Mar. 13, 1923. 1,448,226

J. MATTSON

SILO

Filed Jan. 21, 1922 2 sheets-sheet 1

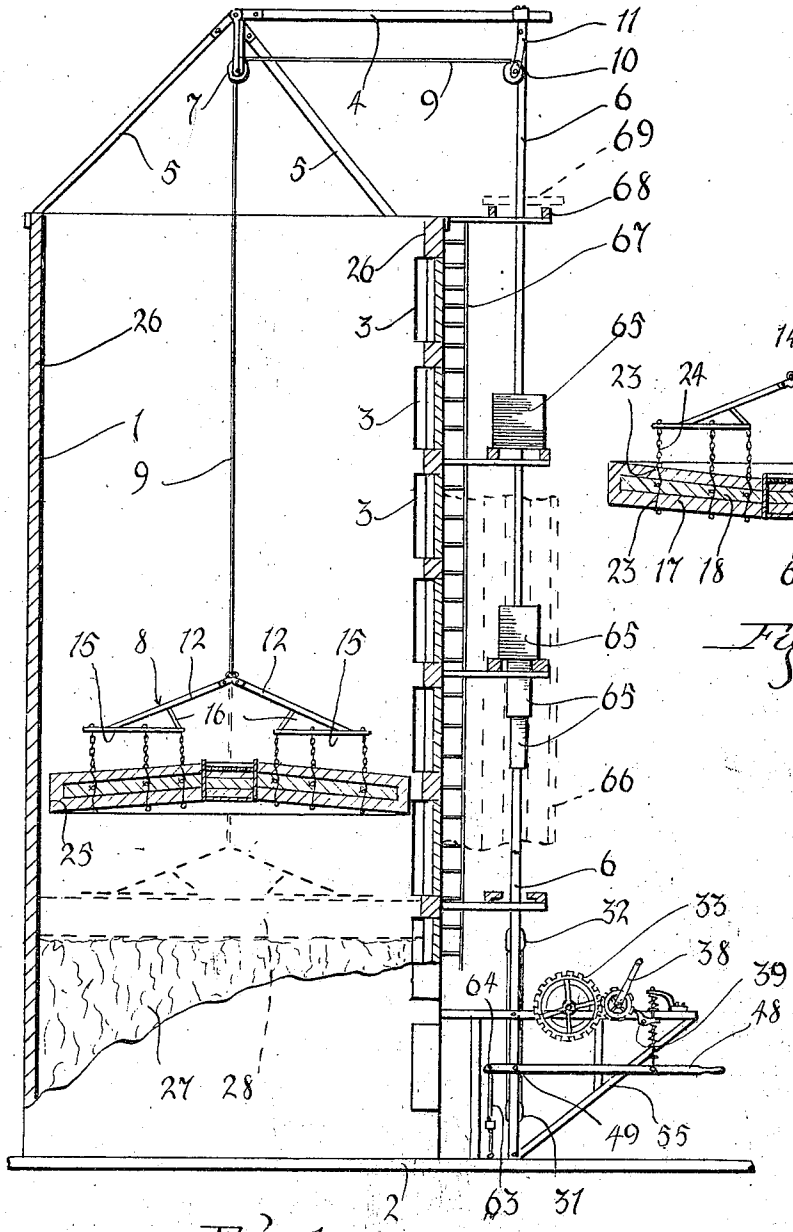


Fig. 1.

Fig. 2.

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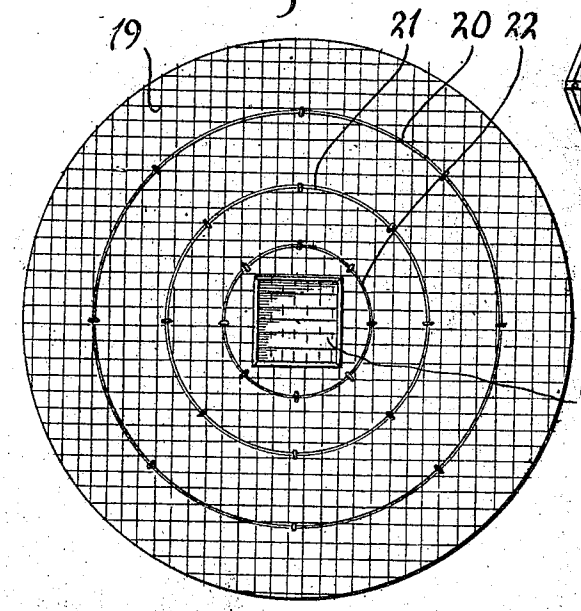
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Fig. 3.



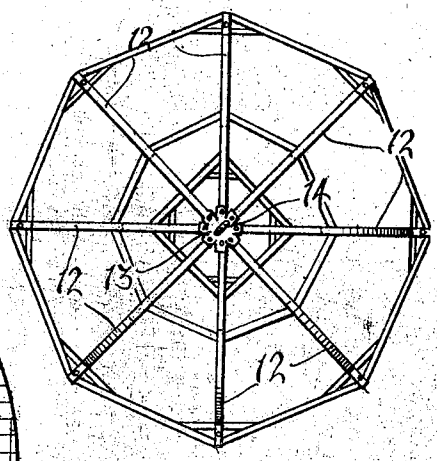


Fig. 4.

Fig. 5.

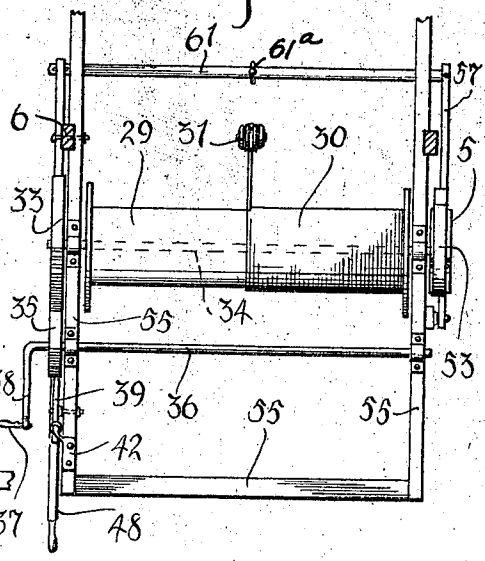
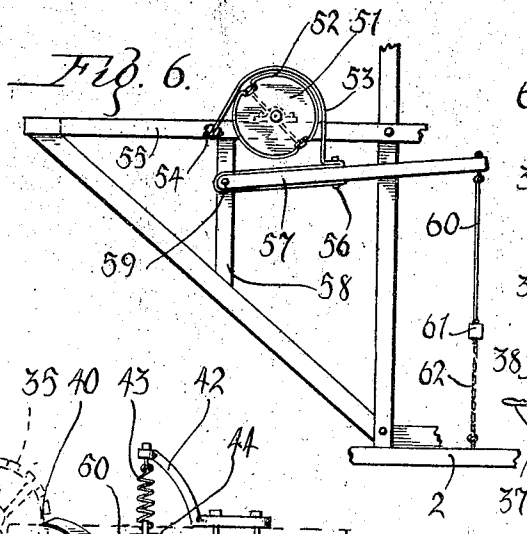


Fig. 6.



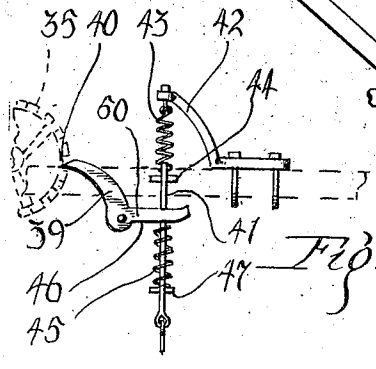


Fig. 7.

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Patented Mar. 13, 1923. 1,448,226

UNITED STATES PATENT OFFICE.

JULIUS MATTSON, OF CHICAGO, ILLINOIS.

SILO.

Application filed January 21, 1922. Serial No. 530,915.

To all whom it may concern:

Be it known that I, JULIUS MATTSON, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Silos, of which the following is a full, clear, and exact description.

My invention relates to improvements in silos, and it consists in the combinations, constructions, and arrangements herein described and claimed.

An object of my invention is to provide a silo having a flexible closure which is supported by a rigid frame so that the closure is concave when supported by the supporting member and may be readily lifted and lowered in the silo.

A further object of my invention is to provide a silo of the character described in which the doors for removing the ensilage are in registration with the counterweight shafts and the whole arranged for incasement with boards if desired.

A further object of my invention is to provide a silo of the character described having a closure in which a door is disposed, thereby permitting access to the ensilage from the top of the closure.

A further object of my invention is to provide a silo in which a block and tackle is disposed in the line intermediate the hoist mechanism and the relatively heavy closure.

A further object of my invention is to provide a silo in which the lock pawl of the hoist mechanism may be released and the brake drum operated simultaneously to lower the closure.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings, forming part of this application, in which—

Figure 1 is a sectional view of an embodiment of my invention.

Figure 2 is a sectional view of the flexible closure in an operative position.

Figure 3 is a top plan view of the flexible closure.

Figure 4 is a top plan view of the closure supporting frame.

Figure 5 is a top plan view of the closure hoist mechanism.

Figure 6 is a side elevation of the hoist brake mechanism, and

Figure 7 is an enlarged side elevation of the pawl mechanism shown in Figure 5.

My present invention relates to improvements in the silo disclosed in my co-pending application filed July 11, 1921, having the Serial No. 483,849. In this pending application I have shown a closure having counterweights and means for progressively applying the weights to the cable as the closure is lowered.

In carrying out my present invention, I make use of a silo tower 1, erected upon foundation 2 and provided with a plurality of doors 3 arranged in vertical alinement with one another. A horizontal beam 4 is supported above the tower 1 by supporting members 5 and the vertical rails 6. The inner end of the beam 4 is disposed directly above the center of the tower 1 and a pulley block 7 is suspended therefrom.

A closure supporting frame 8 is suspended by means of the cable 9 which passes through the block 7 and through a second block 10 hung from the outer end 11 of the beam 4. The opposite end of the cable 9 is connected to a block and tackle hereinafter described.

With reference to Figure 4, it will be noted that the supporting frame 8 consists of a plurality of radially extending arms 12 secured together at their adjacent ends by a spider 13, which spider is provided with an eye 14 for engaging the cable 9. A horizontal wooden bar 15 is provided for each of the arms 12 and is secured thereto adjacent one of its ends. The opposite end is linked to the arm 12 by means of a short rigid link 16. Thus the bars 15 are at all times in a horizontal plane. The flexible silo closure which is more clearly shown in Figure 3 is constructed of an outer layer 17 of a soft flexible material impervious to heat. Various materials may be used. Among them stable bedding is probably the best. The inner layer 18 is preferably of well seasoned dry straw and the whole is held together by wire netting 19. This netting extends over the entire surfaces of the flexible closure and is brought closely to the layers by means of concentric rings 20, 21, and 22 on each side of the closure. These rings are held in close engagement

with the layers by means of S-shaped hooks 23 which engage the rings at their outer ends and which pass down through the layers and engage one another as shown in Figures 1 and 2, thus binding the rings closely to the netting and insuring the whole closure against disintegration. The flexible closure, as described, is suspended from the supporting frame 8 by means of a plurality of chains 24 which are connected at one end to the outer ends of the S-shaped hook members 23 on the top surface of the closure and have their opposite ends connected to the horizontal bars 15. There is one of the chains 24 for each of the hook members 22 extending out on the upper surface of the closure.

In Figure 1, I have shown the flexible closure suspended from the supporting frame 8 so that its concave surface will face downwardly when it is in a normal position and the sides 25 are clear of the walls 26 of the tower 1. When the closure is lowered upon the ensilage 27, as shown in the dotted lines at 28, it will flatten out and its sides 25 will contact with the sides 26 of the tower. In Figure 2, I have shown the flexible closure suspended from the frame 8 so that its concave surface, when in a normal position, faces upward.

Means for moving the cable 9 to lower or raise the closure is provided in a hoist drum 29 upon which a cable 30 may be wound. The free end of the cable 30 is arranged to pass through the tackle blocks 31 and 32 so that when the cable 30 is wound upon the drum 29, the block 32 will be drawn toward the block 31. The opposite end of the cable 9 is fastened to the block 32 so that when the block 32 is lowered, the cable 9 will also be lowered. The introduction of these tackle blocks greatly increases the ratio between the rise of the closure and the length of the cable 30 wound upon the drum 29.

The drum 29 is provided with a relatively large gear 33 disposed upon its shaft 34. A second and smaller gear 35 is carried by a crank shaft 36 and is in mesh with the gear 33. The crank shaft 36 is rotatably disposed in parallel relation to the shaft 34 substantially as shown in Figure 5. A handle 37 is provided on the crank arm 38 of the shaft 36 so that the shaft 36 may be manually turned.

Means for holding the shaft 36 against movement in one direction is provided in a pivotally mounted pawl 39 having a tooth 40 for engaging the teeth of the gear 35. When the pawl 39 is in engagement with the gear 35, the drum 29 may be turned in only one direction, i. e., as in winding the cable 30 upon the drum 29. Means for disengaging the pawl 39 from the gear 35 is provided in a vertical rod 41 suspended from a bracket 42 by means of a tension spring 43. A transverse stop member 44 is provided on the rod 41 adjacent its upper end. The stop member 44 is normally held out of engagement with the pawl 39 through which the rod 41 is arranged to pass, by means of the tension spring 43. The pawl 39 is also normally held in engagement with the gear 35 by means of a compression spring 45 disposed concentric the rod 41 and between the lower surface 46 of the pawl 39 and a stop member 47 disposed on the rod 41. When the rod 41 is lowered as by lowering the controlling arm 48, which arm is pivotally mounted upon the track 6 at 49, the stop member 44 will contact the upper surface 50 of the pawl 39 and simultaneously the compression spring 45 will be released from pressure upon the surface 46 of the pawl. The pawl 39 will thereupon be moved so that its tooth 40 is out of engagement with the gear 35. The drum 29 is thereupon free to turn in either direction unless otherwise held against movement. A brake drum 51 is disposed upon the opposite end of the shaft 34 from the gear 33 (see Figure 6) and is provided with a brake pad 52. A brake band 53 is arranged to pass over the brake pad 52 and is secured at one end 54 to the supporting frame 55 of the hoist mechanism. The opposite end of the brake band 53 is secured by means of a bolt 56 intermediate the length of a pivotally mounted arm 57. The arm 57 is pivotally mounted upon the cross piece 58 as shown at 59. The outer end of the arm 57 is connected by means of a rod 60 to a cross bar 61, which cross bar 61 is linked at its middle point 61[a] by means of a flexible connector 62 (in this case I have shown a rope) to the foundation base 2. The opposite end of the bar 61 is connected by means of a rod 63 to the opposite end of the controlling arm 48, as shown at 64.

When the controlling arm 48 is moved downwardly as described, the pawl 39 will be moved out of engagement with the gear 35 and simultaneously the brake band 53 will be moved into engagement with the brake pad 52 and the lowering of the closure suspended from the supporting frame 8 and the cable 9 may be made gradually and stopped or released at the will of the operator. When the controlling arm is released, the pawl 39 will, by means of the tension spring 43 and the compression spring 45, be moved again into engagement with the gear 35 and the hoist is ready for the operation of lifting the closure.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. In filling the silo, the closure is moved by means of the hoist mechanism so that it is disposed adjacent the beam 4 and clear of the tower 1. The ensilage may then be blown or otherwise delivered into the tower.

If conditions of the climate are severe, the tracks 6, upon which the counterweights 65 are mounted, may be entirely enclosed by means of boards, as shown in dotted lines at 66. These boards will also enclose the silo doors 3, as well as the ladder 67 for ascending the tower. The silo closure is provided with a door 68 which may be opened and admit the passage of gases or vapor from the fresh ensilage, or it may be opened for the purpose of removing a small quantity of the ensilage. When the flexible closure is lowered upon the ensilage 27, it will assume the position shown in dotted lines at 28 and the walls 25 will lie in close engagement with the walls 26 of the tower 1, thus assuring the practical sealing of the silo. When the closure is lifted by means of the cable 9 and the hoist mechanism, it will bulge so that its concave surface faces downwardly and the sides 25 will be drawn toward the center of the closure, allowing a clearance between the sides 25 and the sides 26 of the tower. The closure may then be raised or lowered within the tower without the interference of frictional engagement of the closure and the walls as is the case of the ordinary type of silo closure.

The operation of the hoist mechanism is extremely simple. When the closure is to be lifted within the tower, the crank shaft 36 is turned by means of the handle 37 and the drum 29 will revolve, winding thereon the cable 30. As the cable 30 is wound upon the drum 29, the tackle block 32 will move downwardly, drawing with it the cable 9, which in turn will elevate the closure. When it is desired to stop the closure in its ascent in the tower 1, it is merely necessary to release the handle 37 and the pawl 39, which is in engagement with the gear 35, will serve as a means for locking the drum 29 against movement as in unwinding the cable 30 therefrom.

When it is desired to lower the closure upon the ensilage or to the bottom of the tower, it is merely necessary to grasp the controlling arm 48 and press it downwardly. This action causes the stop 44 to engage the pawl 39 and releases the pawl from the gear 35 and simultaneously engage the brake band 53 with the pad 52 upon the brake drum 51. Extreme pressure upon the controlling arm 48 will cause the positive locking of the drum 29 but slighter pressure will allow the brake drum 51 to slip and the cable 30 will be payed out from the drum 29, thus allowing the closure to move downwardly of its own weight in the tower 1.

If for any purpose it is desirable to disengage the counterweights 65 from the cable 9, it is merely necessary to move the counterweights above their gauge strips 68 and insert a lock pin as shown in dotted lines at 69. This will hold the counterweights 65 from movement upon the track 6 and they will cease to function as counterweights for the closure.

The operation of the counterweights 65 is as follows: Each of the counterweights 65 is mounted for vertical movement on the track 6 and each of the weights is constructed with a different width, the narrowest weight being adjacent the hoist mechanism and the widest adjacent the top of the silo. The cable 9 is free to pass through three of the weights 65 but is attached to the lowermost one and extends downwardly to the tackle block 32. Each of the weights 65 is provided with gauge strips, such as shown at 68 and of such distance apart that the lowermost of the gauge bars 60 will only permit the lowermost block to pass therethrough. The next highest of the gauge bars will only permit the two lowermost weights to pass through, and the third set of gauge bars will permit the three lowermost weights to pass therethrough. Thus, it is evident that when the relatively heavy cable 9 and the silo cover is in the position shown in Fig. 1 that the added weight of the cable within the silo will be compensated by the added weight of the blocks 65. In Fig. 1, the cover is about one-third of the distance of the silo from the bottom and the three lowermost weights are serving as means for counterbalancing the weight of the cable within the silo. If the closure 8 should rise in the silo, then the uppermost of the three weights 65 would rest upon the adjacent guide strips 68 and only the two lowermost weights would operatively engage the cable.

I claim:

1. In a device of the character described, a silo closure comprising flexible plies of heat impervious material, a wire netting encasing said plies, a rigid frame having horizontally disposed supporting members, and a plurality of flexible connecting members connected at one end to said supporting members and at their opposite ends to said closure, said flexible connecting members being adjustable as to length, whereby said closure may be suspended to present a concave or a convex upper surface at will.

2. In a device of the character described, a silo closure, said closure comprising flexible plies of heat impervious material, a wire netting encasing said plies, metal rings disposed on the top and bottom of said closure, the top rings connected to the opposite bottom rings through said plies to bind said netting in close engagement with said plies, said closure having an opening therethrough, and a door for said opening.

3. In a device of the character described, a silo closure, said closure comprising flexible plies of heat impervious materials, a wire netting encasing said plies, and metal

rings disposed on the top and bottom of said closure, the top rings connected to the opposite bottom rings through said plies to bind said netting in close engagement to said plies.

4. In a device of the character described, a silo closure, said closure comprising flexible plies of heat impervious materials, a wire netting encasing said plies, and metal rings disposed on the top and bottom of said closure, the top rings being detachably connected to the opposite bottom rings through said plies and said netting to bind said netting in close engagement to said plies.

JULIUS MATTSON.