Feb. 14, 1933. J. H. WIGGINS 1,897,779

FLOATING ROOF DRAIN

Filed March 17, 1930 2 Sheets-Sheet 1

Fig. 1.

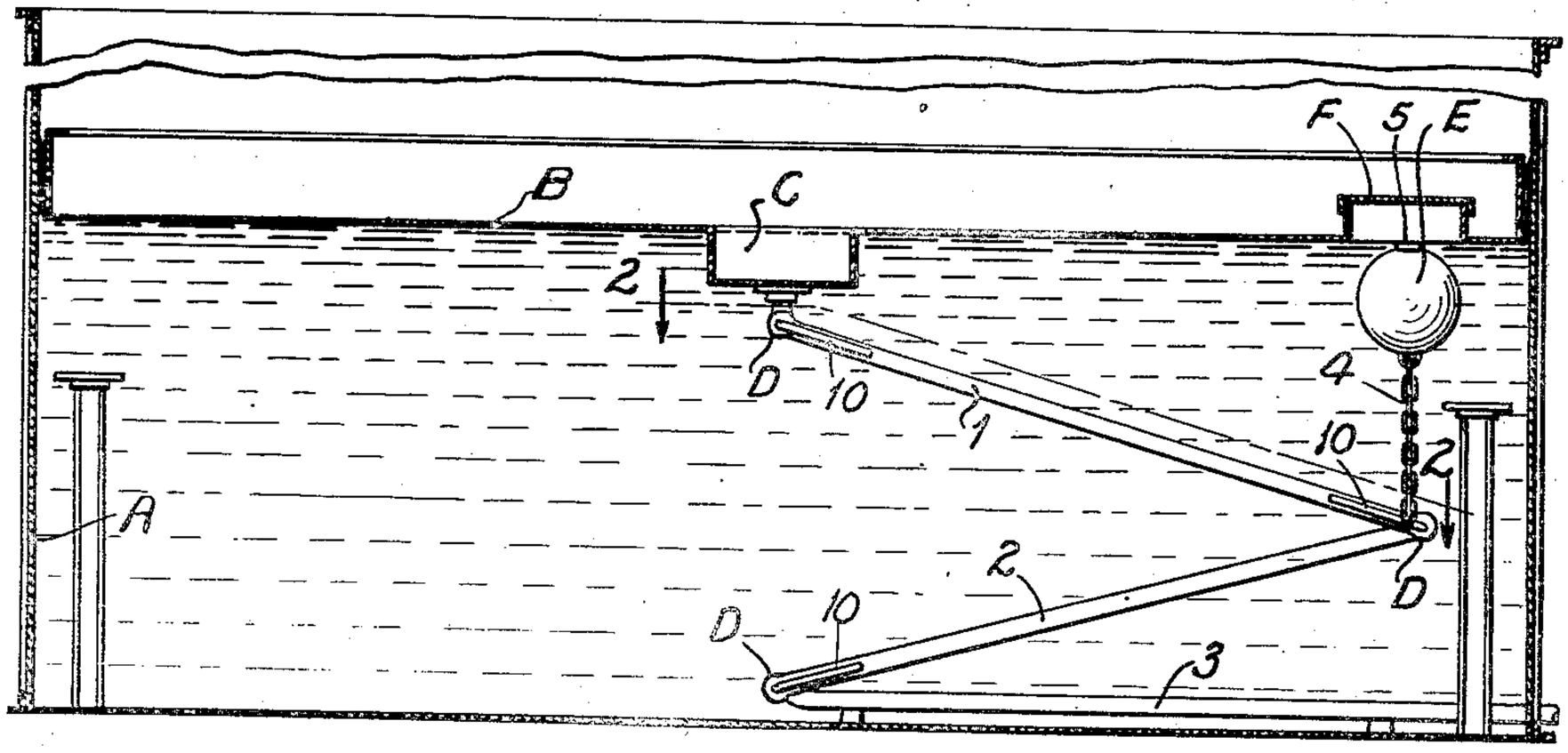


Fig. 2.

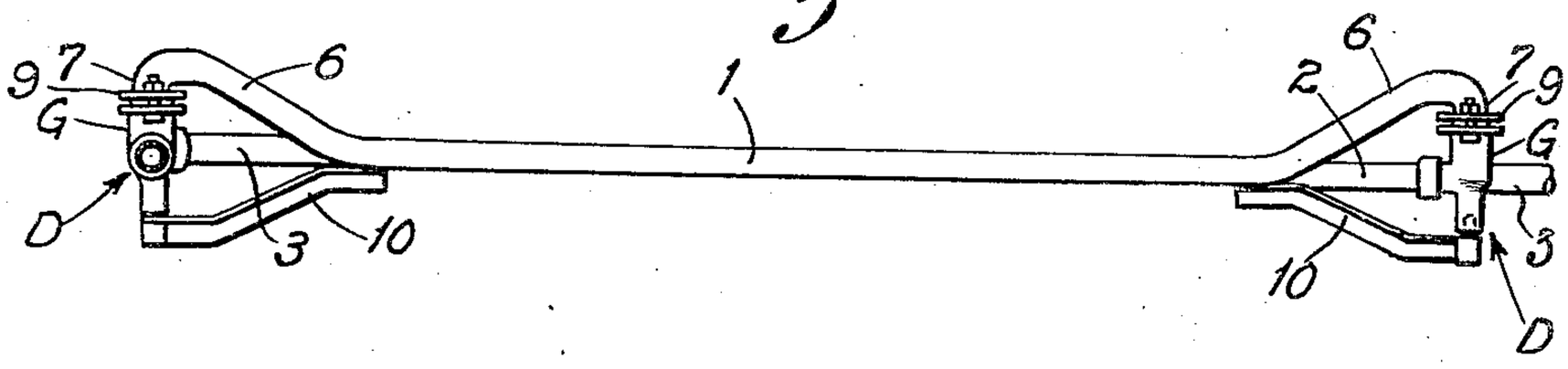
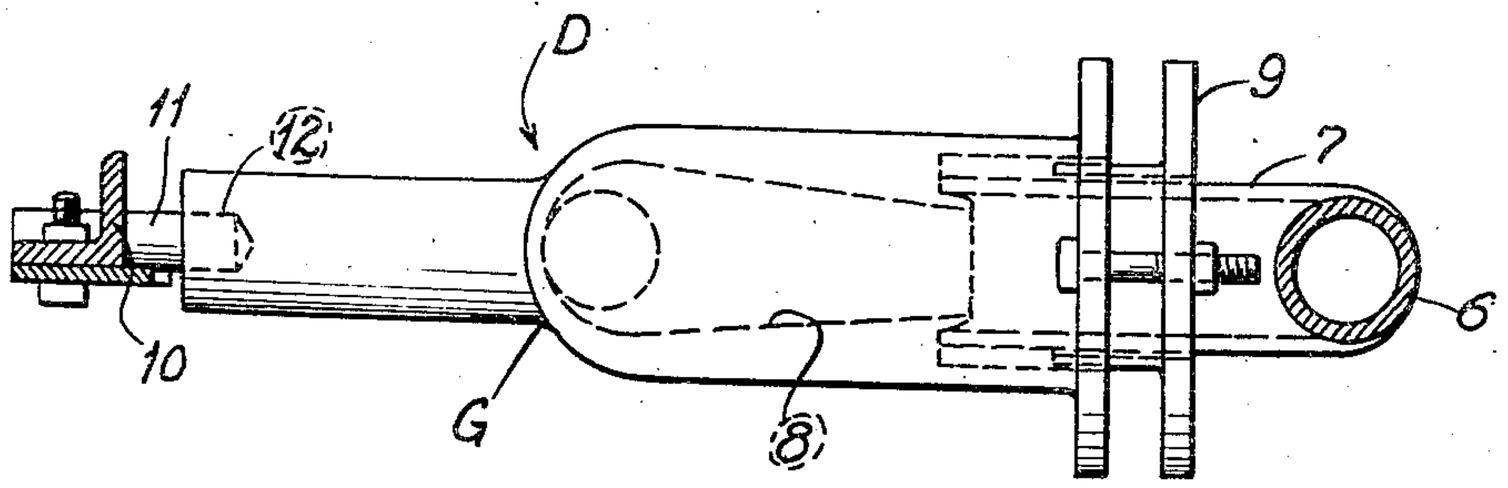


Fig. 4.



INVENTOR:
JOHN H. WIGGINS
BY Bakewell & Church
ATTORNEYS

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Fig. 3.

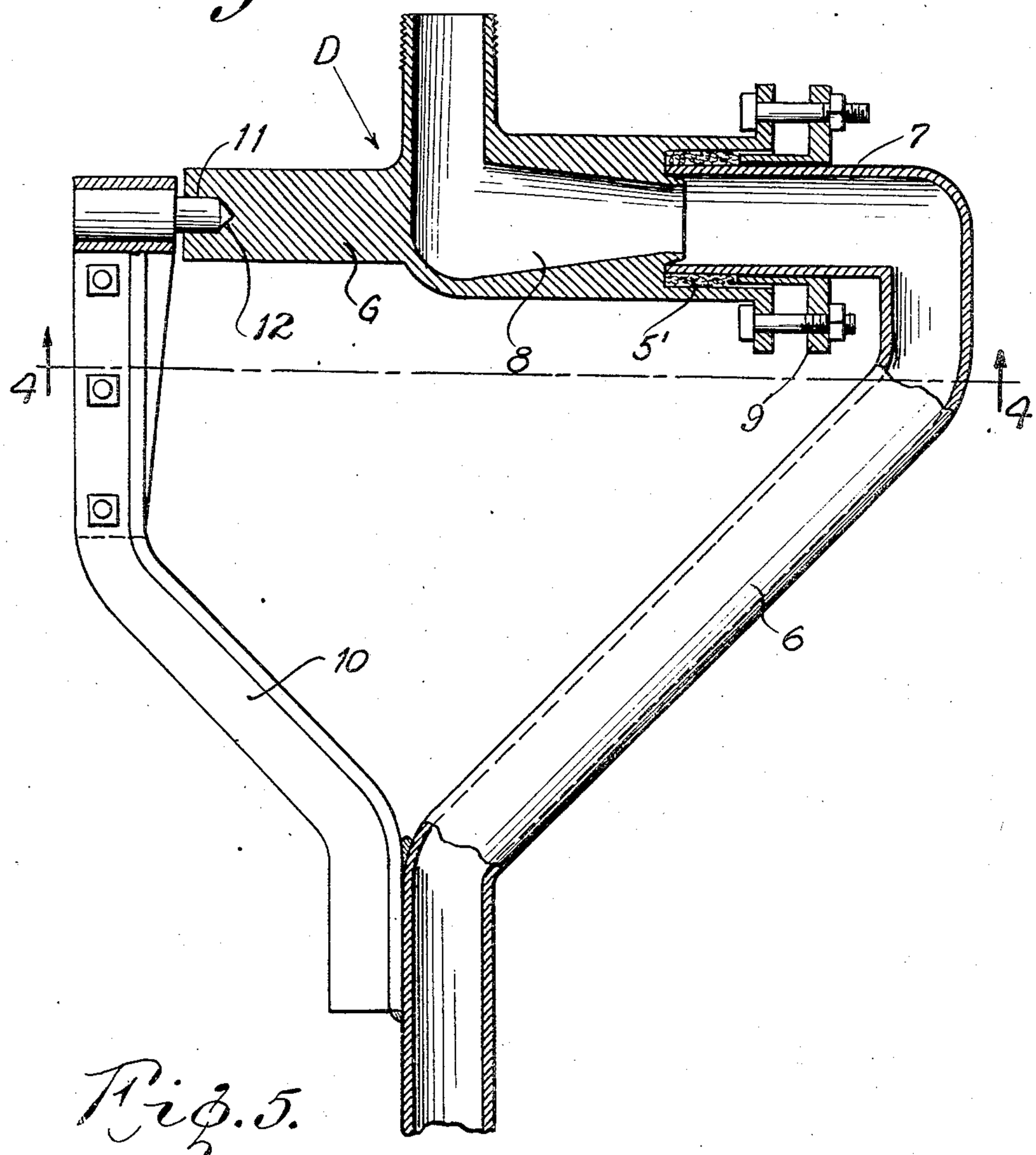
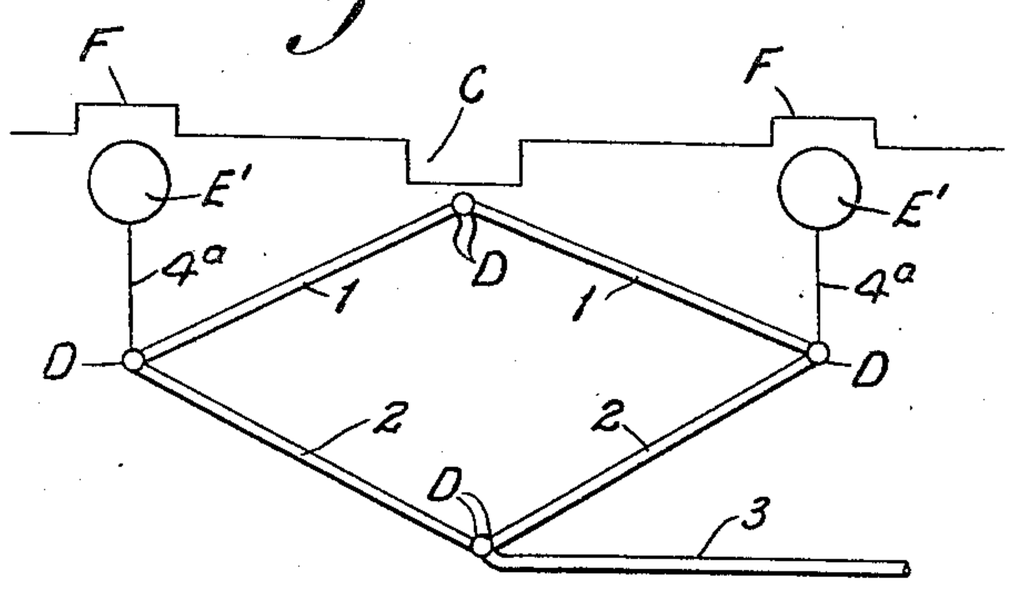


Fig. 5.



INVENTOR:
JOHN H. WIGGINS.
BY Bakewell & Church
ATTORNEYS.

Patented Feb. 14, 1933 1,897,779

UNITED STATES PATENT OFFICE

JOHN H. WIGGINS, OF TULSA, OKLAHOMA

FLOATING ROOF DRAIN

Application filed March 17, 1930. Serial No. 436,483.

This invention relates to drains of the kind that are used for carrying off water from the top side of floating roofs for liquid storage tanks, and particularly, roof drains of the type that are composed of metal pipes connected together by oscillating joints in such a way as to form a lazy tong or pantograph-like tubular structure that will open and close when the roof moves vertically, due to variations in the level of the liquid in the tank on which the roof floats.

One object of my invention is to provide a floating roof drain of the type mentioned, which is of such design or construction that the joints of the drain will not be subjected to excessive or dangerous strains that will cause the packing of the joints to fail, and thus result in leaks.

Another object is to provide a floating roof drain of the single lazy tong or pantograph type, which is of such design or construction that the drain will not exert side thrusts on the roof tending to move the roof towards the side wall of the tank.

And still another object is to provide a roof drain of the lazy tong or pantograph type that is equipped with oscillating joints of novel design. Other objects and desirable features of my invention will be hereinafter pointed out.

To this end I have devised a floating roof drain that is composed of two or more relatively movable pipes hinged or pivotally connected together in such a way as to produce a lazy tong or pantograph tubular structure suspended from the roof, and a means that has no direct connection with the roof, for preventing the weight and movement of the movable pipes of the drain from causing the oscillating joints of the drain to be subjected to excessive thrusts or strains that are liable to cause the packing of the joints to become leaky. My invention is applicable to roof drains of the double pantograph type and of the single pantograph type, and when the invention is embodied in a roof drain of the single pantograph type, it effectively prevents the drain from exerting side thrusts on the roof in a direction tending to force the roof towards the side wall of the tank. Various means may be used to prevent the weight and movement of the movable pipes of the drain from exerting excessive or dangerous thrusts on the joints of the drain, and for preventing the drain from exerting side thrusts on the roof, but I prefer to combine a float with the drain in such a way that said float assists in carrying the weight of the drain, and in the case of a drain of the single pantograph type, effectively prevents the drain from exerting side thrusts on the roof. The oscillating joints that I prefer to use for joining the pipes of the drain together are of novel construction, in that they effectively prevent torsional strains from being set up in the drain, notwithstanding the fact that each joint is provided with only a single packing or stuffing box.

Figure 1 of the drawings is a vertical transverse sectional view of a liquid storage tank equipped with a floating roof that is provided with a drain of the single lazy tong or pantograph type, constructed in accordance with my invention.

Figure 2 is an enlarged top plan view, taken on the line 2—2 of Figure 1, looking in the direction indicated by the arrows.

Figure 3 is an enlarged horizontal sectional view of one of the joints of the drain.

Figure 4 is a transverse sectional view of said joint, taken on the line 4—4 of Figure 3, looking in the direction indicated by the arrows; and

Figure 5 illustrates my invention embodied in a roof drain of the double lazy tong or pantograph type.

In Figure 1 of the drawings A designates the side wall of a liquid storage tank, B designates a roof that floats upon the liquid in the tank, C designates a sump at the center of the roof into which rain water is adapted to drain from the top side of the roof, and 1, 2 and 3 designate a plurality of metal pipes that are hinged or connected together by oscillating joints D, so as to form a tubular structure of the single lazy tong or pantograph type for conducting water out of the sump C. The pipe 3 is stationarily mounted on the bottom of the tank and projects outwardly through the side wall of the tank,

and the upper end of the pipe 1 is connected by an oscillating joint D to the bottom of the sump C, thereby causing the pipes 1 and 2 to be suspended from the floating roof B. When the roof B rises and falls, due to variations in the level of the liquid in the tank, the relatively movable pipes 1 and 2 of the drain will separate or move towards each other like the leaves of a hinge, it being understood that the outer ends of the pipes 1 and 2, i. e., the ends that are adjacent the side wall of the tank, are joined together by an oscillating joint D, and that the inner end of the pipe 2 is joined by an oscillating joint D to the inner end of the stationary pipe 3.

In order to prevent the oscillating joints D of the drain from being subjected to excessive thrusts, produced by the weight and relative movement of the pipes 1 and 2, and in order to prevent said pipes from exerting side thrusts on the roof B in a direction tending to move the roof towards the side wall A of the tank, I combine a float E with the pipes 1 and 2 in such a way that said float assists in sustaining said pipes and exerts a vertical lift on same, regardless of the angles which said pipes may assume relatively to a horizontal plane, when the roof B rises and falls. Preferably, the float E is connected by a chain or other suitable flexible device 4 to the pipes 1 and 2 adjacent the outer ends of said pipes, or adjacent the point where said pipes are hinged together, it being immaterial whether the device 4 is attached to the pipe 1 or to the pipe 2, or to the oscillating joint D arranged at the outer ends of said pipes. The float E is preferably so designed that it will give a lift which is approximately one-half of the moving dead load, formed by the pipes 1 and 2, and the oscillating joint D that joins the outer ends of said pipes together.

When the level of the liquid in the tank varies, the roof B will rise and fall and the pipes 1 and 2 will separate or approach each other, without causing the packing of the oscillating joints D to be subjected to thrusts that will eventually result in said packing becoming leaky. The float E also effectively prevents the drain as an entirety from exerting a side thrust on the roof, and thus shoving the roof towards the side wall of the tank, due, of course, to the fact that the float counteracts the tendency of the outer ends of the pipes 1 and 2 to swing downwardly, due to the force of gravity. In a drain of the construction above described the co-acting tubular portions or telescoped portions of the joints D of the drain will oscillate or rock freely one within the other when the roof B rises and falls, due, of course, to the fact that the pipe 1 is suspended at its opposite end from the roof B and from the float E and the pipe 2 is suspended at one end from the float E and has its opposite end supported by a rockable bearing. The flexible connection 4 between the float E and the intermediate portion of the drain permits said float to move laterally away from the side wall A of the tank and accommodate itself to the position which the intermediate oscillating joint D of the drain assumes when the pipes of the drain separate or approach each other during the vertical movement of the roof. As shown in Figure 1, the roof B is preferably provided with a manhole F arranged so that the float is accessible from the top side of the roof, and a removable plug 5 is mounted in the top of the float, so as to permit the interior of the float to be inspected without removing the float from the tank.

While my invention is particularly adapted for use in floating roof drains of the single lazy tong or pantograph type, it is applicable to floating roof drains of the double lazy tong or pantograph type. Accordingly, in Figure 5 of the drawings I have illustrated my invention embodied in a drain of the type mentioned, wherein two floats E′ are joined by flexible devices 4ª to the intermediate portion of each half of the drain.

Any type of oscillating joint that will permit one of the pipes with which the joint is combined to rock or oscillate relatively to the other pipe with which the joint is combined, may be used to constitute the joints D of the drain. I prefer, however, to use oscillating joints of the kind shown in Figure 3, in view of the fact that such joints will effectively prevent torsional strains from being set up in the drain, even though each joint is provided with only a single packing 5′. The joints D are of such design that the relatively movable pipes 1 and 2 of the drain are arranged in vertical alignment with each other, or in other words, with one pipe directly over the other, and each joint is composed of a member G that is disposed in such relation with one of the pipes with which the joint co-operates that the member G will form in effect a T-shaped element on the end of the pipe. The co-acting member or part of the joint is formed by a substantially yoke-shaped element whose side pieces are pivotally connected to the ends of the head piece of the T-shaped element. Said yoke-shaped element is attached to the other pipe with which the joint co-operates, and one side piece of the yoke-shaped element is provided with a passageway leading from the pipe to which the yoke-shaped element is attached and communicating with a passageway in the member G of the joint that leads to the pipe to which said member G is attached, thereby permitting liquid to flow from one pipe to the other pipe. In the preferred form of my invention herein shown one side piece of the yoke-shaped element of the joint is formed by a laterally bent portion 6 of one of the pipes which the joint joins together, and the terminal end of said

side piece 6 is bent laterally so as to form in effect a hollow trunnion 7 which projects into a bore or socket formed in one end of the member G that constitutes the head piece of the T-shaped element of the joint. Said head piece and trunnion 7 are capable of oscillating or rocking relatively to each other, and the member G is provided with a passageway 8 that establishes communication between the hollow side piece of the yoke-shaped element and the pipe to which the T-shaped element of the joint is attached.

A packing 5, previously mentioned, is used to maintain a liquid tight joint between the hollow trunnion 7 and the member G in which said trunnion turns, and an adjustable gland part 9 is provided for exerting pressure on the packing 5, so as to hold it pressed tightly against the exterior of the hollow trunnion 7 and the side wall of the bore in the member G in which said trunnion is positioned. The other side piece of the yoke-shaped element of the joint is formed by a piece of angle iron or other suitable material 10 attached to the pipe of the drain of which the hollow side piece 6 of the yoke-shaped element forms a part and shaped so as to form in effect a laterally-projecting arm on said pipe which is provided at its outer end with a solid trunnion 11 that fits in a socket or recess 12 formed in a solid portion of the member G, as shown clearly in Figure 3. When the two pipes which the joint joins together approach each other or separate, the parts of the joint will not be subjected to torsional strains, due, of course, to the fact that one of the pipes has attached to same a yoke-shaped element whose side pieces are pivotally connected to the ends of the head piece of a substantially T-shaped element arranged symmetrically with relation to the yoke-shaped element. The desirable feature just described, coupled with the fact that the joint is provided with only a single packing, makes the joint particularly adapted for use in floating roof drains for liquid storage tanks.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination of a floating roof for liquid storage tanks, a lazy tong or pantograph-like drain suspended from said roof and composed of pipes connected together by oscillating joints, and a float combined with said drain for assisting in sustaining the weight of the drain.

2. The combination of a floating roof for liquid storage tanks, a lazy tong or pantograph drain extending downwardly from said roof and having its lower end supported adjacent the bottom of the tank, and a float combined with said drain for assisting in sustaining the weight of same.

3. The combination of a floating roof for liquid storage tanks, a lazy tong or pantograph drain suspended from said roof and having its lower end attached to the bottom of the tank, said drain comprising a plurality of pipes connected together by oscillating joints, and a float joined by a flexible device to the drain in such a way as to overcome the tendency of the pipes of the drain to exert excessive thrusts on the joints of the drain.

4. The combination of a floating roof for liquid storage tanks, a drain of the single pantograph type suspended from said roof and composed of a plurality of pipes connected together by oscillating joints, and a float joined by a flexible device to the drain to assist in sustaining the weight of same and for overcoming the tendency of the drain to exert a side thrust on the roof.

5. The combination of a floating roof for liquid storage tanks, a sump on said roof, a drain pipe mounted on the bottom of the tank and having its discharge end terminating outside of the tank, a plurality of swing pipes connected together at their outer ends by means of an oscillating joint and having their inner ends connected by oscillating joints to the sump and to said drain pipe, respectively, a float, and a flexible connection between said float and the outer ends of said swing pipes.

6. The combination of a floating roof for liquid storage tanks, a sump on said roof, a drain pipe mounted on the bottom of the tank and having its discharge end terminating outside of the tank, a plurality of swing pipes connected together at their outer ends by means of an oscillating joint and having their inner ends connected by oscillating joints to the sump and to said drain pipe, respectively, a float, a flexible connection between said float and the outer ends of said swing pipes, and a manhole in said roof for providing access to said float.

JOHN H. WIGGINS.