

Aug. 19, 1924.

1,505,840

F. ZÜBLIN
CLOSING AND DISCHARGING DEVICE FOR LARGE RECEPTACLES
SUCH AS BUNKERS AND THE LIKE
Filed Sept. 3, 1921

3 Sheets-Sheet 1

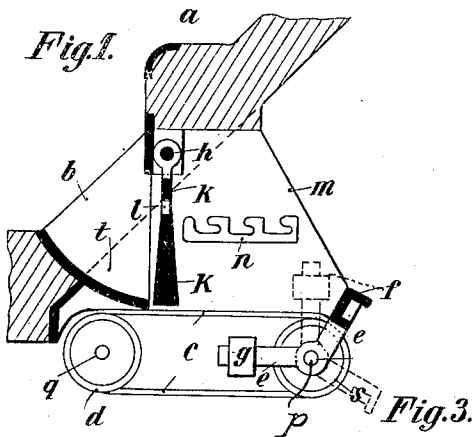
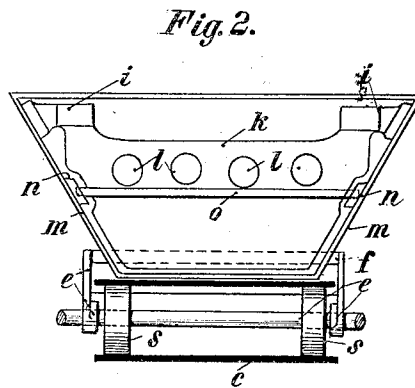
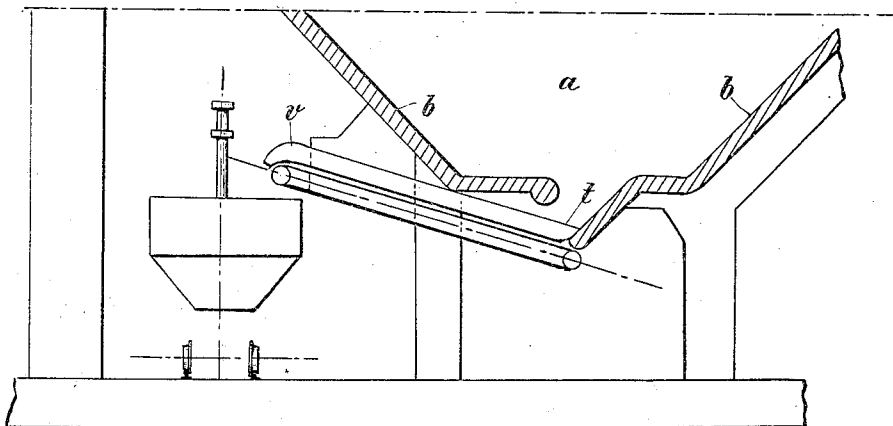
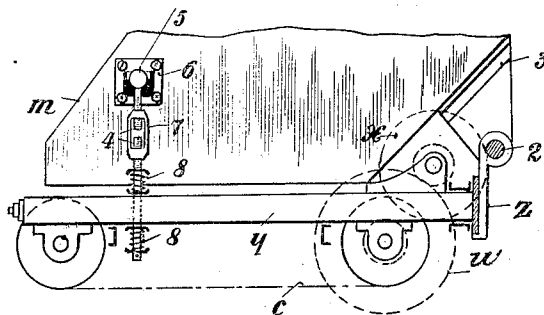


Fig. 4.



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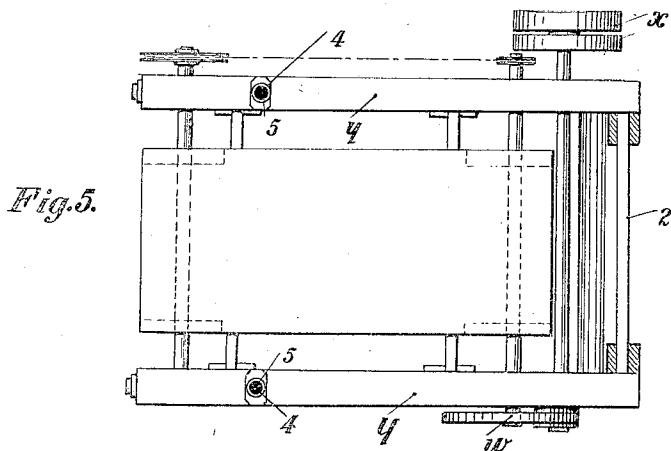
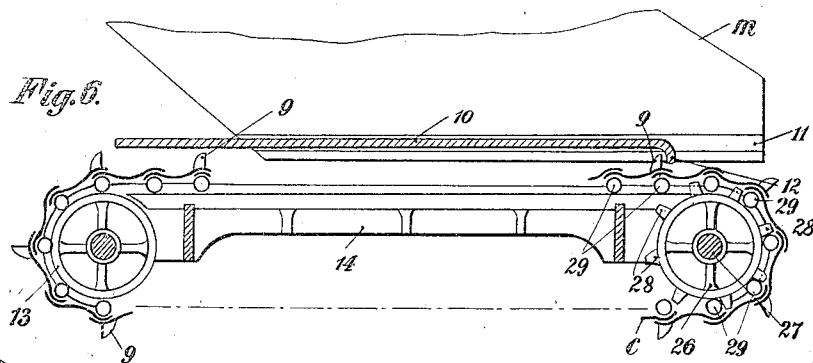
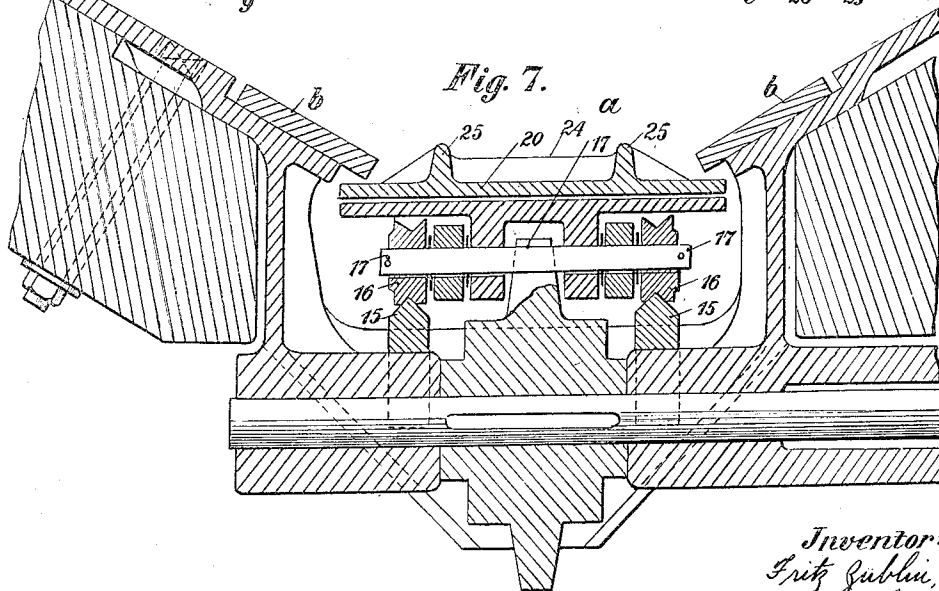
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

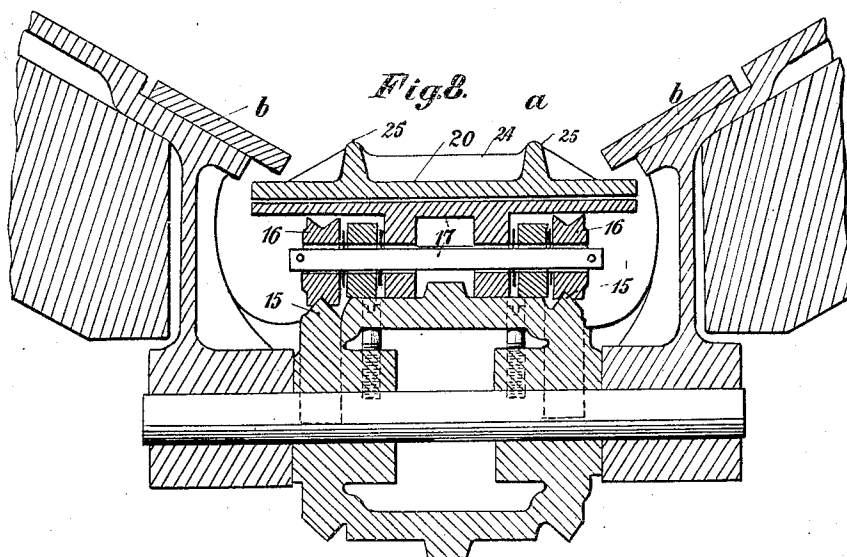
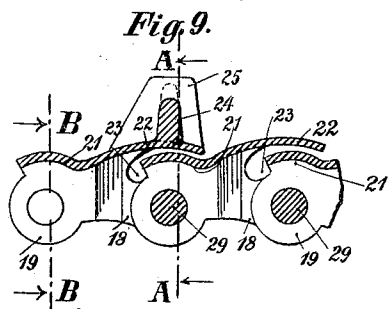


Fig. 10.

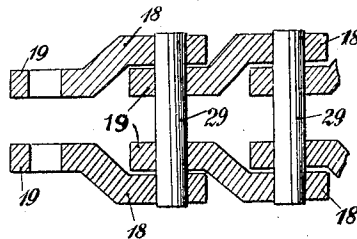


Fig. 11.

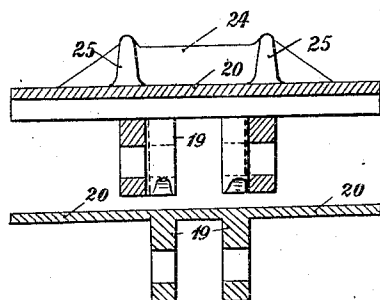


Fig. 12.

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UNITED STATES PATENT OFFICE.

FRITZ ZÜBLIN, OF STRASSBURG, FRANCE.

CLOSING AND DISCHARGING DEVICE FOR LARGE RECEPTACLES, SUCH AS BUNKERS AND THE LIKE.

Application filed September 3, 1921. Serial No. 498,357.

To all whom it may concern:

Be it known that I, FRITZ ZÜBLIN, a citizen of Switzerland, residing at 25 Finkmattstrasse, Strassburg, Alsace, France, have invented certain new and useful Improvements in Closing and Discharging Devices for Large Receptacles, Such as Bunkers and the like (for which I have filed applications for patents in Germany, Nos. Z.89.Z.11 936 XI/81 e, filed December 6, 1920; Z.93.Z.12 012 XI/81 e, filed December 31, 1920; Z.75.Z.10 333 XI/81 e, filed February 25, 1918; Z.76.Z.11 469 XI/81 e, filed March 27, 1920; France, filed May 16, 1919, now Patent 552,971, April 11, 1921; Belgium No. 22 948, April 29, 1919; and Japan, 54 633, filed February 24, 1920), of which the following is a specification.

My invention relates to devices for discharging any quantity of the contents of the large receptacles such as ore or coal bunkers etc. and which also act as doors or closing devices for preventing the escape of the said contents. The novel closing and discharging device is equally suitable for retaining or discharging all kinds of material and may therefore be used for loose material consisting of large pieces, pieces of medium size or fine grains. The novel device permits of any desired quantity of all such kinds of material being discharged even from receptacles of the largest size so that in cases in which various sorts of material are to be mixed it is always possible to add the precise quantity required no matter how light this quantity may be.

The closing and discharging device may consist of an endless belt or the like and preferably of an articulated belt or conveyor chain placed in close proximity to the discharge opening, or hopper of the receptacle. The mouth of the discharge hopper extends out to the closing and discharging device in such a manner that the contents of the receptacle are let down onto the device gently and carried away from the said mouth without any bumping or sharp collision or falling material etc.

The invention is illustrated by way of example in the drawing in which—

Fig. 1 is a diagrammatic longitudinal vertical section of the closing and discharging or conveying device and a section of the discharge hopper;

Fig. 2 is a front view of the discharge hopper;

Fig. 3 is a section of a modified discharge hopper and a side view of an inclined conveying and closing device;

Fig. 4 is a side view of a discharge hopper in which the means for suspending the closing and conveying device are in evidence;

Fig. 5 is a plan view of the closing and conveying device of Fig. 4;

Fig. 6 shows the closing and conveying device in the form of an articulated endless belt or chain;

Fig. 7 is a section through the discharge hopper, the top section of the endless conveyor chain, and driving wheel of the chain;

Fig. 8 is a section through the discharge hopper, the top section of the endless conveyor chain, and the drum that supports the conveyor chain at the end opposite to the driving wheel end;

Fig. 9 is a vertical section through a fragment of the conveyor chain;

Fig. 10 is a horizontal section of Fig. 9 on the line extending through the link pins;

Figs. 11 and 12 are transverse sections through links of the endless conveyor chain.

Referring to Fig. 1 the bunker *a* is provided with a discharge hopper *b* and immediately beneath the hopper there is a discharging and closing device in the shape of a horizontal endless conveyor belt *c* or chain or the like. The mouth of the discharge hopper extends out to a position close to the top surface of the conveyor belt *c* so that the contents of the receptacle or bunker *a* are delivered to the belt without dropping violently onto it and then conveyed to some other point or conveyor such as a truck or the like. The roll *d* or *s* that carries the endless member *c* is driven by any suitable mechanical driving means which is arranged to be controlled in an accurate manner.

The rolls or drums *d* and *s* are mounted upon shafts *q* and *p* respectively. Mounted upon the shaft *p* is a bell crank *e* at whose outer end is mounted a retaining beam or gate *f*—adapted to hold back the material on the belt—and whose inner end is provided with counterweights *g*.

The bell crank *e* is adapted to be swung around by hand or by any mechanical contrivance.

In Figs. 1 and 2 the retaining beam or gate *f* is shown in its elevated position in which it prevents pieces of loose material from dropping down from the sloping bank of the said material that forms itself at the portion of the belt that passes round the driving roll or drum *s*. When the discharging and conveying operation is to commence, i. e. when the mechanism that drives the conveyor *c* is to be set in motion the gate *f* is swung down into a position in which it forms a surface that slopes down from the bend of the belt *c* and allows the material to slide down over it.

Arranged in the interior of the discharge hopper is a heavy door *k* which is hinged on journal pins *z* and whose cross section flares downwardly as shown in Fig. 1. Holes *l* are provided in the door through which bars may be introduced for the purpose of dislodging the material in the bunker, which might be necessary in cases in which hollows or the like arise in the material. Attached to the inner surfaces of the two sides *m* of the discharge hopper are racks *n* into the notches of which a rod *o* may be placed so as to act as a stop for determining the extent to which the door *k* is opened by the escaping material and to regulate the rate at which this material is discharged. By this means the thickness of the layer of the material that slips off or is discharged from the conveyor may be regulated, and when an empty or partially empty bunker is being filled the door may be made to prevent pieces of the loose material from flying out and giving rise to mishaps or obstructing traffic in the neighbourhood of the bunker.

The bottom of the discharge hopper consists of a piece that slopes gradually down to a position immediately above the conveyor so as to let the discharged material drop gently onto the endless belt or chain.

By arranging the combined conveyor and closing device in close proximity to the mouth of the hopper in the manner described above and shown in Figs. 1 and 2 it is possible to place the exit *t*, Fig. 3, from the bunker at a lower level than the part *v* at which the material leaves the conveyor. This enables the available space to be utilized to much greater advantages than has hitherto been possible.

The arrangement in all cases is such that the pressure of the loose material at the bottom of the bunker does not affect the ejection of the same through the hopper, and therefore the combined closing and conveying device has at all times to take not the weight of the material in the bunker but only the weight of the material resting on the belt. Hence, the conveyor can be made comparatively light. When the material is discharged from the bunker a slope forms itself at the side of material nearest

to the discharge hopper and the door *k* opens automatically, the extent to which it is opened being limited, by the rod *o* in such a manner that a layer of the desired thickness is poured onto the belt.

As shown in Figs. 4 and 5 the entire conveyor may be suspended from pivots so as to enable it to be easily substituted and to enable it to be adapted to any slight changes of shape which the bunker is liable to undergo.

The frame *y* is supported by the side walls *m* of the hopper and is hinged at its one end. The conveyor *c* is driven by a driving wheel *w* through speed changing gear *x* at any desired speed and for any length of time so that the material may be discharged at any desired rate.

The entire closing and conveying device is mounted on beams *y* held up at one end by hooks *z* arranged to swing round an axis 2. The supporting brackets of the axis 2 are fixed to any suitable part of the bunker or of any other preferred structure. At the end opposite to the axis 2 the beams *y* depend from rods 4 held at their upper ends by ball sockets 5, 6 attached to the sides *m* of the bunker.

The length of the rods 4 may be adjusted by coupling nuts 7. The connection between the beams *y* and the rods 4 is effected by spring cushions 8 so that the beams *y* are suspended elastically.

Due to this elastic suspension the combined closing and conveying device is able to adapt itself to any more or less slight changes of position of the fixed points of suspension. As the suspension rods 4 are supported by ball sockets 5, 6 the conveyor is enabled to execute both longitudinal and lateral movements. By virtue of the coupling nuts 7 the lengths of the suspension rods may be adjusted in accordance with any changes of the height of the ball sockets 5, 6 that may take place in the course of time. The supporting brackets 3 of the axis 2 may also be arranged to be adjustable so as to enable the position of the conveyor to be adjusted in accordance with any deformations that may arise.

The combined closing and conveying device may be constructed in the form of a chain or articulated belt with outwardly projecting teeth 9 as shown in Fig. 6. By means of these teeth a closing plate 10 adapted to slide in grooves 11 in the side walls of the hopper may be pulled into the position in which it closes the said hopper.

A closing plate 10 of this kind is required in cases in which the whole combined closing and conveying device has to be removed for repairs or in which there are only a few such devices for a large number of discharge hoppers. When a hopper is to be closed by a plate 10 the chain is stopped and a band

12 at the end of the plate 10 is introduced at the rear side of the discharge hopper. On the chain being restarted a tooth 9 will engage with the band 12 and pull the closing plate 10 into the groove 11 at the mouth of the discharge hopper so as to close the same. The material that has passed out of the bunker into the hopper will now be supported by the plate 10 and the combined closing and conveying device may then be removed.

The construction of the articulated belt or chain is shown more clearly in Figs. 8-12. One end of the chain *c* rests upon the guide drum 13, Fig. 6, and the section of it that extends from this drum to the driving wheel at the other end is supported by a beam or girder 14. The guide beam 14 may extend to points near the vertical lines through the shafts of the supporting drum and driving wheel so that the members or links of the chain adjacent to the drum or wheel ride upon the top surface of the guide beam, or the guide drum 13 may be provided with bevelled disks 15 which form an extension of the guide beam. Rolls 16 travel on the guide beam and bevelled disks and shafts 17 or axles are journaled in these rolls and act as link bolts or pins for connecting the members of the chain.

The members or links of the chain consist of two cheeks with parallel parts 18 and 19 joined by flaring intermediate parts, the parallel parts 18 being wider apart than the parts 19. The said cheeks extend downward from a top supporting plate 20 which extends laterally beyond the cheeks. The supporting plate consists of two curved sections 21 and 22. Each section 21 is covered by the section 22 of the adjacent link. The supporting plates extend laterally to a considerable distance beyond their supports so that their outer edges lie beneath the bottom edges of the hopper as shown in Figs. 7 and 8. In order to provide for a considerable rotary movement of any link with respect to its neighbouring link the supporting cheeks 18 have indentations 23 into which the curved top portions 21 may move. The upwardly projecting portions or teeth 24 with their side pieces 25 serve partly to increase the strength of the curved supporting surfaces, partly as means for scratching out the material from the hopper, and finally for pulling in the closing plate 10, Fig. 6.

The chain is driven by a driving wheel 26, Fig. 6, mounted on the shaft 27 and driven by any suitable driving means through the medium of a coupling member or clutch. The teeth 28 of the wheel 26 engage with the link pins 29 of the members of the chain, the link pins resting at either end in rollers 16 supported on the guide beams 15, Fig. 7.

I claim:—

1. In combination with a receptacle hav-

ing a discharge outlet, an endless conveying member adapted to maintain the said outlet closed, a power device for driving the said outlet conveyor, one side of the said outlet extending to a position immediately above the said conveying member whereby material is made to move from the receptacle onto the conveying member without any abrupt drop, and a pivotally mounted material-retaining member for preventing material from dropping off the endless conveying member.

2. In combination with a receptacle having a discharge outlet; a conveyor comprising a guide drum, a driving wheel, an endless delivering member passing over the drum and being in engagement with the driving wheel, the endless member extending across the opening of the said outlet and being close to the edges of the opening, whereby the discharge outlet is maintained closed; a pivotally mounted material-retaining member for preventing material from dropping off the said delivery member; and a power device for driving the conveyor through its driving wheel.

3. In combination with a receptacle having a discharge outlet; a conveyor comprising a guide drum, a driving wheel, an endless delivering member passing over the drum and being in engagement with the driving wheel, the endless member extending across the opening of the said outlet and being close to the edges of the opening, whereby the discharge outlet is maintained closed; a pivotally mounted material-retaining member; a counter-weight for maintaining the material-retaining member in a position in which it prevents material from dropping off the said delivery member; and a power device for driving the conveyor through its driving wheel.

4. In combination with a receptacle having a discharge outlet, a downwardly flaring heavy door, a hinge for the door at the top edge of the said outlet, a conveyor adapted to maintain the said outlet closed when the said door is swung back, and a power device for driving the said conveyor.

5. In combination with a receptacle having a discharge outlet, a downwardly flaring heavy door with holes therein through which implements may be thrust for the purpose of dislodging material in the receptacle, a hinge for the door at the top edge of the said outlet, a conveyor adapted to maintain the said outlet closed when the said door is swung back, and a power device for driving the said conveyor.

6. In combination with a receptacle having a discharge outlet, an endless conveyor chain at the said outlet adapted to maintain the said outlet closed, one side of the said outlet extending to a position immediately above the said chain, whereby material is

made to move from the receptacle onto the chain without any abrupt drop, a power device for driving the said chain, a closing plate adapted to close the said outlet, an engaging member attached to the said closing plate; and projections on the said chain adapted to engage with the said engaging member and to move the closing plate into its closing position.

In testimony whereof I have signed this specification in the presence of two witnesses.

FRITZ ZÜBLIN.

Witnesses:

FRANK A. KELLER,

MARTHE LHEINEHMUNN.