

No. 737,500.

PATENTED AUG. 25, 1903.

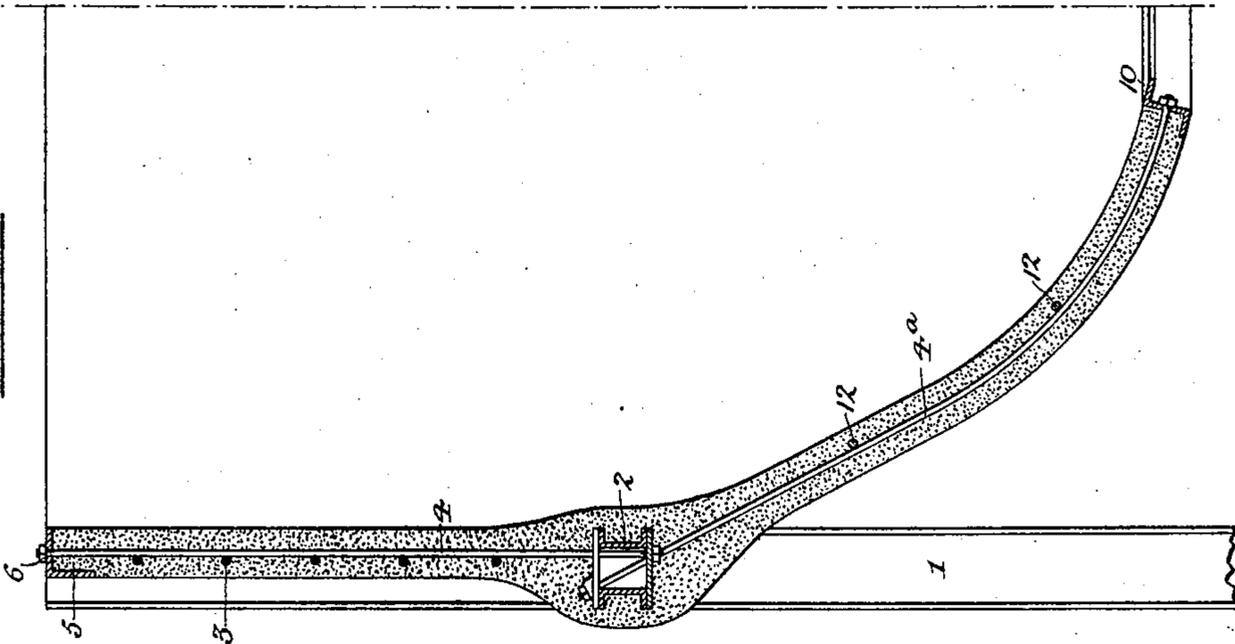
J. W. SEAVER & J. E. A. MOORE.  
METALLIC FRAMING FOR CONCRETE TANKS.

APPLICATION FILED DEC. 16, 1902.

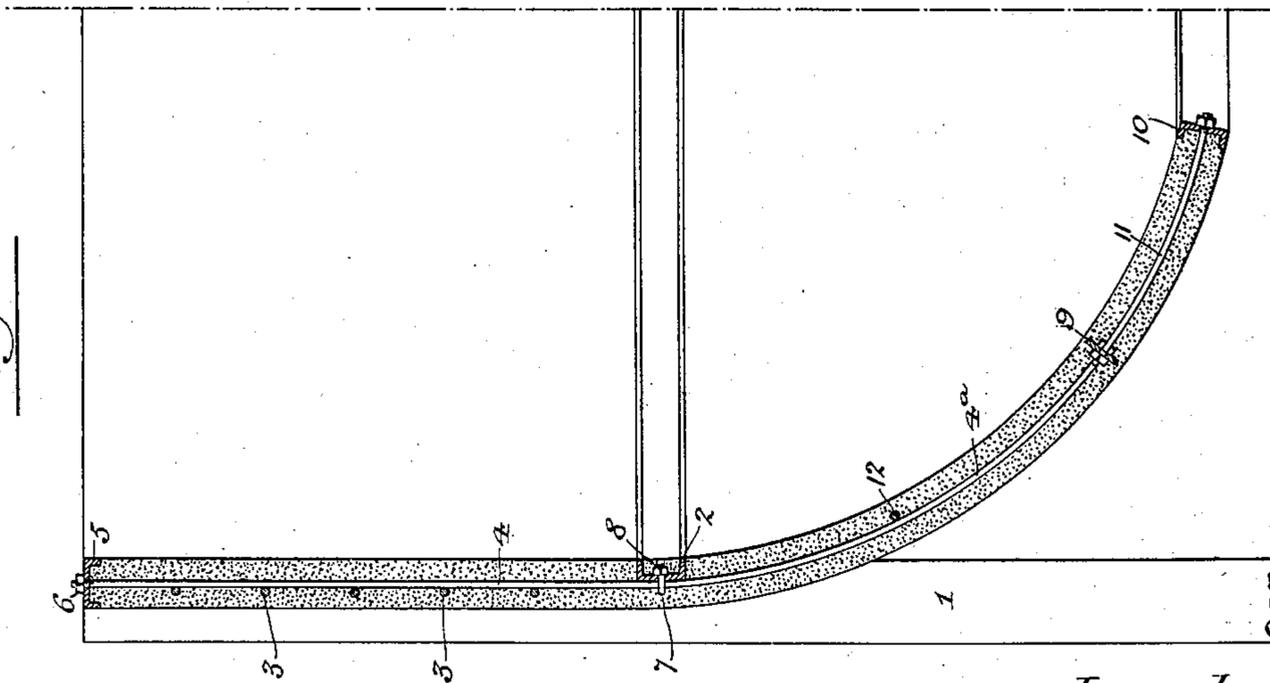
NO MODEL.

3 SHEETS—SHEET 1.

*Fig. 2.*



*Fig. 1.*



Witnesses:-

*Frank L. Graham*  
*Herman E. McKies*

Inventors

*John W. Seaver*

*James E. A. Moore*

by their Attorneys:

*Howson & Howson*

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3 SHEETS—SHEET 2.

Fig. 3.

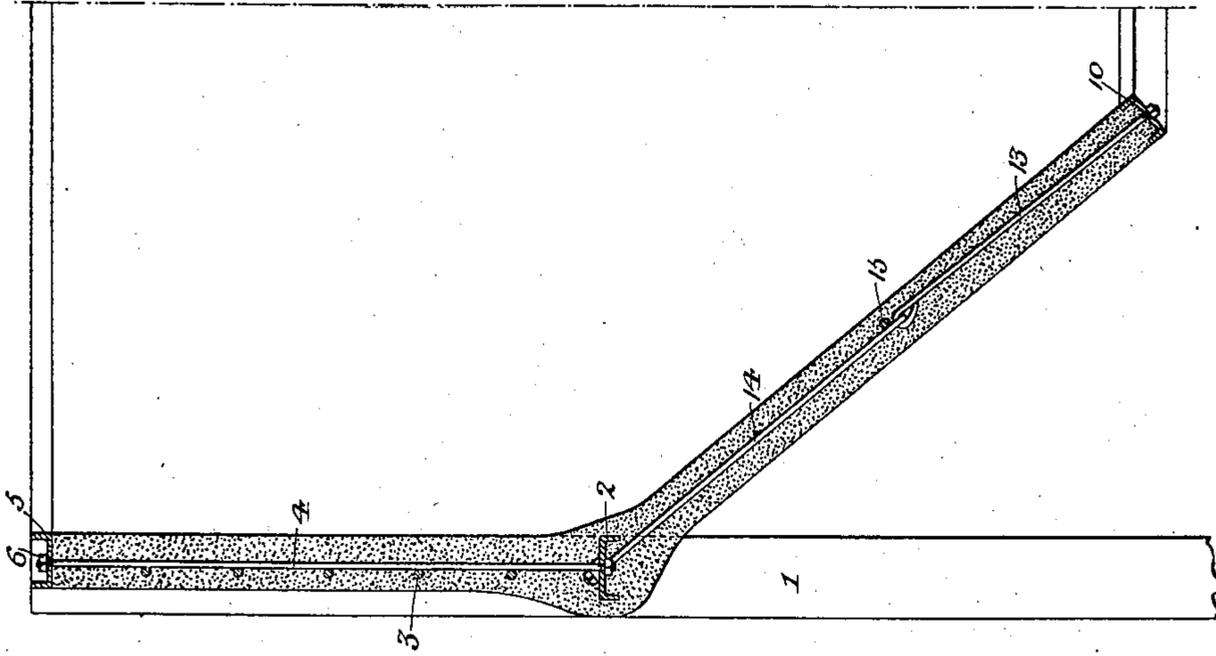
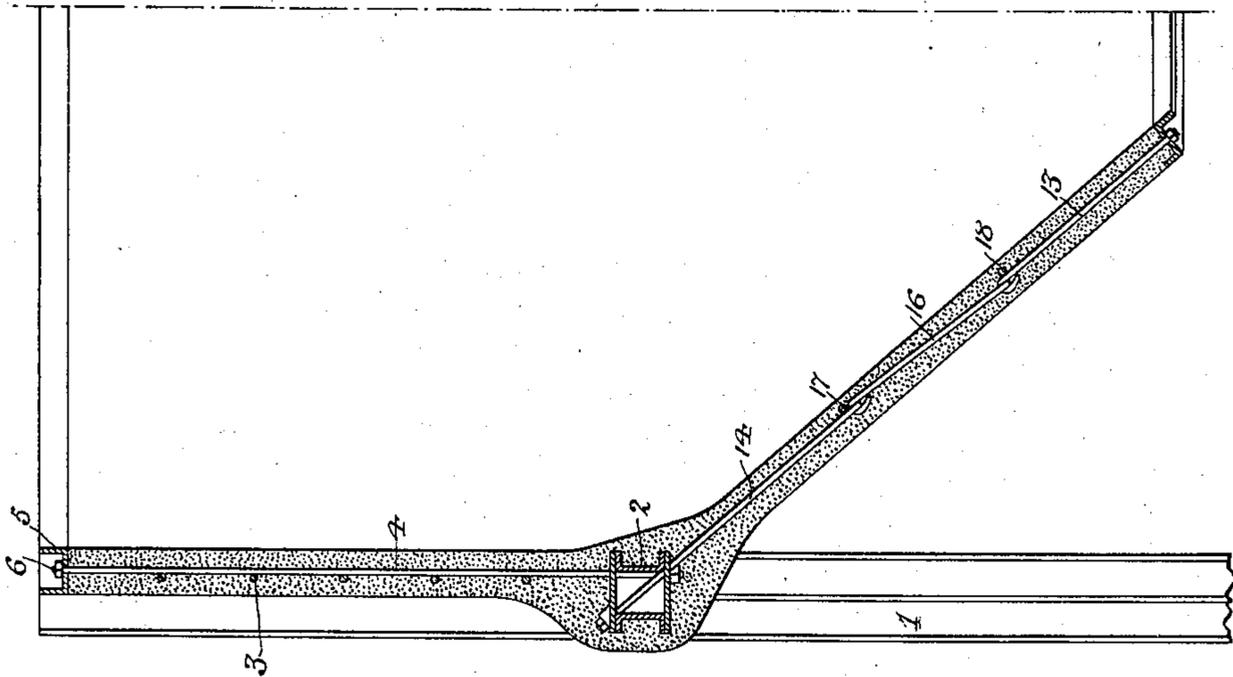


Fig. 4.



Witnesses:-

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Norman E. McKies

Inventors:-

John W. Seaver,  
James E. A. Moore,  
by their Attorneys:

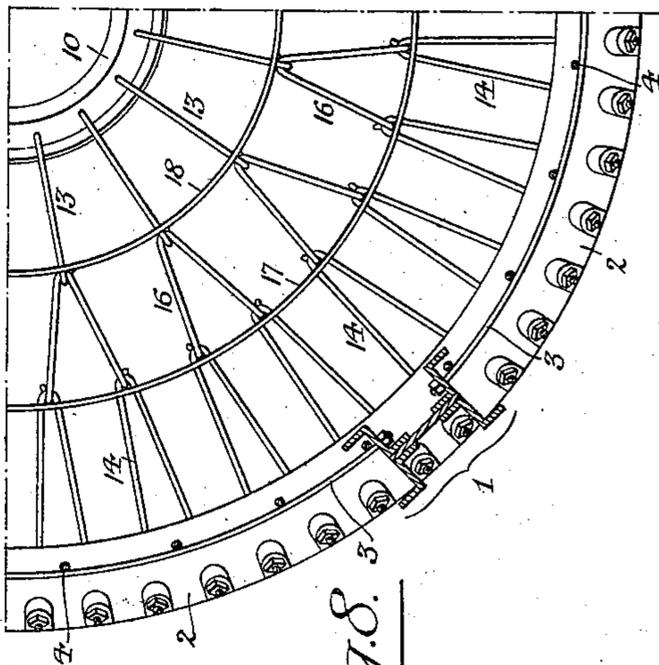
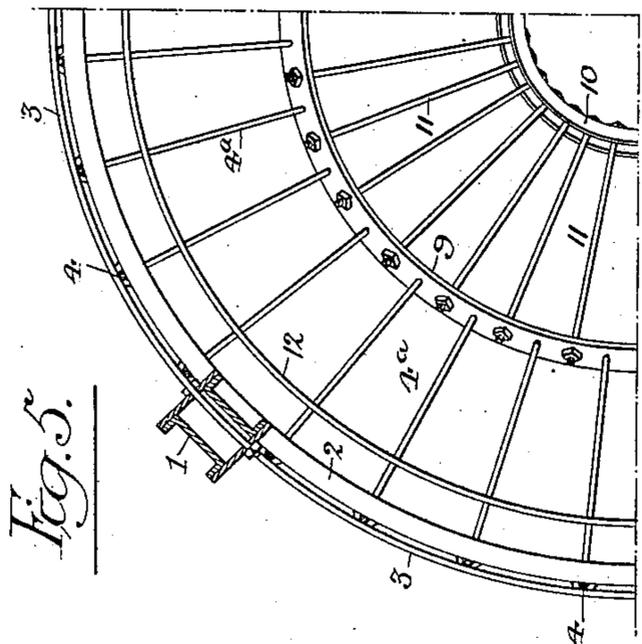
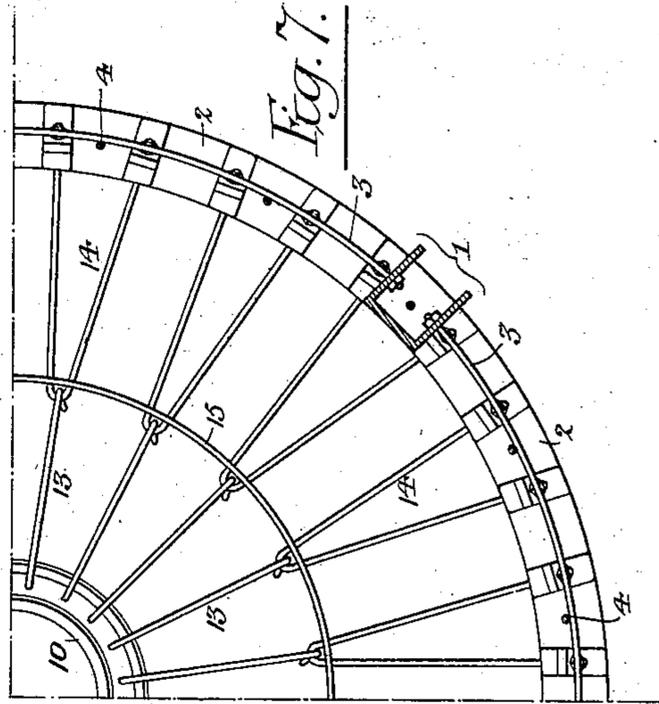
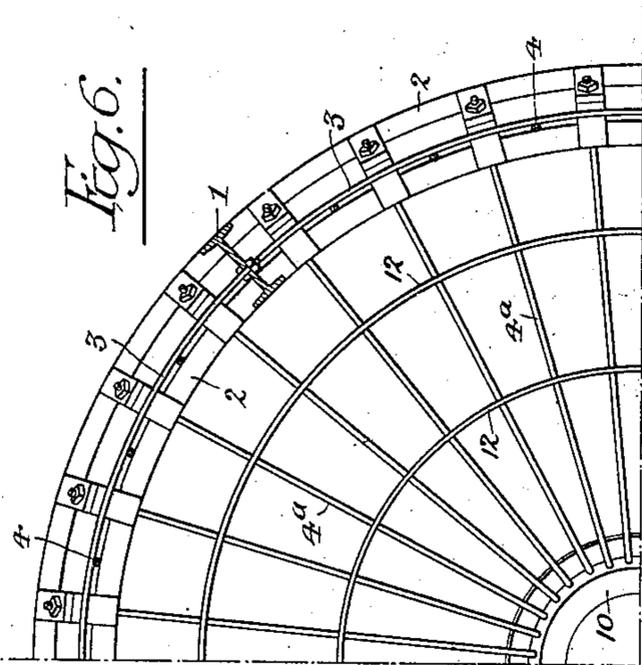
Howson & Howson

J. W. SEAVER & J. E. A. MOORE.  
METALLIC FRAMING FOR CONCRETE TANKS.

APPLICATION FILED DEC. 16, 1902.

NO MODEL.

3 SHEETS—SHEET 3.



Witnesses:

*Frank L. Graham*  
*Norman E. Metcalf*

Inventors:

*John W. Seaver,*  
*James E. A. Moore,*  
*by their Attorneys*  
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# UNITED STATES PATENT OFFICE.

JOHN W. SEAVER AND JAMES E. A. MOORE, OF CLEVELAND, OHIO,  
ASSIGNORS TO THE WELLMAN-SEAVER-MORGAN ENGINEERING  
COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

## METALLIC FRAMING FOR CONCRETE TANKS.

SPECIFICATION forming part of Letters Patent No. 737,500, dated August 25, 1903.

Application filed December 16, 1902. Serial No. 135,430. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN W. SEAVER and JAMES E. A. MOORE, both citizens of the United States, and residents of Cleveland, Ohio, have invented certain Improvements in Metal Framing for Concrete Tanks, of which the following is a specification.

Our invention relates to the construction of tanks having a body of concrete or other material which while in a plastic condition can be molded into shape upon a metallic supporting frame or skeleton, one object of our invention being to simplify and cheapen the construction of this metallic framework, especially in the case of tanks having conical, semispherical, or other tapering bottom portions, and a further object being to so construct the metallic framework that all of the pieces composing the same will be of limited weight and size, so that it can be readily stored, transported, or assembled, the field-work on the frame being of the simplest possible character.

In the accompanying drawings, Figures 1, 2, 3, and 4 are vertical sections of portions of tanks constructed in accordance with our invention; and Figs. 5, 6, 7, and 8 are plan views of quarter-sections of the metallic framework of the tanks shown in Figs. 1, 2, 3, and 4, respectively.

We have shown our invention as applied to a circular tank with tapering bottom, but said invention in its broadest form is not limited to circular tanks, although the tapering bottom will in most cases be retained. The tank is supported upon vertical columns connected by means of horizontal tie-rods, these columns supporting a circular or other surrounding girder which is suitably secured to the columns and may be mounted thereupon in different ways, either by recessing the column for the reception of the girder, by recessing the girder for the reception of a portion of the column, or by forming the girder in segments rigidly secured to the column. To this girder are attached rods which support the bottom of the tank, and the girder is stayed or supported by means of vertical rods embedded in the concrete or other material forming the sides of the tank, these rods be-

ing by preference connected to a top girder which is suitably secured to and carried by the supporting-columns.

In Figs. 1 and 5 of the drawings, 1 represents one of the supporting-columns of the tank; 2, the circular girder; 3, the horizontal rods whereby one column is connected to another; 4, the vertical supporting-rods embedded in the concrete body of the tank, and 5 the circular top girder to which the said vertical rods are connected. In the present instance this connection is effected by passing the rods through openings in the girder 5 and providing their threaded upper ends with nuts 6, bearing upon the top of the girder. The rods 4 are connected to the girder 2 by means of yokes or clips 7, the legs of which pass through openings in the girder and are threaded for the reception of nuts 8, whereby they are secured to said girder; but other means than these may be adopted for securing the vertical rods 4 to either of the girders. The girders 2 and 5 and the rods 3 and 4 thus form a strong and rigidly-braced body structure, all engaging parts of which lend each other mutual support.

The tank shown in Figs. 1 and 5 has a semispherical bottom with central opening, and the rods which support said bottom consist in part of continuations 4<sup>a</sup> of the vertical rods 4, these rods being continued downwardly to an annular bar 9, embedded in the concrete bottom of the tank, to which bar 9 the lower ends of the rods 4<sup>a</sup> are secured. From the bar 9 to a flanged bar 10, which surrounds an opening in the bottom of the tank, extend other rods 11, suitably secured both to the bars 9 and 10, and those portions of the rods 4<sup>a</sup> which extend between the circular girder 2 and the bar 9 are stiffened by means of horizontal lattice-rods 12.

In the tank shown in Figs. 2 and 6 the girder 2 is of box form instead of being a simple channel-bar, as shown in Figs. 1 and 5, and the bottom of the tank is of parabolic instead of semispherical form. The bottom brace-rods 4<sup>a</sup> in this tank are separate from the vertical supporting-rods 4 of the sides of the tank, and the top member of the box-girder 2 has inclined lugs, forming seats for

nuts at the upper ends of the rods 4<sup>a</sup>. The rods extend directly from the girder 2 to the bar 10, surrounding the bottom opening of the tank, and they are braced by two sets of horizontal lattice-rods 12.

The tank shown in Figs. 3 and 7 has a conical bottom which is braced by rods 13, secured at their lower ends to the bar 10 and hooked at their upper ends for engaging with the loops of a series of looped or bent rods 14, the upper ends of which pass through the girder 2 and receive nuts bearing upon inclined lugs on the top of said girder, whereby the various parts may be maintained under proper tension. A horizontal rod 15 bears upon the looped ends 14 just above their connection with the hooked ends of the rods 13.

The tank shown in Figs. 4 and 8 embodies a further extension of the looped-rod idea, the lower hooked rods 13 in this case engaging an intermediate set of looped rods 16, whose upper ends are hooked for engagement with the upper set of looped rods 14, the latter being secured to the girder 2 in the same manner as the corresponding rods of Figs. 3 and 7, the girder 2 in this case, however, being a box-girder instead of the channel-bar girder shown in Fig. 3. Horizontal stiffening-rods 17 and 18 are in this case disposed adjacent to the looped ends of the rods 14 and 16.

In the tanks shown in Figs. 3, 4, 7, and 8 the number of bracing-rods in the bottom increases in proportion to the increasing diameter of the bottom. Hence a more uniform support for and bracing of all portions of the bottom is provided than where the bottom has the same number of bracing-rods throughout.

In all of the forms of metallic framework which we have shown the parts are simply ordinary merchant rods, bars, or plates, and the erection of the framework involves nothing more than the application of nuts to the various rods or bolts after the latter have been put in place. The parts, moreover, are all relatively small in size and light in weight. Hence they can be readily transported, and the tanks can consequently be erected without the employment of skilled labor and in any desired locality irrespective of its difficulty of access.

Having thus described our invention, we claim and desire to secure by Letters Patent—

1. A metallic framework for concrete tanks comprising supporting-columns, a girder mounted thereon and extending around the tank, said girder carrying rods which support the bottom of the tank, and vertical side rods connected to said girder, substantially as specified.

2. A metallic framework for concrete tanks comprising supporting-columns, a top girder mounted thereon, a lower girder extending around the tank and carrying rods which support the bottom of the tank, and vertical side rods extending from said lower girder to the top girder, substantially as specified.

3. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, and a girder mounted on said columns and extending around the tank, said girder carrying rods which support the bottom of the tank, substantially as specified.

4. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, said girder carrying rods which support the bottom of the tank, and vertical side rods connected to said girder, substantially as specified.

5. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a top girder mounted on said columns, a lower girder extending around the tank and carrying rods which support the bottom of the tank, and vertical side rods extending from said lower girder to the top girder, substantially as specified.

6. A metallic framework for concrete tanks comprising supporting-columns, a girder mounted thereon and extending around the tank, vertical side rods connected to said girder, bottom-supporting rods depending from said girder, and means for connecting the lower ends of said rods, substantially as specified.

7. A metallic framework for concrete tanks comprising supporting-columns, a top girder mounted thereon, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, bottom-supporting rods depending from said lower girder, and means for connecting the lower ends of said rods, substantially as specified.

8. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, bottom-supporting rods depending from said girder, and means for connecting the lower ends of said rods, substantially as specified.

9. A metallic framework for concrete tanks, comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, vertical side rods connected to said girder, bottom-supporting rods depending from said girder, and means for connecting the lower ends of said rods, substantially as specified.

10. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a top girder mounted on said columns, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, bottom-supporting rods depending from said lower girder, and means for connecting the lower ends of said rods, substantially as specified.

11. A metallic framework for concrete tanks comprising supporting-columns, a

girder mounted thereon and extending around the tank, vertical side rods connected to said girder, bottom-supporting rods depending from said girder, means for connecting the lower ends of said rods, and one or more horizontal braces engaging the rods between the girder and the lower connection, substantially as specified.

12. A metallic framework for concrete tanks, comprising supporting-columns, a top girder mounted thereon, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, bottom-supporting rods depending from said lower girder, means for connecting the lower ends of said rods, and one or more horizontal braces engaging the rods between the girder and said lower connections, substantially as specified.

13. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, bottom-supporting rods depending from said girder, means for connecting the lower ends of said rods and one or more horizontal braces engaging the rods between the girder and said lower connection, substantially as specified.

14. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, vertical side rods connected to said girder, bottom-supporting rods depending from said girder, means for connecting the lower ends of said rods and one or more horizontal braces engaging the rods between the girder and the lower connection, substantially as specified.

15. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a top girder mounted on said columns, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, bottom-supporting rods depending from said lower girder, means for connecting the lower ends of said rods, and one or more horizontal braces between the girder and said lower connection, substantially as specified.

16. A metallic framework for concrete tanks comprising supporting-columns, a girder mounted thereon and extending around the tank, vertical side rods connected to said girder, a bar surrounding an opening at the center of the tank-bottom, and bottom-supporting rods disposed between said girder and bar and connected to each, substantially as specified.

17. A metallic framework for concrete tanks comprising supporting-columns, a top girder mounted thereon, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, a bar surrounding an opening at the center of the tank-bottom, and bottom-supporting rods disposed between said lower

girder and the bar and connected to each, substantially as specified.

18. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, a bar surrounding an opening at the center of the tank-bottom, and bottom-supporting rods disposed between said girder and bar and connected to each, substantially as specified.

19. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, vertical side rods connected to said girder, a bar surrounding an opening at the center of the tank-bottom, and bottom-supporting rods disposed between said girder and bar and connected to each, substantially as specified.

20. A metallic framework for concrete tanks, comprising supporting-columns, tie-rods connecting the same, a top girder mounted on said columns, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, a bar surrounding an opening at the center of the tank-bottom, and bottom-supporting rods disposed between said lower girder and the bar and connected to each, substantially as specified.

21. A metallic framework for concrete tanks comprising supporting-columns, a girder mounted thereon and extending around the tank, bottom-supporting rods comprising upper and lower sets connected together and comprising a greater number in the upper than in the lower set, means for connecting the lower ends of the lower set of rods, and connections between the upper ends of the upper set of rods and the girder, substantially as specified.

22. A metallic framework for concrete tanks comprising supporting-columns, a girder mounted thereon and extending around the tank, vertical side rods connected to said girder, bottom-supporting rods comprising upper and lower sets connected together, the upper set having a greater number of rods than the lower set, means for connecting the lower ends of the lower set of rods, and connections between the upper ends of the upper set of rods and the girder, substantially as specified.

23. A metallic framework for concrete tanks comprising supporting-columns, a top girder mounted thereon, a lower girder extending around the tank, vertical rods extending from said lower girder to the top girder, bottom-supporting rods comprising upper and lower sets connected together, the upper set having a greater number of rods than the lower set, means for connecting the lower ends of the lower set of rods, and connections between the upper ends of the up-

per set of rods and the lower girder, substantially as specified.

24. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, bottom-supporting rods comprising upper and lower sets connected together and comprising a greater number in the upper than in the lower set, means for connecting the lower ends of the lower set of rods, and connections between the upper ends of the upper set of rods and the girder, substantially as specified.

25. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, vertical side rods connected to said girder, bottom-supporting rods comprising upper and lower sets connected together, the upper set having a greater number of rods than the lower set, means for connecting the lower ends of the lower set of rods, and connections between the upper ends of the upper set of rods and the girder, substantially as specified.

26. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a top girder mounted on said columns, a lower girder extending around the tank, vertical rods extending from said lower girder to the top girder, bottom-supporting rods comprising upper and lower sets connected together, the upper set having a greater number of rods than the lower set, means for connecting the lower ends of the lower set of rods and connections between the upper ends of the upper set of rods and the lower girder, substantially as specified.

27. A metallic framework for concrete tanks comprising supporting-columns, a girder mounted thereon and extending around the tank, upper, lower and intermediate sets of bottom-supporting rods connected together, the upper set having a greater number of rods than the intermediate set and the intermediate set having a greater number of rods than the lower set, means for connecting the lower ends of the lower set of rods, and connections between the upper ends of the upper set of rods and the girder, substantially as specified.

28. A metallic framework for concrete tanks comprising supporting-columns, a girder mounted thereon and extending around the tank, vertical side rods connected to said girder, upper, lower and intermediate sets of bottom-supporting rods connected together, the upper set having a greater number of rods than the intermediate set and the intermediate set having a greater number of rods than the lower set, means for connecting the lower ends of the lower set of rods, and connections between the upper ends of the upper set of rods and the girder, substantially as specified.

29. A metallic framework for concrete

tanks comprising supporting-columns, a top girder mounted thereon, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, upper, lower and intermediate sets of bottom-supporting rods connected together, the upper set having a greater number of rods than the intermediate set, and the intermediate set having a greater number of rods than the lower set, means for connecting the lower ends of the lower set of rods, and connections between the upper ends of the upper set of rods and the lower girder, substantially as specified.

30. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, upper, lower and intermediate sets of bottom-supporting rods connected together, the upper set having a greater number of rods than the intermediate set and the intermediate set having a greater number of rods than the lower set, means for connecting the lower ends of the lower set of rods, and connections between the upper ends of the upper set of rods and the girder, substantially as specified.

31. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, vertical side rods connected to said girder, upper, lower and intermediate sets of bottom-supporting rods connected together, the upper set having a greater number of rods than the intermediate set and the intermediate set having a greater number of rods than the lower set, means for connecting the lower ends of the lower set of rods, and connections between the upper ends of the upper set of rods and the girder, substantially as specified.

32. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a top girder mounted on said columns, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, upper, lower and intermediate sets of bottom-supporting rods connected together, the upper set having a greater number of rods than the intermediate set, and the intermediate set having a greater number of rods than the lower set, means for connecting the lower ends of the lower set of rods, and connections between the upper set of rods and the lower girder, substantially as specified.

33. A metallic framework for concrete tanks comprising supporting-columns, a girder mounted thereon and extending around the tank, bottom-supporting rods composed in part of looped rods and in part of hooked rods engaging said looped rods, means for connecting the lower ends of said hooked rods and connections between the upper ends of the looped rods and the girder, substantially as specified.

34. A metallic framework for concrete

tanks comprising supporting - columns, a girder mounted thereon and extending around the tank, vertical side rods connected to said girder, bottom-supporting rods composed in part of looped rods and in part of hooked rods engaging said looped rods, connections between the upper ends of the looped rods and said girder, and means for connecting the lower ends of the hooked rods, substantially as specified.

35. A metallic framework for concrete tanks comprising supporting-columns, a top girder mounted thereon, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, bottom-supporting rods consisting in part of looped rods and in part of hooked rods engaging said looped rods, connections between the upper ends of the looped rods and the lower girder, and means for connecting the lower ends of the hooked rods, substantially as specified.

36. A metallic framework for concrete tanks comprising supporting - columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, bottom - supporting rods composed in part of looped rods and in part of hooked rods engaging said looped rods, means for connecting the lower ends of said hooked rods and connections between the upper ends of the looped rods and the girder, substantially as specified.

37. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, vertical side rods connected to said girder, bottom-supporting rods composed in part of looped rods and in part of hooked rods engaging said looped rods, connections between the upper ends of the looped rods and said girder, and means for connecting the lower ends of the hooked rods, substantially as specified.

38. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a top girder mounted on said columns, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, bottom-supporting rods consisting in part of looped rods and in part of hooked rods engaging said looped rods, connections between the upper ends of the looped rods and lower girder, and means for connecting the lower ends of the hooked rods, substantially as specified.

39. A metallic framework for concrete tanks comprising supporting - columns, a girder mounted thereon and extending around the tank, bottom-supporting rods composed in part of looped rods and in part of hooked rods engaging said looped rods, means for connecting the lower ends of said hooked rods connections between the upper ends of

the looped rods and the girder, and one or more horizontal braces engaging the rods between said lower connections and the girder, substantially as specified.

40. A metallic framework for concrete tanks comprising supporting - columns, a girder mounted thereon and extending around the tank, vertical side rods connected to said girder, bottom-supporting rods composed in part of looped rods and in part of hooked rods engaging said looped rods, connections between the upper ends of the looped rods and said girder, means for connecting the lower ends of the hooked rods, and one or more horizontal braces engaging the rods between said lower connections and the girder, substantially as specified.

41. A metallic framework for concrete tanks comprising supporting-columns, a top girder mounted thereon, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, bottom-supporting rods consisting in part of looped rods and in part of hooked rods engaging said looped rods, connections between the upper ends of the looped rods and the lower girder, means for connecting the lower ends of the hooked rods, and one or more horizontal braces engaging said rods between said lower connections and the girder, substantially as specified.

42. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, bottom-supporting rods composed in part of looped rods and in part of hooked rods engaging said looped rods, means for connecting the lower ends of said hooked rods, connections between the upper ends of the looped rods and the girder, and one or more horizontal braces engaging the rods between said lower connections and the girder, substantially as specified.

43. A metallic framework for concrete tanks comprising supporting-columns, tie-rods connecting the same, a girder mounted on said columns and extending around the tank, vertical side rods connected to said girder, bottom-supporting rods composed in part of looped rods and in part of hooked rods engaging said looped rods, means for connecting the lower ends of said hooked rods, connections between the upper ends of the looped rods and the girder, and one or more horizontal braces engaging the rods between said lower connections and the girder, substantially as specified.

44. A metallic framework for concrete tanks comprising supporting - columns, tie-rods connecting the same, a top girder mounted on said columns, a lower girder extending around the tank, vertical side rods extending from said lower girder to the top girder, bottom-supporting rods composed in part of looped rods and in part of hooked rods en-

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gaging said looped rods, means for connect-  
ing the lower ends of said hooked rods, con-  
nections between the upper ends of the looped  
rods and the girder, and one or more hori-  
5 zontal braces engaging the rods between said  
lower connections and the girder, substan-  
tially as specified.

In testimony whereof we have signed our

names to this specification in the presence of  
two subscribing witnesses.

JOHN W. SEAVER.  
JAMES E. A. MOORE.

Witnesses:

C. W. COMSTOCK,  
WM. A. STEVENSON.