

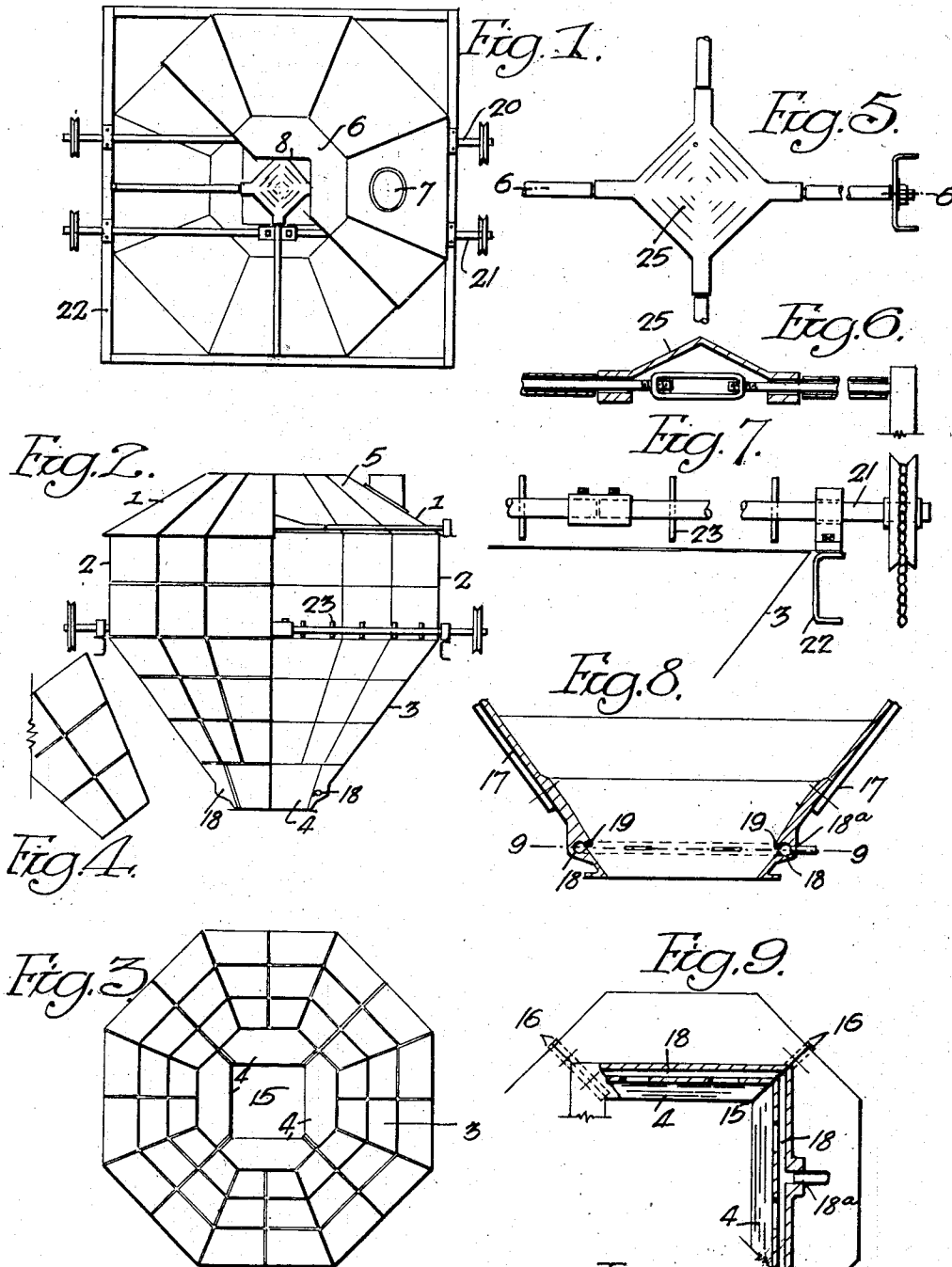
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E. HAHN

1,933,012

TANK CONSTRUCTION

Original Filed March 7, 1925 2 Sheets-Sheet 1



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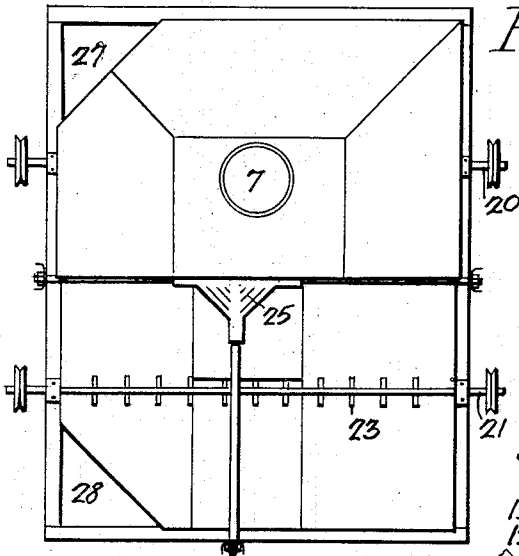


Fig. 15.

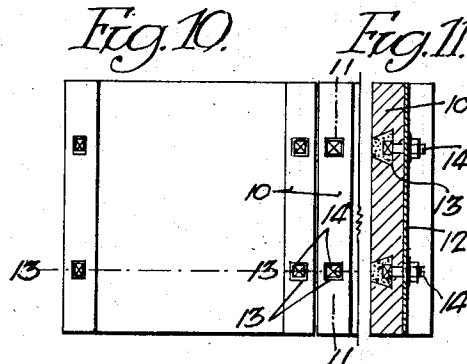


Fig. 10.

Fig. 11.

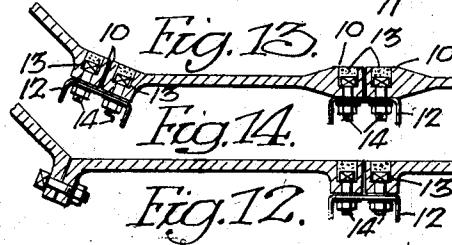


Fig. 13.

Fig. 14.

Fig. 12.

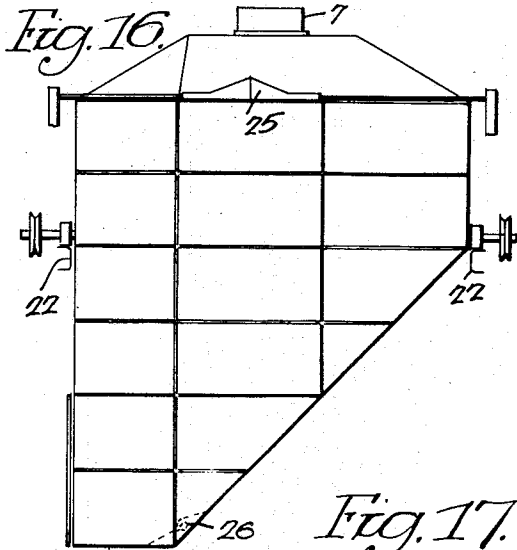


Fig. 16.

Fig. 17.

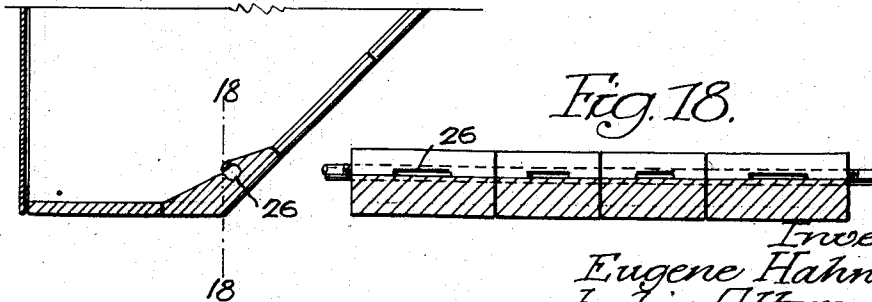


Fig. 18.

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## UNITED STATES PATENT OFFICE

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## TANK CONSTRUCTION

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Application March 7, 1925, Serial No. 13,876

Renewed March 29, 1933

9 Claims. (Cl. 220—1)

This invention relates primarily to sectional metal cast tanks of the type adapted for use as storage hoppers in conjunction with pipe-line or mechanical conveyers and the like, and the invention resides in novel and improved details of construction and features as hereinafter fully described.

A specific object of the invention is to provide a novel and improved tank construction employing more or less standardized parts in such manner as to reduce to a minimum the number of component shapes required, and therefore the cost of manufacture and erection, while still providing a tank of high efficiency in its function of storing compactly and freely discharging the material contained.

An additional improvement is offered in the utilization of crosswise tie rods at the top of the tank body for the retention of the pyramidal or conical splash plate. Thus the function of these rods is double. They strengthen the tank construction and provide the best location for the splash plate.

Another object is to provide novel and advantageous means for securing together the plates which form the walls of the tank, whereby the securing elements may not be exposed on the inside of the tank and to the possible harmful action of the material stored.

Still another object of the invention is to provide means for agitating the ashes or other material in the tank to facilitate free discharge of the contents therefrom in case of packing or arching.

The invention further contemplates the provision of novel and improved means for preventing freezing of the material in the tank, and the thawing out of the material if frozen.

In the attached drawings:

Figure 1 is a diagrammatic plan view of a tank made in accordance with my invention;

Fig. 2 is a side elevation, also diagrammatic, of the tank;

Fig. 3 is an inverted plan view of the tank;

Fig. 4 is a detail of one section of the side walls of the tank;

Fig. 5 is a plan view of the distributor or splash plate;

Fig. 6 is a section on the line 6—6, Fig. 5;

Fig. 7 is a fragmentary enlargement showing details of the agitator;

Fig. 8 is a transverse section through the base or discharge fitting;

Fig. 9 is a section on the line 9—9, Fig. 8;

Fig. 10 is an enlarged elevation of the inside

face of one of the side plates and a part of an adjoining plate;

Fig. 11 is a section on the line 11—11, Fig. 10;

Fig. 12 is an enlarged elevation of the outside face of one of the side plates and a part of an adjoining plate;

Fig. 13 is a fragmentary sectional plan taken on the line 13—13, Fig. 10, through one of the side plates and portions of the adjoining plates;

Fig. 14 is a view similar to that of Fig. 13, illustrating a modification;

Fig. 15 is a plan view of a modified form of my tank;

Fig. 16 is a side elevation of the tank of Fig. 15;

Fig. 17 is a section through the lower portion of the tank, and

Fig. 18 is a section on the line 18—18, Fig. 17.

With reference to the drawings, I have illustrated in Figs. 1 to 14 an octagonal tank, this being the preferred form over the universally used square and circular sectional tanks by reason of the fact that it closely approximates the advantageous shape of a circular tank, as hereinafter more clearly set forth, while affording a construction from flat sections—a material manufacturing advantage over curved, so-called, radial plates. As illustrated, the tank comprises in effect four main sections, a top or roof 1, vertical sides 2, a funnel-shaped under portion 3, each comprising eight equal trapezoidal flat areas, and a four-part cast gate frame 4 at the bottom forming into a square discharge opening.

The roof or cover section 1 may vary materially as to form, material, and construction. In the present instance, it may be considered that the cover is made of sheet metal in nine sections comprising the eight trapezoidal sections constituting the pyramid 5 and the center octagonal section 6, the plates or sections being joined together in any suitable manner. One of the sections 5 preferably is provided with an opening or port 7 acting as a vent, while the center section may also have an opening 8 communicating for example with the discharge end of a pipe line or mechanical conveyer and constituting an intake port for the tank. The cover 1 may rest upon the top edges of the vertical side section 2 of the tank, which as previously stated is octagonal in form.

Each of the eight areas of the section 2 consists of four flat plates, as shown in Figs. 12 to 14, or more when extended, these plates having an outwardly extending flange 9 at top and bottom and being provided at their side edges with portions 10 of greater thickness apertured at in-

tervals for the reception of bolts, by means of which the plates are secured together.

This pyramidal hopper consisting of eight uniform trapezoidal areas requires a lesser variety of component section plates than each trapezoidal area of a four-sided pyramidal hopper would, which is a distinct advantage in manufacturing. For securing the plates of the several areas together, I employ channel beams 12 or angles which are apertured in accordance with apertures 13 in the enlarged side portions 10 of the said plates and are adapted to seat on the outside of said enlargements, as illustrated in Fig. 13. In assembling, the side edges of the plates are brought into abutment and the channel beam set in place so that its apertures correspond with the bolt holes in the plates, after which bolts 14 are passed through the apertures from the inside and nuts applied to the outer projecting ends, as clearly illustrated. It will be noted that the holes 13 in the side portions 10 of the plates are countersunk on the inside, and I prefer to make these countersunk holes larger at the bottom than at the top so that the sides converge outwardly. After the plates are assembled and the bolts secured, I prefer to fill these apertures with a suitable plastic material which covers the bolt heads and thoroughly protects them from contact with the stored material.

It will also be noted that the enlarged portions 10 of the plates at the outer side or adjoining edges of the respective faces are set at an angle such that the abutting edges of the faces lie flush together, as shown in Fig. 13, and this provides a flat seat on the outer faces of the portions 10 for the beams 12. In Fig. 14, I show a modification in which abutting edges of the adjoining plates are provided with simple flanges projecting outwardly and united by bolts passed transversely through the two flanges from the outside of the tank.

The eight sides forming the pyramidal funnel-shaped bottom of the tank are made up of shapes conforming to the trapezoidal areas as shown in Fig. 4. The plates are secured together along their side edges by means of channel or angle bars, as previously described, the flanges at the upper and lower edges of the plates abutting to form the lateral joints.

The bottom part 4, preferably of cast metal, is composed of four uniform sections, as shown in Fig. 3, so formed that when assembled they provide a square discharge opening 15 at the bottom of the tank. The sections are provided at their abutting edges with outwardly extending flanges 16 through which pass the bolts which secure the sections together, and the entire section is supported from the lower extended ends of the channel bars 17 joining the plates of the funnel-shaped mid-section 3, as shown in Figs. 3, 8 and 9. Each of the parts of the section 4 is provided with a transverse channel 18 opening on that face of the plate which in assembly lies on the inside of the tank, these channels in assembly forming a continuous duct around the fitting, and one of the sections is provided with a lug 18a at the outside of the channel portion which is apertured for the reception of a pipe through which steam may be conducted to the channel. This steam is distributed through slots into the bottom of the tank, these slots being placed horizontally so as to prevent their filling up easily with the material in the tank. Also the slots may be formed with overhanging lips 19 or the like, as

shown in Fig. 8, to prevent clogging up of the slots.

It will be noted that I have provided in the opposite walls of the center section of the tank openings through which extend shafts 20 and 21, these shafts being supported in journals on a suitable supporting frame or structure 22 utilized also to support the tank. The shafts are adapted to be operated through externally placed chain wheels or the like, and those portions of the shafts on the inside of the tank are provided with suitable projecting prongs or studs 23 which, when the shaft is rotated, agitate the material within the tank. Although I have shown these shafts in the present instance at the bottom of the vertical section 2 of the tank, obviously they may be placed at any point where agitation is required, it being only necessary to aperture certain of the plates to permit the shafts to pass through, and to provide suitable bearings for the shaft outside of the tank. Under some instances, it may be desirable to form the journals in the walls of the tank itself, but this requires a special supporting member and so is avoided where possible.

I also prefer to provide underneath the cover and directly below the inlet opening a pyramidal or conical splash plate 25 for the better distribution of the material which rests on and is secured to tie rods connecting opposite sides of the tank with the purpose of strengthening its construction and with their ends secured in the opposite upright channel beams 12, as shown in Figs. 5 and 6. These supporting rods may be threaded at their inner ends and provided with turnbuckles for adjustment. These rods being of steel or wrought iron are protected from contact with the stored material through the splash plate itself and pipes through which the rods pass.

Certain material advantages attach to the aforescribed construction, one being that it provides a tank which to all practical intents and purposes approaches the shape and therefore the efficiency of a circular tank due to the near uniform radial pressures within it as produced by the accumulating material. While this permits the use of uniform channels or angle bars in the construction of the tank, it insures the uniform density of the material in every radial direction so that arching is prevented. The slight advantage of a circular tank in having fully uniform radii is more than outweighed by the advantage in casting of flat component sections of an octagonal tank against curved so-called radial plates as required with sectional circular tanks.

A further material advantage is found in the method of securing the plates together utilizing the outer channel beams or angles. The construction is extremely convenient and forms a tank of great rigidity. This construction together with the countersinking of the bolt holes on the inside of the plates also provides a simple and highly effective means for protecting the bolts from the abrasive and corrosive action of the material within the tank. The tapering of the countersinks toward the top prevents the material used to cover and protect the heads of the bolts from being dislodged from the apertures, and at the same time this material is easily removed if it be desired to disassemble the tank or replace any of the parts.

The construction also provides for the use of a minimum number of molds for casting the various plates. The plates in the vertical side section 2 of the tank are identical, while the two series of right and left-hand plates making up

each of the eight trapezoidal areas of the bottom funnel sections consist of less variations than in case of a square tank.

A very considerable advantage is also found in the agitating device which facilitates the discharge of the material from the tank in case of freezing, packing or arching. The steam chamber providing for the discharge of live steam into the interior of the tank also will be found of material advantage in tanks of this type should the moisture in the material stored cause freezing of the contents in the winter time and for thawing the material out if frozen so that it may pass freely when the gate is opened.

Obviously there may be considerable modification in the general form of the tank without departure from the essential features of the invention. Thus for example in Figs. 15 to 18 I have illustrated a similarly constructed tank comprising a side discharge as against the former bottom discharge. In this instance, the sides of the tank are substantially vertical, the tank, however, being undercut from one side to give the desired slide-slope tapering toward the discharge opening. The plates constituting the sides of the tank may in this instance be of the same general construction and be secured together, in the manner as previously described, by means of the upright channels. In this case, I have illustrated a modification of the steam chamber 26, this being provided in the present instance through the full width of the tank, as illustrated in Figs. 17 and 18, at the bottom of the slide-slope.

In conformity to the original octagonal design, corners 27 and 28 in this tank are cut off, the advantage of which is evident from the fact that due to the location of the side gate between these two corners, the material will flow readily towards the gate, whereas otherwise it would clog and stay in the sharp corners.

I claim:

1. A tank including a substantially funnel-shaped section having at least five sides, each side consisting of a plurality of flat cast metal plates secured together in edge-abutting relation, and a four-part fitting adapted to be attached in abutment at the lower edge and to constitute a continuation of the said polygonal section and including a discharge opening.

2. A tank including a substantially funnel-shaped section built up of a plurality of relatively small cast metal plates and terminating at the bottom in a cast metal fitting including a discharge opening, a chamber in said fitting having a port opening into the interior of the tank, and a second port opening to the outside of said fitting.

3. A tank for solid materials including a base section consisting of a plurality of castings adapted when secured together to constitute an open frame, a channel in each casting having at least one port opening to the interior of the tank, said channels being so arranged in the respective castings as to constitute when the latter are as-

sembled a continuous duct, at least one of said castings having a port opening for the outside thereof into said channel.

4. A tank for solid materials, tie rods having their ends secured in the sides and extending across the tank, and a splash plate supported on said tie rods.

5. A tank for solid materials having an intake opening at the top, tie rods having their ends secured in the sides of the tank and extending thereacross, at least one of said rods comprising two parts connected at the inner ends by means of a turnbuckle, and a splash plate mounted on the tie rods beneath the intake opening and overlying said turnbuckle.

6. A tank for solid materials comprising an intake opening at the top, tie rods having their ends secured in the sides of the tank and extending thereacross, a splash plate mounted on and overlying the tie rods underneath the intake opening, and sleeves on said tie rods extending from the sides of the tank to the edge of the splash plate.

7. A tank for solid materials comprising tie rods having their ends secured in the sides of the tank and extending thereacross, said tie rods crossing substantially at the center of the tank, and a splash plate having oppositely disposed openings for passage of the tie rods whereby the splash plate is supported on the tie rods.

8. A tank having walls comprising a plurality of cast metal plates arranged with abutting edges, said plates having along at least two opposite edges a plurality of bolt holes countersunk on the side constituting the inner surface of the tank, bolts having their heads in said countersinks and extending through the bolt holes, a single member overlying the joints on the outside of the tank and having apertures for reception of the bolts whereby the adjoining plates are secured to one of said members and are thereby joined together, and an initially plastic material inserted in the said countersinks over the said bolt heads and preventing contact of the material contained in the tank with the said bolts.

9. A tank having walls comprising a plurality of cast metal plates arranged with abutting edges, said plates having along at least two opposite edges a plurality of bolt holes countersunk on the side constituting the inner surface of the tank, said countersinks being restricted at the top, bolts having their heads in said countersinks and extending through the bolt holes, a single member overlying the joints on the outside of the tank and having apertures for reception of the bolts whereby the adjoining plates are secured to one of said members and are thereby joined together, and an initially plastic material inserted in the said countersinks over the said bolt heads and preventing contact of the material contained in the tank with the said bolts.

EUGENE HAHN.