

Oct. 25, 1949.

D. E. LARSON ET AL

2,485,614

STABILIZING AND GUIDE APPARATUS FOR LIFTER ROOFS

Filed Aug. 29, 1946

2 Sheets-Sheet 1

Fig. 1.

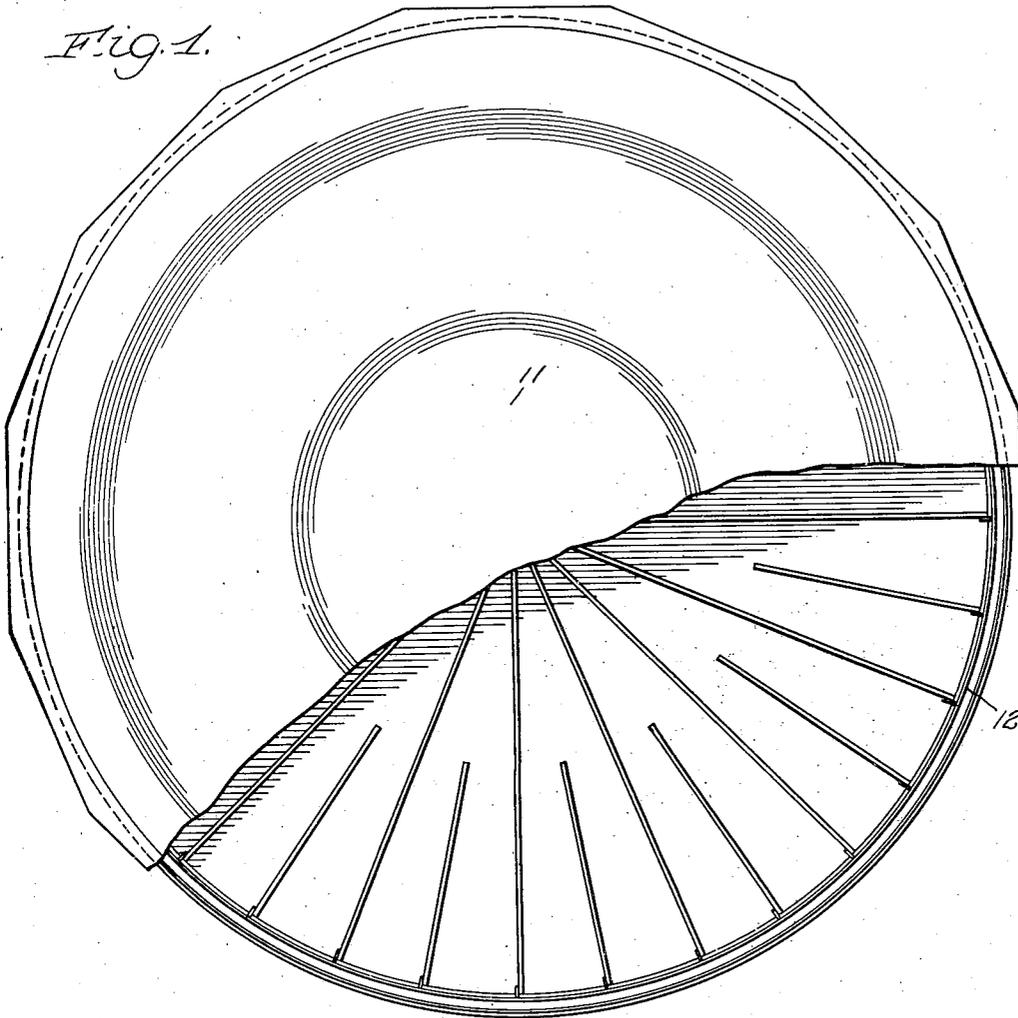
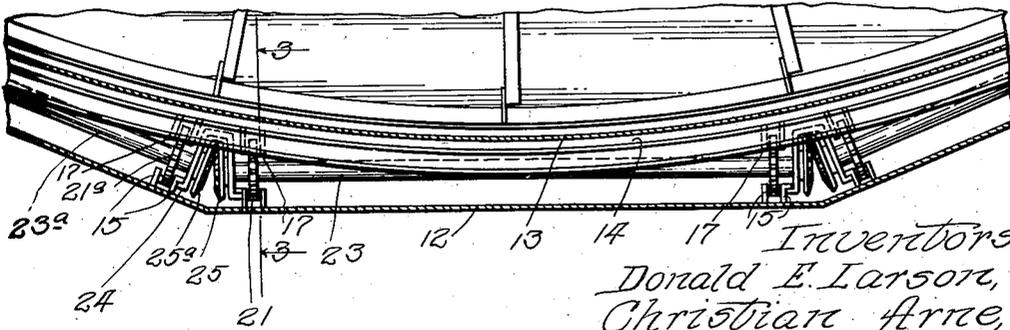


Fig. 2.



Inventors:
Donald E. Larson,
Christian Arne,
By *Christen, Schroeder, Merriam & Nygren,*
Attys.

Oct. 25, 1949.

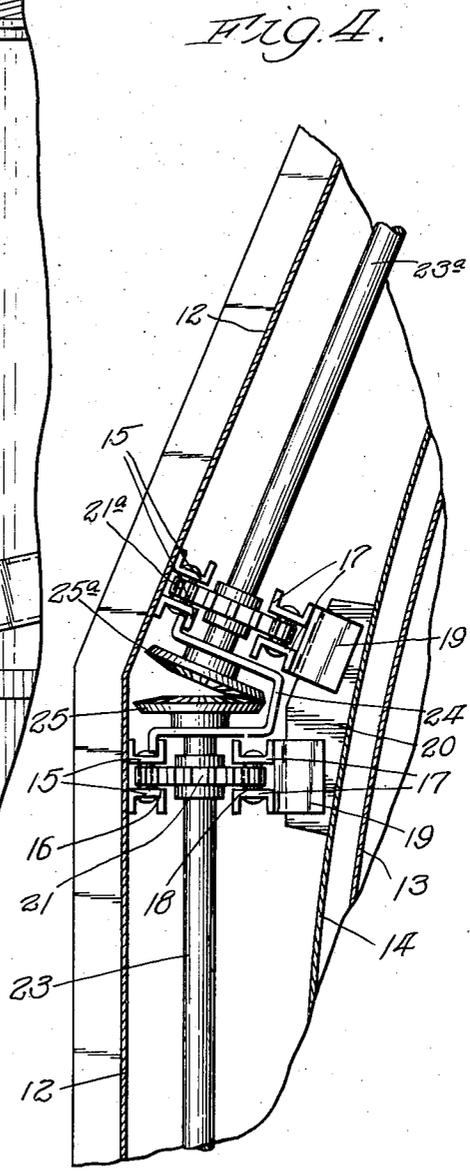
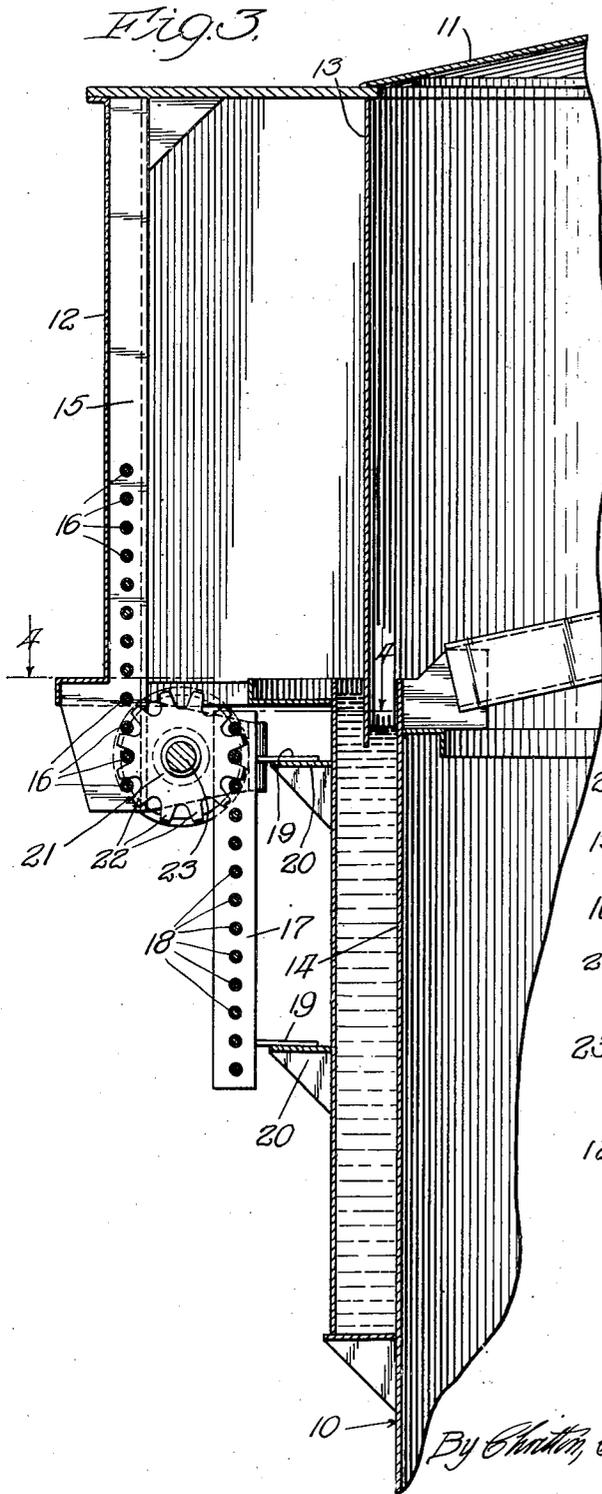
D. E. LARSON ET AL

2,485,614

STABILIZING AND GUIDE APPARATUS FOR LIFTER ROOFS

Filed Aug. 29, 1946

2 Sheets-Sheet 2



Inventors:
Donald E. Larson,
Christian Arne,
By Chatter, Schroeder, Merriam, & Appen,
Attys.

UNITED STATES PATENT OFFICE

2,485,614

STABILIZING AND GUIDE APPARATUS FOR LIFTER ROOFS

Donald E. Larson, Eureka, Calif., and Christian Arne, Chicago, Ill., assignors to Chicago Bridge & Iron Company, a corporation of Illinois

Application August 29, 1946, Serial No. 693,770

6 Claims. (Cl. 48-176)

This invention relates to a lifter roof tank wherein the roof rises and falls with increasing and decreasing pressure of gas within the tank and relates particularly to a stabilizing means for maintaining the roof substantially level at all times.

Lifter roof tanks are used for the storage of gas and for the storage of mixtures of liquid and gas. The tank is designed so that the roof rises and falls with increasing and decreasing gas pressure. Flexible sealing members of impregnated cloth or the like are sometimes provided between the roof and the shell of the tank, and in some cases liquid seals are employed. These tanks, which are sometimes made large in diameter, are subject to uneven loads, such as wind pressure and snow, all of which tend to unbalance the roof. Various means have been proposed for maintaining the roof level during storage, but these have often been made complicated or cumbersome. We have invented and we are herein disclosing and claiming a stabilizing means for maintaining a lifter roof substantially horizontal at all times during its travel, with said stabilizing means comprising broadly, a plurality of substantially horizontal shafts rotatably mounted on the roof and interconnected by means of beveled gears, with the shafts being rotatable by a pinion mounted thereon engaging a rack on the roof and a second rack on the shell.

The invention will be described as related to the embodiment shown in the accompanying drawings, in which Fig. 1 is a plan view of the top of a lifter roof tank with portions broken away for clarity of illustration; Fig. 2 is a horizontal section taken at the top of the shell; Fig. 3 is a sectional view along line 3—3 of Fig. 2; and Fig. 4 is an enlarged detailed view of a portion of the apparatus shown in Fig. 2.

The lifter roof tank shown in the accompanying drawings comprises a shell 10, a roof 11 thereover having a downwardly extending skirt 12. Spaced inwardly from the skirt 12 is a second downwardly depending skirt 13 with its lower end entering a liquid chamber 14 comprising a liquid seal. As this seal does not form a part of the invention, it will not be described further herein, it being understood that our invention can be used on tanks employing a liquid or a dry seal.

Attached to the inside of the skirt 12 is a rack 15 extending a short distance below the skirt and provided with a plurality of teeth 16. Attached to the outside of the shell 10 is the rack 17 having a plurality of teeth 18 formed therein, and said rack being attached to the shell by means

of a bracket 19 on the rack and bracket 20 on the shell. Interposed between the two racks is a pinion 21 whose teeth 22 engage the teeth 16 and 18 of the racks. The pinion 21 is rigidly mounted upon a rotatable and substantially horizontal shaft 23. Alignment of the shafts is assured by a bracket 24 in which the shafts are journaled, the bracket being free to move upwardly and downwardly with the shaft and pinion. A bevel gear 25 is mounted at the extremity of the shaft 23 and has teeth engaging the teeth of a similarly mounted bevel gear 25a mounted on shaft 23a and having a substantially similar pinion 21a mounted thereon.

In the embodiment shown, the units, comprising the shaft, pinions, bevel gears and racks, are duplicated by similar units about the entire periphery of the roof.

It can be seen from the foregoing that an unequal load on any part of the roof, causing that part of the roof to rise, for instance, will cause a rotation of the pinion 21 and thereby a rotation of the shaft 23 and the gear 25 which will transmit that rotation to the adjoining unit 25a. The adjoining unit 25a will transmit the rotation to the pinion associated therewith and to a substantially similar unit (not shown) adjoining it, the process being repeated about the entire periphery of the tank, with a consequence that the entire roof will rise equally. Similarly, a load tending to depress a portion of the roof will cause rotation of the pinions, shafts and gears and cause the entire roof to be lowered uniformly.

It is possible to omit the beveled gears 25 and 25a and still secure a substantial stabilization of the roof in a level position. However, we prefer to use the gears as shown, as there will be less lost motion in the series than would be if the gears were omitted and, therefore, the roof is maintained substantially more level at all times than is possible without their use.

Having described our invention as related to the embodiment set out in the accompanying drawings, it is our intention that the invention be not limited by the details of the description unless otherwise specified, but rather be construed broadly within its spirit and scope, as set out in the accompanying claims.

We claim:

1. In a lifter roof tank including a shell having a roof thereover adapted to rise and fall with increasing and decreasing gas pressure within the shell, stabilizing and guide means comprising: a first rack attached to said roof, a second rack attached to said shell parallel to the first rack, a

3

pinion interposed between and engaging said racks, a rotatably mounted shaft connected to said pinion, and means for transmitting the rotation of said shaft to at least one substantially similar shaft.

2. In a lifter roof tank including a shell and a roof thereover adapted to rise and fall with increasing and decreasing gas pressure within the shell, stabilizing and guide means comprising: a first rack attached to said roof, a second rack attached to said shell parallel to the first rack, a pinion interposed between and engaging said racks, a substantially horizontal rotatably mounted shaft connected to said pinion, a gear mounted on the end of said shaft, said gear being adapted to engage at least one similarly mounted gear.

3. A stabilizing and guide means of claim 2 wherein a plurality of said shafts extend around said roof in the shape of a regular polygon and in which one of said gears is mounted on each end of each shaft.

4. In a lifter roof tank including a shell and a roof thereover adapted to rise and fall with increasing and decreasing gas pressure within the shell, stabilizing and guide means comprising: a plurality of substantially horizontal shafts rotatably mounted about the periphery of said roof and forming a regular polygon, a gear mounted on the end of each shaft engaging the teeth of a similarly mounted gear on a similar adjoining shaft, a first rack mounted on said shell, a second rack mounted on said roof parallel to the first rack, and a pinion rigidly mounted on said shaft interposed between and engaging said racks

4

whereby rotary movement of said shaft is converted into vertical movement of said roof.

5. In a lifter roof tank including a shell and a roof thereover adapted to rise and fall with increasing and decreasing gas pressure within the shell, stabilizing and guide means comprising; a pinion mounted for rotation in a substantially vertical plane; two substantially parallel racks engaging the teeth of said pinion, one of said racks being mounted on said roof and the other of said racks being mounted on said shell, said racks being adapted to rotate said pinion during relative movement between the roof and the shell, and means for transmitting rotation of the pinion to at least one substantially similarly mounted pinion.

6. The stabilizing and guide means of claim 5 wherein said transmitting means comprises a substantially horizontally mounted shaft.

DONALD E. LARSON.
CHRISTIAN ARNE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
433,462	Gadd	Aug. 5, 1890
2,345,174	Bailey	Mar. 28, 1944

FOREIGN PATENTS

Number	Country	Date
18,119	Great Britain	Dec. 12, 1888