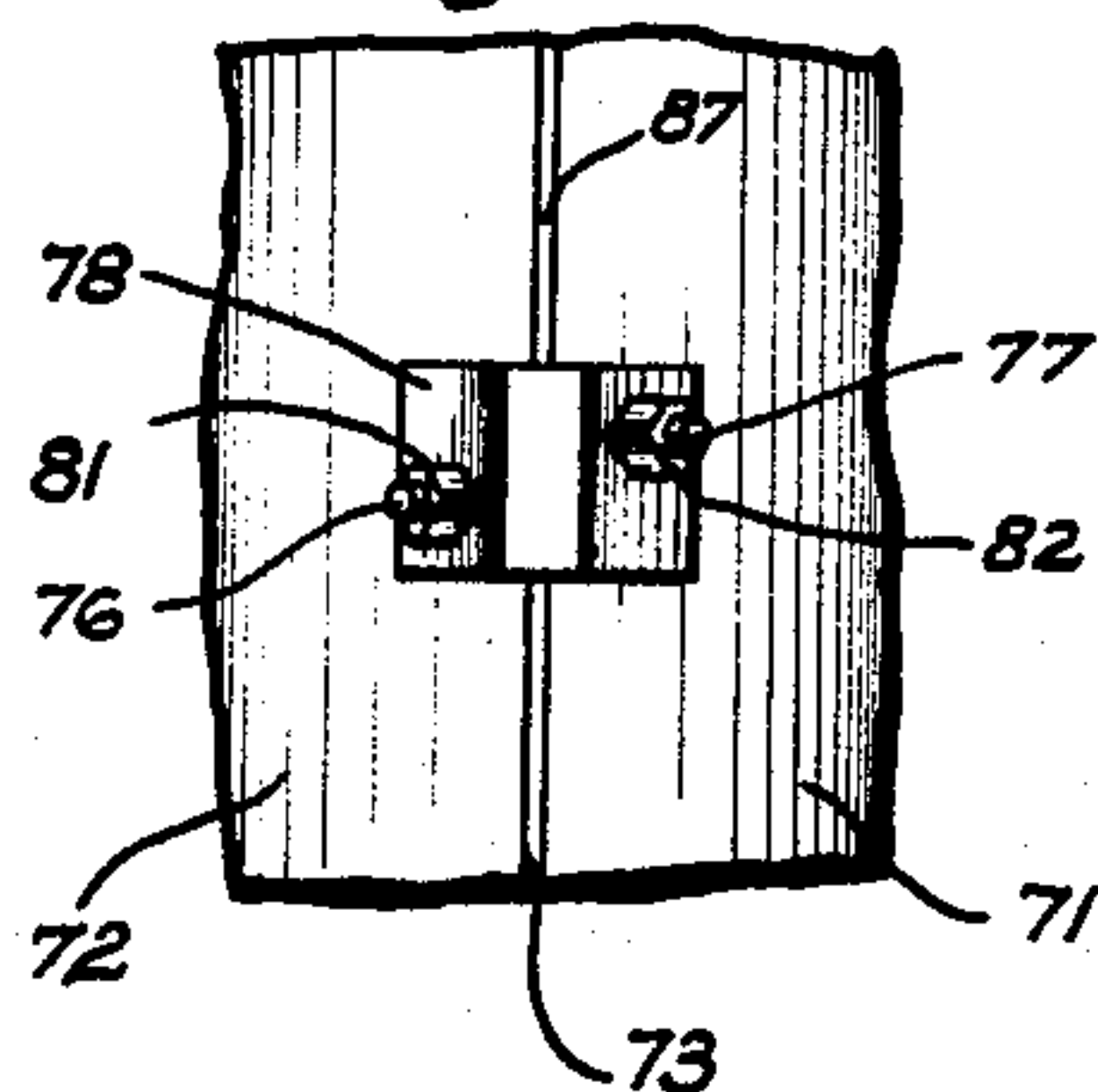
CONCRETE STORAGE STRUCTURE

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4 Sheets-Sheet 4

*Fig. 8.*

*Fig. 11.*



*Fig. 9.*

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## CONCRETE STORAGE STRUCTURE

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Filed July 23, 1956, Ser. No. 599,471

1 Claim. (Cl. 50—346)

This invention relates to an elevator construction, and more particularly to concrete structures for forming elevators or like structures wherein the slabs are preformed and hoisted to place in vertical sections.

It is the principal object of the present invention to preform a plurality of slabs of concrete material in horizontal position on the ground or other surface where the elevator is to be erected and to hoist the slab to a vertical position on the site.

Other objects of the present invention are to provide reinforcement in the slab structures; to provide rods, which may be the reinforcing rods, extending outwardly from the respective edges of the slabs; to provide means for tying the extension ends of the rods together; to provide a space between the respective slabs so that the tie rods may be overlapped and be tied together; to provide for filling of the space between the slabs with concrete or the like when the slabs are in vertical position; to provide the side edges of the slabs with vertical grooves so that when the space is filled between the slabs a key joint will be formed, and to provide a structure of this character simple and economical to erect.

Still another object of the present invention are to provide concrete slabs of various sections for forming the elevator or other construction so that the slabs may be placed one on top of the other in tiers and secured together; to provide spaced horizontal reinforcing rods extending outwardly from the respective edges of the slabs; to provide the upper and lower edges of these slabs with openings for receiving the rods extending from the next adjacent slab to hold the slab in place; to provide for placement of the concrete between the respective upper and lower edges of the tiers of slabs; to provide for tying the reinforcing rods together at the side edges thereof; and to provide means for retaining the sealing material filling the vertical spaces between the slabs.

Still further objects of the present invention are to provide an elevator structure having a plurality of bins or hoppers therein for storage of grain or other material in separate parts thereof whereby different kinds of grain or other material may be stored in the same elevator; to provide means for admission of the grain to the respective bins; to provide means, such as chutes, for removing the grain from the respective bins or hoppers; and to provide access to the respective bins for cleaning thereof or other purposes.

In accomplishing these and other objects of the invention I have provided improved details of structure the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a side view of my invention showing one of the slabs in horizontal position before it is raised.

Fig. 2 is a cross sectional plan view of the elevator as shown in Fig. 1.

Fig. 2A is a cross sectional view taken on a line 2A—2A, Fig. 1, particularly illustrating the tying of reinforcing rods of the respective slabs together.

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Fig. 3 is a disassembled view of a modified form of elevator made of a plurality of slabs.

Fig. 4 is a cross sectional view taken on a line 4—4, Fig. 3.

Fig. 5 is a fragmentary cross sectional view taken on a line 5—5, Fig. 3.

Fig. 6 is a further modified view showing a plurality of bins or hoppers in the elevator construction.

Fig. 7 is a cross sectional view taken on a line 7—7, Fig. 6.

Fig. 8 is still another modified view of the construction particularly illustrating the elevator formed of separate bins by a concrete bottom in respective bins.

Fig. 9 is a cross sectional view taken on a line 9—9, Fig. 8.

Fig. 10 is a fragmentary sectional plan view showing a modified form of fastening the slabs together.

Fig. 11 is a fragmentary side view of the wall with the shackle and bolts in position.

Referring more in detail to the drawings:

1 designates an elevator or the like composed of a plurality of slabs 2, 3, 4, 5, 6 and 7. The slab 7 is shown in a horizontal position on the ground or surface where the slab is formed before it is hoisted in position.

In building structures of this type generally a suitable concrete or other foundation is prepared upon which the super-structure is erected. The slabs may be formed on the side of the ground in horizontal position and of course they are formed curved as indicated at 8 and the curvature depends on the diameter of the structure to be erected. The concrete slabs include various reinforcements as is usual in this structure and they run horizontally therethrough as shown by the plurality of such reinforcing rods extending from the respective sides 9 and 10 of slab 7 as indicated at 11 and 12 which also serve the dual purpose of tying the slabs together as shown in Fig. 2A. Vertical reinforcing rods 11' and 12' are also utilized in the making of the structure as is the usual practice. The slabs after they are formed are hoisted to vertical position by suitable apparatus (not shown) as is the usual practice and the respective slabs are spaced apart as illustrated in Fig. 2, substantially the length of the tie rods 11 and 12. By way of illustration these rods may extend outwardly from the slab about 8 to 12 inches and are overlapped as indicated at 13 (Fig. 2A) and are fastened together by fastening members 14 and 15, such as wires or the like. After the respective slabs have been placed in vertical position and the tie rods secured together by the fastening members 14 and 15 the spaces between the respective slabs are filled with concrete or other suitable sealing material as indicated at 16 (Fig. 2). Forms such as wood or the like may be placed over the space on the outside and inside of the slabs and held in position by suitable means to hold the concrete until it is settled also as is the usual practice. When the concrete is settled then the forms may be removed.

Each side edge 9 and 10 of the slabs are provided with longitudinal grooves 17 and 18 to provide a key joint by the concrete poured between the slabs as illustrated at 16 (Fig. 2) to aid in tying the slabs together. It will be noted the wire ties or reinforcing rods are overlapped and tied as illustrated in Fig. 2A which provides a tight joinder of the slabs together.

With this form of the invention the slabs are each preformed on the ground and then tilted into place by hoisting apparatus (not shown) as above stated, the reinforcing rods being overlapped and tied and the concrete poured between the slabs to form the air tight structure.

It will be obvious from the foregoing that the structure I have illustrated may be utilized for silos, grain bins,



elevators for storage of grain or other products, as I do not wish to be limited to any particular use of such structure. It will further be obvious that any form of retaining of the concrete as it is poured between the slabs may be utilized for my purpose.

It will further be obvious that the concrete bins may be erected singly or in clusters with common walls, either in a substantially square shape, rectangular shape or other shapes as desired. The height, arc, radius and cord length of slabs will be determined for each individual job. The size of reinforcing and amount of key joint will be determined for each individual job depending upon the moisture barrier and other elements.

It will further be obvious that the slabs may be joined together by external cable, bars, or means other than the cementing of overlapping reinforcement without departing from the spirit of my invention.

In Figs. 3, 4 and 5, I have illustrated a form of invention constructed from a plurality of slab structures which may be preformed on the ground, or some other place of convenience, and erected by hoisting or crane (not shown). The lower layer as indicated at 19 may be set in place as in the form of invention shown in Figs. 1 to 2A, inclusive, and then as many layers or tiers of blocks placed on top thereof as is desired for the height of the bin or elevator structure. As the blocks are of the same structure only one will be described. 20 indicates one of such blocks formed of a curvature desired as indicated at 21 with the ends 22 of the reinforcing rods 23 extending from the respective side edges and such side edges 24 and 25 being provided with grooves 26 and 27 for forming a key therein by the concrete 28 as indicated at 29. The reinforcing rods are overlapped as indicated at 30 and tied by the fastening devices 31 as in the first form of the invention. The top edge 32 and bottom edge 33 are provided with a plurality of tie rods 34 and 35 extending from such edges and are adapted to engage in bore openings as indicated at 36 and 37 in the respective ends of the blocks or slabs so that when placing one block on top of the other the rods 35 will engage in the openings 36 of the lower slab and the rods 34 will engage in the opening in the bottom edge 21 which would be similar to the opening 37 in the top edge of the block. These reinforcing rods engaging in the openings will tend to hold the blocks in place and in addition thereto I preferably provide a sealing material, such as concrete, plastic or like material as indicated at 38 between the slabs to provide a tight seal therebetween.

It will be obvious from this form of the invention that as high a structure as desired may be built and the diameter controlled by the shape of the respective slabs when forming the same for each individual job.

In Figs. 6 and 7 I have illustrated an elevator or bin wherein a plurality of storage spaces or bins are utilized for storing grains of different grades or of different ownership and whereby the grain may be inserted in the bins and returned therefrom by gravity.

39 designates an elevator or storage structure with a plurality of cone-shaped bins or hoppers 40 therein one above the other having sloping walls terminating in an apex as indicated at 41. The bins may be of any suitable material but are here shown to be made of metal with an annular flange 42 which fits within the walls of the structure and are secured thereto by stud bolts or the like 43 at spaced intervals around the circumference of such walls. Filling spouts 44, 45 and 46 are provided for the respective bins, and unloading chutes 47, 48 and 49 are also provided which are secured to the apex of the lower portion of the bins as indicated at 50 in a suitable manner, and extend through openings 51 in the side wall of the elevator structure. The mechanism for elevating the grain 52 is not shown, and the unloading spouts 47, 48 and 49 are provided with the usual cutoff valves, also not shown.

It will be noted in Fig. 7 that the walls of the ele-

vator structure may be made according to the form of invention shown in either Figs. 1, 2 and 2A, or Figs. 3, 4 and 5. The hoppers 40 may be of different depth and have different angle to the side walls as desired.

5 In Figs. 8 and 9 I have illustrated another form of bin construction wherein the elevator structure 54 is divided into a plurality of bins or compartments 55 and the compartments are separated by a concrete wall as indicated at 56 with suitable reinforcing as indicated at 57. 10 It will be noted that at substantially the center of this structure there is a vertical wall 58 and in order to provide for self dumping of the grain 59 I fill the triangular shaped portion of the bin from the vertical wall 58 to the side edge of the structure with concrete as indicated at 60 and 61 so as to make a sloping floor 62 in each bin construction. Grain spouts 63, 64 and 65 are provided for the respective bins and unloading chutes or spouts 66, 67 and 68 are also provided in the lower corner or side of each bin as indicated at 69 (Fig. 8). 20 Manholes 70 are also provided in the respective bins. Compartments of different size may be provided by varying the placement of the walls in the bin structure.

In Figs. 10 and 11 I have illustrated a form of securing the slabs 2, 3, 4, 5, 6 and 7 together. In this 25 form slabs 71 and 72 may be formed on the ground and hoisted to position in side by side relation with only a small space therebetween as indicated at 73. The slabs 71 and 72 have a plurality of vertical and horizontal reinforcing rods 74 and 75 respectively. Welded or 30 otherwise rigidly secured to the ends of the rods 75 are short rods 76 and 77 which extend outwardly through the slabs and cross each other as illustrated in Fig. 10. A shackle member 78 having openings 79 and 80 engages over the ends of the rods 76 and 77. The ends of the 35 rods 76 and 77 are threaded to receive nuts 81 and 82.

The edges of the slabs 71 and 72 are provided with longitudinal grooves or key ways 83 and 84 which are filled with grouting 85 after the slabs are in place. If 40 desired strips of neoprene or rubber gaskets 86 and 87 may be placed in the space 73 between the slabs.

With this form of my invention when the slabs are hoisted in place in closed relation the gaskets 86 and 87 are inserted, and the shackle 78 placed on the tie rods 76 and 77. The nuts 81 and 82 are tightened on the 45 rods and tightened to draw the slabs together to make a tight seal between them. The key ways are then filled with grouting as indicated at 85.

It will be obvious from the foregoing that I have provided an improved bin structure whereby the slabs may 50 be preformed on the ground and hoisted to position and secured together in a convenient manner.

It will further be obvious that I have provided an improved storage structure wherein a plurality of separate bins or compartments may be utilized for the storage of 55 grain for different customers or different kinds of grain in the same elevator or structure.

What I claim and desire to secure by Letters Patent is:

A concrete structure made from a plurality of preformed slabs and hoisted to vertical position, the respective edges of said slabs having vertically aligned facing 60 grooves, said slabs including spaced vertically arranged and spaced horizontally arranged reinforcing rods therein, tie rods having one end lying parallel with and rigidly secured to the ends of the horizontally arranged reinforced rods spaced from the ends thereof and extending outwardly at an angle through the outer sides of the slabs, the ends of the horizontally arranged rods extending outwardly of the tie rods toward the edge of the slabs and being secured to a vertically arranged rod, the reinforcing 65 rods of one slab being in substantially horizontal alignment with the reinforcing rods of an adjacent slab with the respective tie rods of adjacent slabs being in crossed relation, sealing means between the side edges of said slabs, sealing means in said vertical grooves, a shackle member having openings through which the outer ends 75



of the tie rods extend, the free ends of the tie rods being threaded, and nuts engaging on said threads and against said shackle member for drawing said slabs toward each other and sealing the side edges thereof.

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