April 4, 1939. G. SCHWABACH 2,153,276

DEVICE FOR REMOVING ASHES

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Fig. 1.

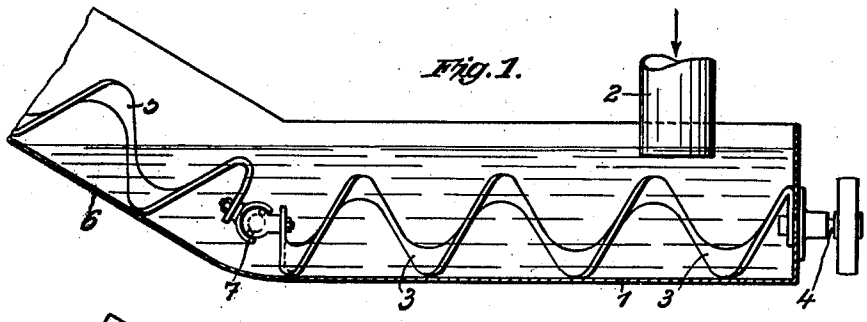


Fig. 2.

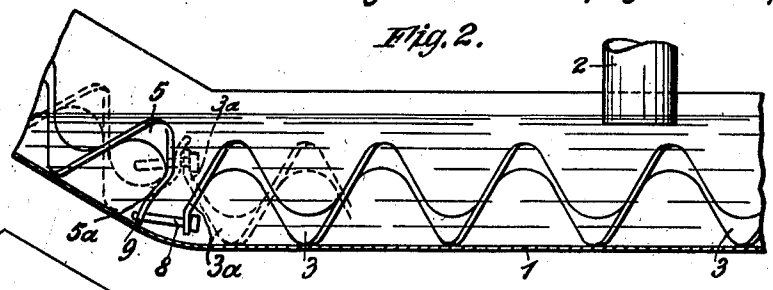


Fig. 3.

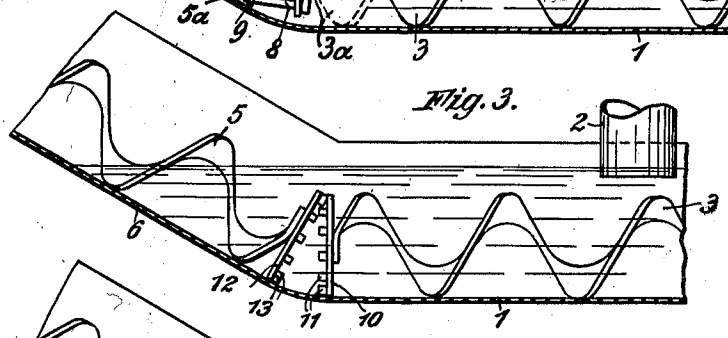


Fig. 4.

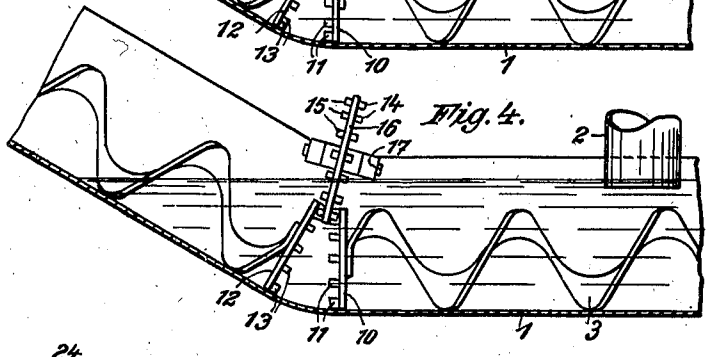


Fig. 5.

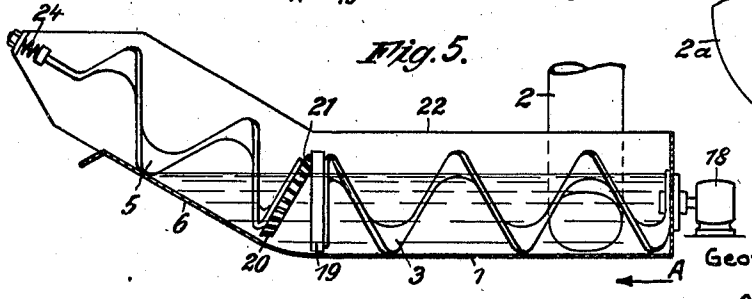
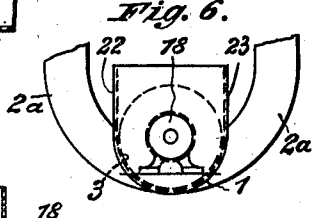


Fig. 6.



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DEVICE FOR REMOVING ASHES

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Fig. 7.

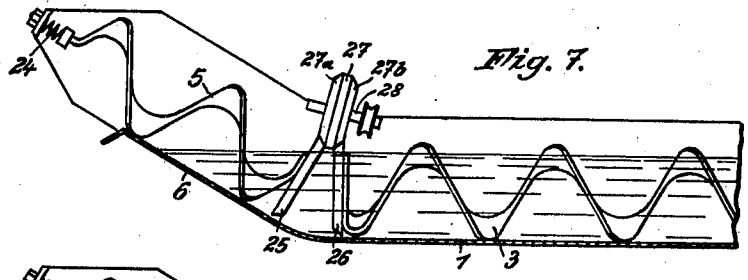


Fig. 8.

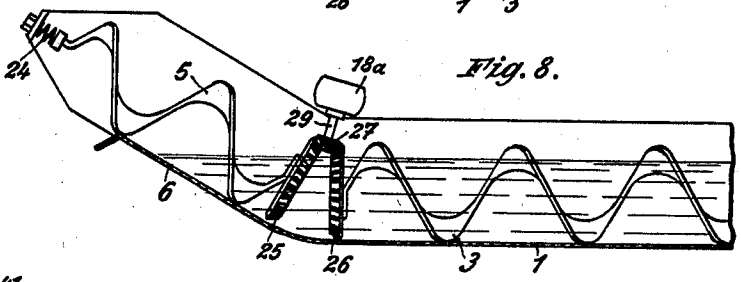


Fig. 9.

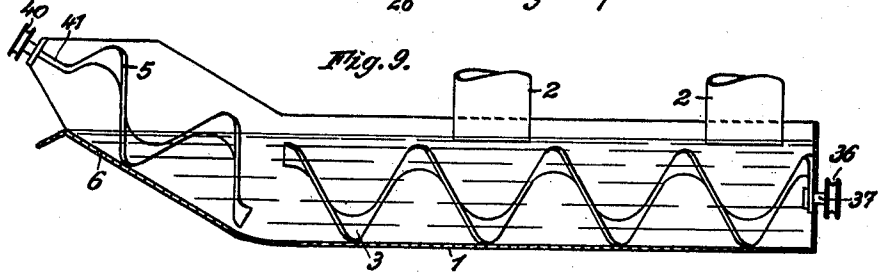


Fig. 10.

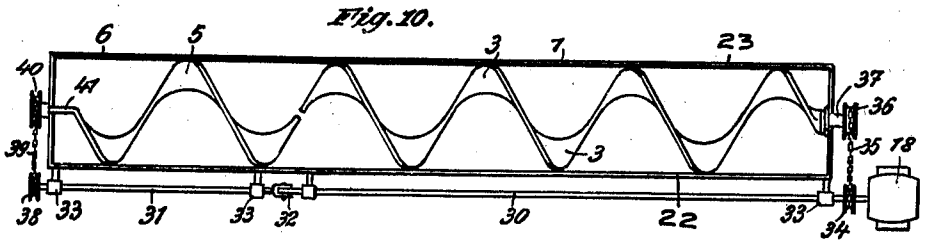


Fig. 12.

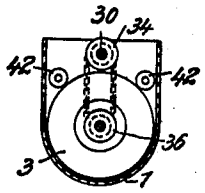
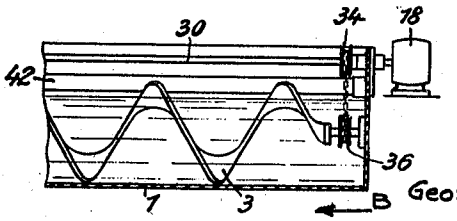


Fig. 11.



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DEVICE FOR REMOVING ASHES

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Fig. 13.

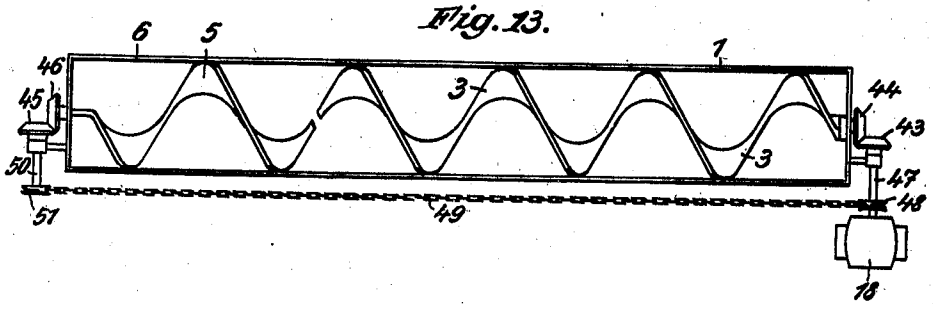


Fig. 14.

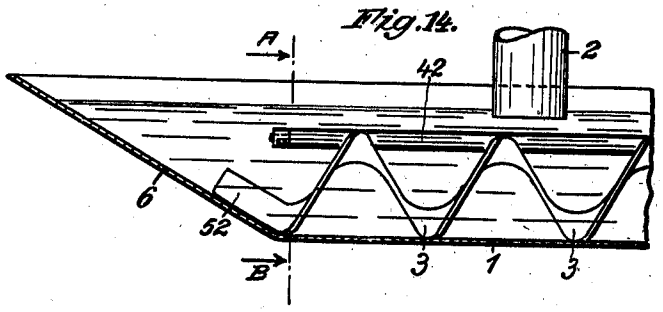
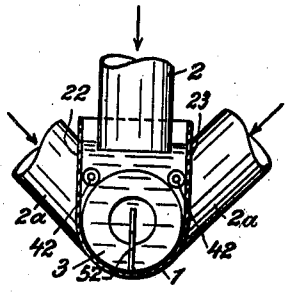


Fig. 15.



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Fig.17.

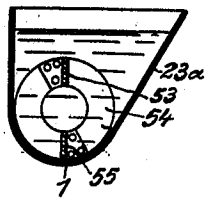


Fig.16.

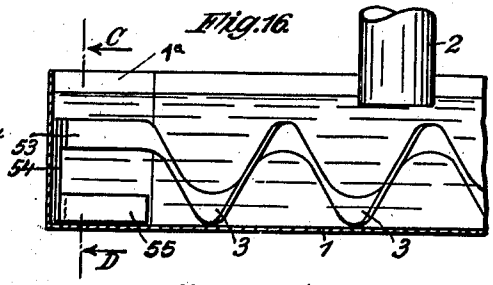


Fig.19.

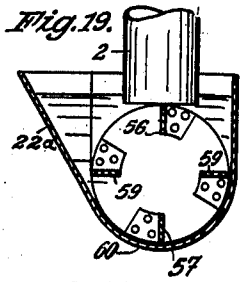


Fig.18.

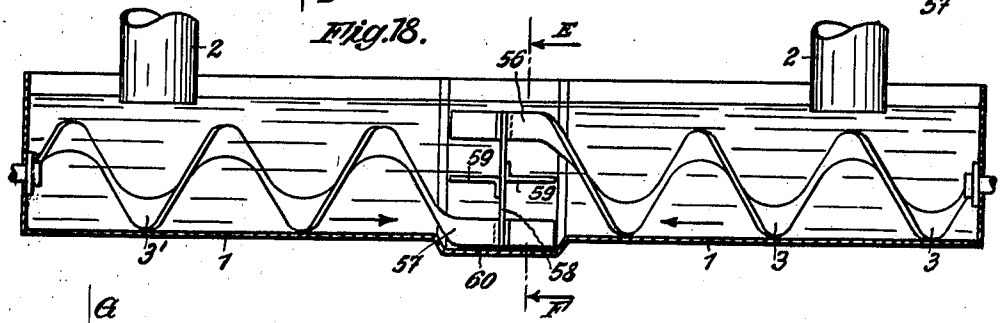


Fig.20.

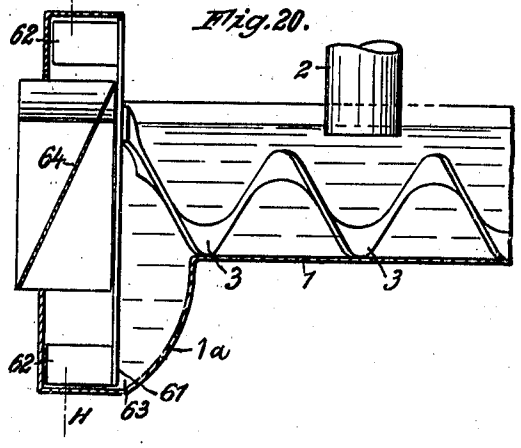


Fig.21.

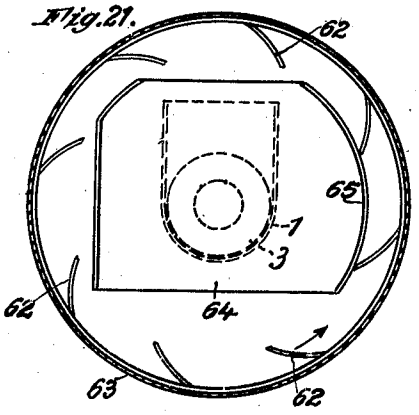


Fig.22.

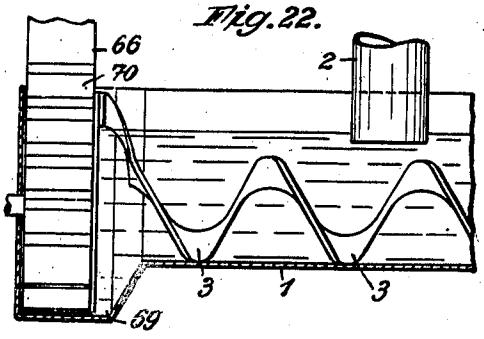
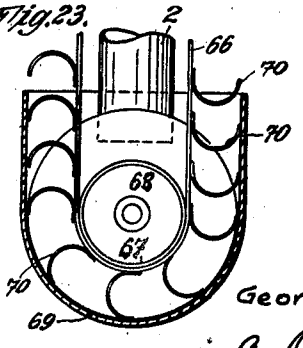


Fig.23.



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Patented Apr. 4, 1939

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UNITED STATES PATENT OFFICE

2,153,276

DEVICE FOR REMOVING ASHES

Georg Schwabach, Berlin-Charlottenburg, Germany

Application July 24, 1936, Serial No. 92,331
In Germany July 29, 1935

3 Claims. (Cl. 110—165)

My invention relates to a device for removing ashes, cinders, etc., and more particularly to a device in which the ashes, etc., are led by means of a tube into a trough containing water, said tube or branch extending downwards below the level of the water.

It is an object of my invention to provide means for discharging the ashes, cinders, etc., from the water-filled trough.

It has been proposed to provide scraping-chains in order to discharge the ashes from a trough of the kind referred to. Such chains however are subjected to considerable wear. Besides this the known devices involve some other drawbacks such as the necessity of increasing the dimension of the trough because the tubes leading the ashes into the trough must be arranged with their discharge openings below the water-level and above the chains.

It is an object of my invention to provide an improved discharging device for withdrawing the ashes from the water-filled trough. According to my invention a screw is arranged in the trough, as discharging means, this screw being designed as a conveying screw adapted to discharge the ashes from the trough or being connected to a separate discharging device driven by the screw.

In the drawings, fixed to this specification and forming part thereof, some embodiments of my invention are diagrammatically illustrated by way of example.

In the drawings

Fig. 1 shows a trough provided with a horizontal conveying screw and an upward inclined screw in order to withdraw the ashes from the trough.

Figs. 2–4 show similar embodiments of my invention comprising two conveying screws but with modified means for coupling the screws.

Fig. 5 is a side elevation partly in section of another embodiment of my invention comprising two conveying screws coupled by means of bevel gear wheels.

Fig. 6 is an end elevation of the device shown in Fig. 5, seen in the direction of the arrow A.

Figs. 7 and 8 illustrate another embodiment of the device shown in Fig. 5, modified in regard to the coupling of the screws.

Figs. 9 and 10 are a side elevation and a plan view, respectively, partly in section of another embodiment of my invention, comprising two conveying screws, whereby both conveying screws are driven by means of two connected driving shafts, which are arranged outside of the trough.

Fig. 11 is a side elevation, partly in section, of a modified embodiment of the invention shown in Fig. 9, only the right-hand end of the device being shown.

Fig. 12 is a section inside the end of the device shown in Fig. 11, seen in the direction of the arrow B.

Fig. 13 is a plan view, partly in section of an embodiment similar to the device shown in Figs. 9 and 10, differing from that device in using a driving chain instead of driving shafts.

Fig. 14 is a side elevation, partly in section, of another embodiment of my invention in which the end-portion of the screw is shaped so as to discharge the ashes, etc., from the trough.

Fig. 15 is a section on the line A—B of Fig. 14.

Figs. 16 and 17 are corresponding views of another embodiment of my invention, Fig. 17 being a section on the line C—D of Fig. 16.

Fig. 18 is a side elevation, partly in section, of another embodiment of my invention and

Fig. 19 is a section on the line E—F of Fig. 18.

Fig. 20 is a side elevation, partly in section, of another embodiment of my invention and

Fig. 21 is a front elevation, partly in section, along the line G—H of Fig. 20.

Fig. 22 is a side elevation, partly in section, of another embodiment of my invention and

Fig. 23 is a corresponding front elevation of the device shown in Fig. 22.

Referring now to the drawings and first to Fig. 1, 1 is a trough filled with water up to the level indicated in Fig. 1, which is to serve as a conveying channel. 2 is an ash-tube extending downwards beyond the level of the water into the trough 1 through which ashes are led to the trough, so that they will assemble on the bottom of the trough within the body of the water. The bottom of the trough is shaped cylindrically such as shown for instance in Figs. 6, 12, 15. 3 is a conveying screw horizontally arranged in the trough. The screw is preferably bent from a ribbon of metal so as to be devoid of a shaft. The diameter of the screw corresponds to that of the cylindrical bottom of the trough, so that the edges of the blades of the screw are spaced a very small distance from the bottom of the trough. The screw 3 is driven by suitable means such as a driving shaft 4. The trough 1 is provided with an upward inclined end-portion 6 in which a correspondingly inclined conveying screw 5 is arranged which is driven from the conveying screw 3 by means of a suitable connection such as a joint 7.

The operation of the device is as follows:

The ashes led into the trough 1 through the pipe 2 and resting on the bottom of the trough 1

are conveyed by the screw 3 towards the inclined portion 6 and here they are taken up by the inclined screw 5 and discharged from the trough.

Fig. 2 shows a modified coupling between the screws 3 and 5. To the end 3a of the horizontal screw 3 a pin 8 is fastened projecting substantially normally from the front surface of the screw-end 3a. This pin engages a hole 9 in the screw-end 5a of the inclined screw 5, the diameter of the hole 9 being slightly larger than that of the pin 8. Both screw-ends 3a, 5a are somewhat spaced apart from one another so that the pin 8 will transmit the rotation of the screw 3 to the inclined screw 5, thereby periodically sliding in the hole 9 in an axial direction. The end positions of the screws 3, 5 and the pin 8 with respect to the hole 9 are shown in Fig. 2 in full and dotted lines, respectively.

In the embodiment shown in Fig. 3 the screws 3 and 5 are coupled by means of a device similar to a dog-clutch. To this end the screw 3 is provided at its end with an annular member 10 carrying a row of dogs 11 uniformly distributed along its periphery. The screw 5 is provided with a similar annulus 12 carrying dogs 13. The annulus 12 is inclined with respect to the annulus 10 so that at every position of the screws only the dogs at the most elevated portions of the annuli engage each other. Preferably the number of the dogs 11 exceeds that of the dogs 13 slightly, e. g. by one. The dogs 11 transmit the rotation of the screw 3 to the dogs 13 and thus to the screw 5.

In Fig. 4 the screws 3 and 5 are provided with similar annuli 10 and 12 carrying dogs 11 and 13, respectively. The dogs 11 and 13 however are not in direct engagement, but engage dogs 14 and 15, respectively, arranged on opposite sides of a disk 16 secured to a shaft 17 driven by suitable means (not shown). Thus in this embodiment both the screws 3 and 5 are driven from the shaft 17 in order to avoid use of further driving means. Preferably in this embodiment the members of the dogs are so chosen that the screw 5 rotates at a slightly higher speed than the screw 3.

Referring now to Figs. 5 and 6, the screws 3, 5 are coupled with each other in similar manner as in Fig. 3, the screw 3 being driven by a motor 18. The disks 10, 12 with the dogs 11, 13 are replaced by bevel gear wheels 19, 20, engaging each other with their top portions at 21. As will be seen from Fig. 5 the engaging portions of the bevel gear wheels are situated above the level of the water. It will be understood that in the embodiment shown in Figs. 3 and 4 the single members of the devices may be dimensioned in such manner that the engaging dogs 11, 13, 14, 15 are situated above the level of the water.

The tubes 2a through which the ashes are led to the trough 1 in Fig. 6 may be arranged with their orifices in the side walls 22, 23 of the trough 1 below the level of the water.

In order to secure a proper engagement of the wheels 19 and 20 at 21 a compression spring 24 is provided exerting a pressure on the inclined screw 5 in the direction of the axis thereof. The strength of the spring 24 is so chosen that the screw 5 may yield in the event that large cinder particles enter the space between the teeth of the wheels 19 and 20. If desired, conically shaped friction wheels 25, 26 may be provided instead of the toothed wheels 19, 20. Embodiments comprising friction wheels of this kind are shown in Figs. 7 and 8 which are similar to the embodiment shown in Fig. 4 in that the screws 3 and 5 are driven by means of a driving member 27 engaging the friction wheels 25 and 26 secured to the screws 5 and 3, respectively.

In the embodiment shown in Fig. 7 the axis 28 of the driving member 27 is arranged horizontally, the wheel being provided with two conically shaped friction surfaces 27a and 27b. In the embodiment shown in Fig. 8 the axis 29 of the driving member 27 is arranged vertically and is directly driven by the motor 18a. It should be understood, however, that also in these embodiments toothed wheels may be provided instead of the friction wheels. Also in these embodiments an axial pressure is exerted on the inclined screw 5 by means of a spring 24 which, however, in these embodiments, is arranged outside of the inclined portion 6 of the trough.

Referring now to Figs. 9 and 10 an embodiment is shown in which the coupling means of the conveying screws 3 and 5 are arranged outside of the trough 1. The motor 18 drives a horizontally arranged shaft 30 which in turn drives an inclined shaft 31 by means of a suitable coupling 32, these members being arranged adjacently to a side wall 22 of the trough 1 and being supported by suitable bearings 33 connected to the trough 1. 34 is a chain wheel or the like connected by means of a chain 35 to a chain wheel 36 secured to the shaft 37 of the screw 3. 38 is a chain wheel secured to the shaft 31 and driving by means of a chain 39 a chain wheel 40 secured to the shaft 41 of the inclined screw 5. By suitably choosing the diameters of the chain wheels the speed of the inclined screw 5 may be made slightly higher than that of the screw 3, so that accumulation of the ashes at the end of the horizontal screw 3 will be avoided.

In the embodiments shown in Figs. 11 and 12 which are substantially similar to those shown in Figs. 9 and 10 the driving shafts such as 30 and the chain wheels such as 34 and 36 are arranged within the trough 1, the shaft 30 and the chain wheel 34 being situated above the level of the water. By doing so stuffing boxes for the shafts of the screws at the end walls of the trough 1 may be dispensed with. 42 are rollers engaging the upper portions of the screw 3 and preventing a rising of the screw.

Referring now to Fig. 13 the screws are driven by means of bevel gears 43, 44 and 45, 46, respectively. The bevel gear wheel 43 is directly secured to the shaft 47 of the motor 18 whereas the bevel gear wheel 45 is driven by means of a chain gear comprising a chain wheel 48 secured to the shaft of the motor 18, a chain 49 and a chain wheel 51 secured to the shaft 50 of the bevel gear wheel 45. Also in this embodiment the screw 5 may be driven at a higher speed than the screw 3 by suitably choosing the ratios of the bevel gears of the diameters of the chain wheels.

Referring now to Figs. 14 and 15 the inclined screw 5 shown in Figs. 1 to 13 is dispensed with. In order to discharge the ashes from the trough the screw-end of the conveying screw 3 is shaped as a shovel 52 by which the ashes assembled at the front end of the screw 3 are forced to rise along the bottom of the inclined portion 6 of the trough, so that they eventually fall over the front edge of the trough. As will be seen from Fig. 15 the trough may be provided with inclined tubes 2a, which enter the trough 1 at its side walls.

Referring now to Figs. 16 and 17 the inclined extension of the trough is dispensed with and replaced by an inclined side wall 23a in the chan-

nel part 1*a*, in which the ashes are discharged from the trough 1 (as will be seen from Fig. 17). The screw-end is shaped as a shovel 53 carrying at its front end a disk 54 connected to the shovel 53 near its periphery. 55 is another shovel secured to the disk 54 opposite to the shovel 53, the mutual position of the shovels being shown in Figs. 16 and 17. When the screw 3 is driven the shovels 53 and 55 co-operate in forcing the ashes upwards along the inclined wall-portion 23*a* of the trough 1 so that the ashes will be discharged.

Referring now to Figs. 18 and 19 two screws 3 and 3' are provided conveying in opposite directions as indicated by the arrows (Fig. 18) and facing one another with their discharging ends. The screw-ends are shaped as shovels 56 and 57, respectively, the shovels being secured to a disk 58 carrying additional shovels 59. The bottom of the trough 1 forms a sump 60 below the disk 58 and the shovels 56 and 57 as shown in Fig. 18. The mid-portion 22*a* of the side wall of the trough 1 is inclined as shown in Fig. 19. The operation of the device is substantially the same as that of the device shown in Figs. 16 and 17. It will be understood that only one of the screws 3 and 3' must be driven by a driving motor, not shown, the other screw 3' receiving its drive from the first screw 3.

Referring now to Figs. 20 and 21 showing a device adapted for conveying big amounts of ashes or to raise the ashes to a greater height, the front-end of the screw 3 is connected to a disk 61 carrying shovels 62 similar to vanes, by which the ashes collecting in the downwardly extended front portion 1*a* of the trough 1 are directed to an inclined chute 64. Preferably the side wall of the chute 64 is curved as shown at 65, in order to prevent the ashes conveyed by the rising vanes from sliding-back into the trough.

Finally, in the embodiment shown in Figs. 22 and 23 the discharging device is designed as a chain 66 driven by a chain wheel 67 secured to the conveying screw 3. The chain wheel 67 is provided with an opening 68 through which the ashes conveyed by the screw 3 pass into the front porton 69 of the trough from which they are withdrawn by means of suitable cups 70 secured to the chain 66.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

I claim:

1. A device for quenching ashes, cinders, slag and the like discharged from a furnace comprising in combination a down-pipe, a trough disposed below said down-pipe, said trough being adapted to contain water and having a lower cylindrical portion, a horizontal conveyor worm in said trough with its blades contacting said cylindrical portion of the latter, said conveyor worm consisting of a twisted metal band devoid of any internal support, means to rotate said conveyor worm, and elevator means coupled to said worm to lift the ashes above the level of the water in said trough at a point out of the range of said down-pipe and then to discharge the ashes from said trough.

2. A device, as claimed in claim 1, comprising further two rolls arranged in and extending throughout said trough parallel to said worm and above the same to prevent upward displacement thereof in the trough.

3. A device for quenching ashes, cinders, slag and the like discharged from a furnace comprising in combination a down-pipe, a trough disposed below said down-pipe, said trough being adapted to contain water and having a lower cylindrical portion and an upwardly inclined end portion, a horizontal conveyor worm in the main portion of said trough with its blades contacting said cylindrical portion, means to rotate said conveyor worm, and a second upwardly inclined conveyor worm in said upwardly inclined trough portion, said second worm being coupled to the first one, and each of said worms consisting of a twisted metal band devoid of any internal support.

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