A. W. HILLE.

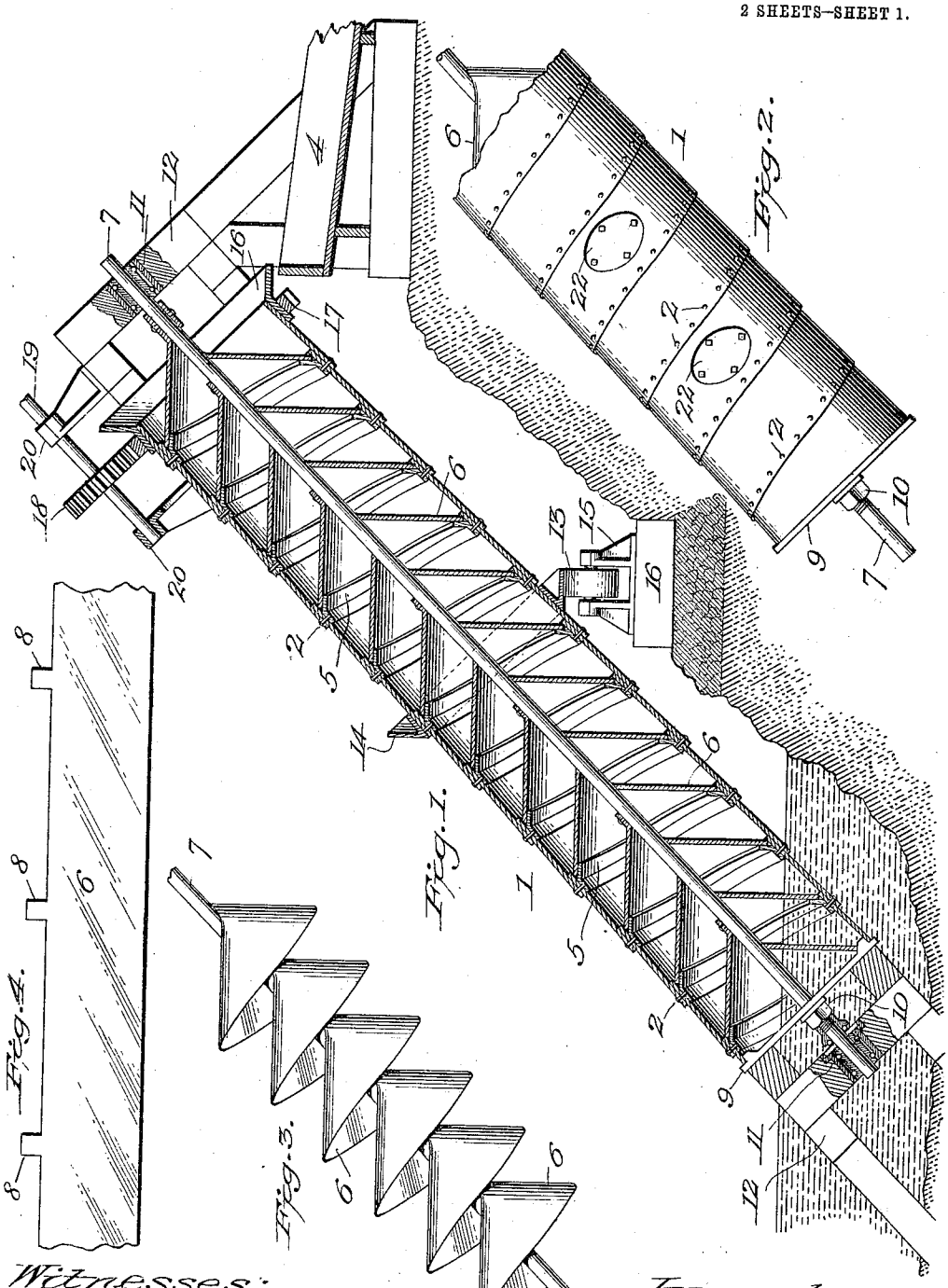
ROTATABLE INCLINED WATER AND MATERIAL LIFTING ELEVATOR.

APPLICATION FILED NOV. 11, 1913.

1,132,775.

Patented Mar. 23, 1915.

2 SHEETS—SHEET 1.



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Inventor:
Adolph W. Hille.
By
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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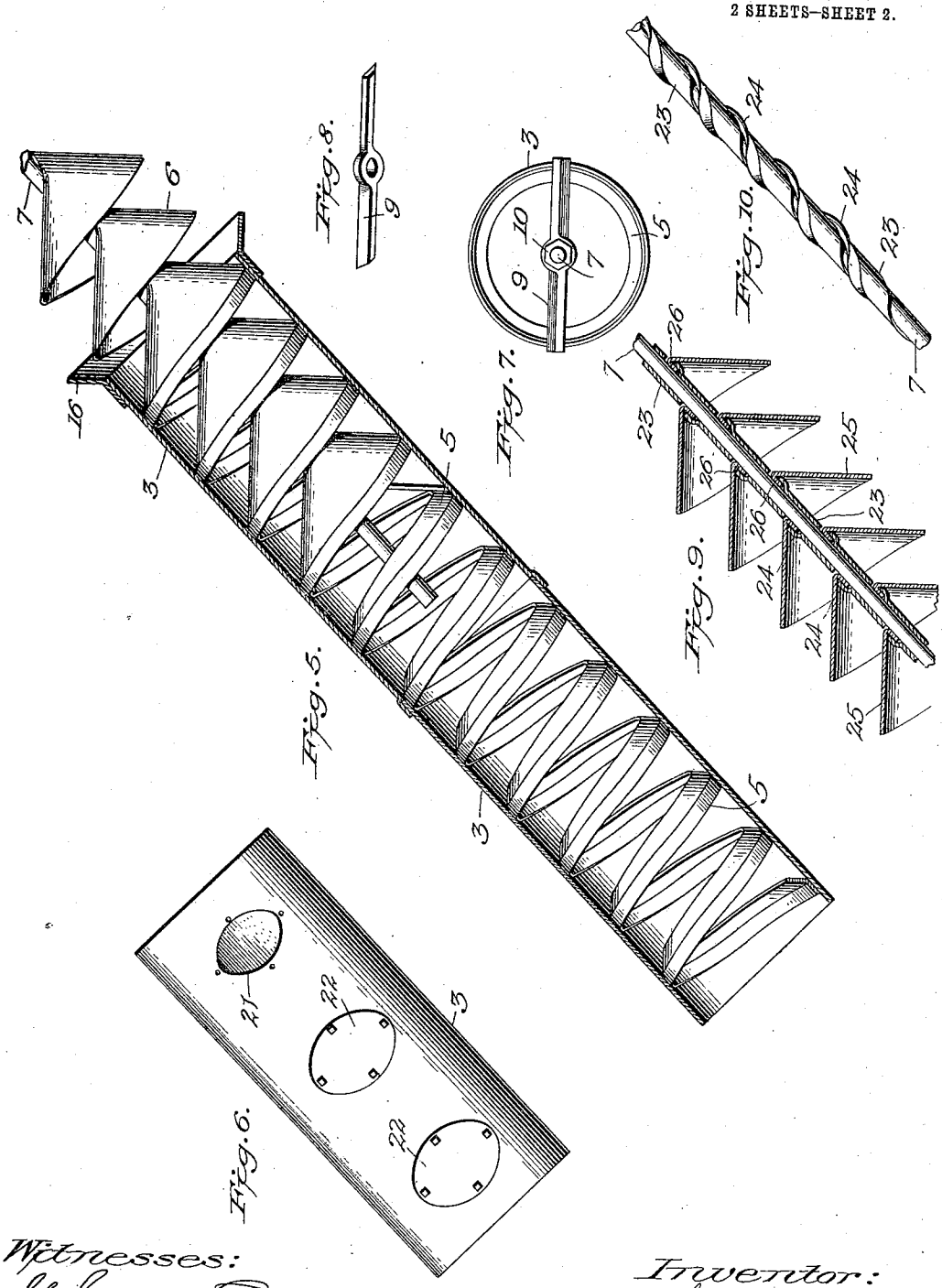
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UNITED STATES PATENT OFFICE.

ADOLPH W. HILLE, OF DENVER, COLORADO.

ROTATABLE INCLINED WATER AND MATERIAL LIFTING ELEVATOR.

1,132,775. Specification of Letters Patent. Patented Mar. 23, 1915.

Application filed November 11, 1913. Serial No. 800,411.

To all whom it may concern:

Be it known that I, ADOLPH W. HILLE, a citizen of the United States of America, residing in the city and county of Denver and State of Colorado, have invented a new and useful Rotatable Inclined Water and Material Lifting Elevator, of which the following is a specification.

My invention relates to improvements in rotating inclined water and material lifting elevators for lifting or raising water, liquids, ore-pulp and granular material; and the objects of my invention are: First, to provide a water and material lifting elevator or apparatus that will raise a stream of water with a forcible and positively lifting action. Second, to provide a water and material raising apparatus that is entirely free from parts that work one within the other, and that will raise a large volume of water with but little power, and that can be operated for an indefinite time without replacing any of its parts, and that can be installed for the raising of water from shallow depths, for the irrigation of crops, with slight expense. I attain these objects by the mechanism illustrated in the accompanying drawings, in which:

Figure 1, is a longitudinal sectional view of the improved conveyer, in position to raise water from a stream or ditch. Fig. 2, is a side view of a portion of the conveyer, showing more clearly the casing constructed of spirally-wound sheet metal, and provided at intervals with closed man-holes. Fig. 3, is a side view of a portion of the spiral screw or helix. Fig. 4, is a front or plan view of a portion of a metal strip from which the screw or helix may be formed, the same being provided at intervals with ears or projections which are adapted to be secured to the shaft upon which the strip is wound. Fig. 5, is a longitudinal sectional view of a conveyer similar to that shown in Fig. 1, but having a cylindrical casing of the usual form, made up of connected sections, and showing more clearly the spirally wound angle strip which constitutes the receiving thread for the screw or helix, a portion of which is shown partially screwed into the casing upon the said spiral thread. Fig. 6, is a side view of one of the casing sections, showing the same provided with man-holes. Fig. 7, is an end view of the conveyer, showing the abutment bar which bridges the lower end of the casing, and through which the screw shaft passes. Fig. 8, is a perspective view of the abutment bar. Fig. 9, is a longitudinal sectional view, showing a modification in the manner of securing the screw blade to its shaft. And Fig. 10, is a side view of the shaft shown in Fig. 9, illustrating more clearly the spirally wound strip having a flared upper edge which receives the inturned edge of the screw blade.

Similar letters of reference refer to similar parts throughout the several views.

Referring to Figs. 1 and 2 of the drawings, the numeral 1 designates a cylindrical casing, which in this instance is formed of a spirally wound strip of metal, the edges of which overlap, as shown, and are secured by rivets 2, the casing being of any desired practicable length and diameter. In Figs. 5 and 6 is illustrated a casing 3, which is made of sections of ordinary piping, which sections are formed of metal sheets bent into cylindrical form in the usual manner. In constructing the conveyer, however, either form of casing may be employed, and in practice the casing is inclined at an angle of approximately forty-five degrees, its lower end resting in a sump or ditch or stream, while its upper end is in position to discharge into a chute 4, from which the water may be conveyed by flumes for irrigation purposes. To the inner surface of the casing, is secured a spiral metal angle strip 5, which forms a receiving thread for a helical screw 6, to be presently described. The strip 5 is bent upon itself centrally of its width, so that in cross sectional outline it is substantially V-shaped, and the strip is bent into a spiral of the required pitch, the lower half of the width of the strip being riveted to the casing, while the upper half of its width inclines toward the axis of the casing at an angle of approximately forty-five degrees, and this upper half of the width of the strip forms, in conjunction with the wall of the casing, a gutter form of thread as shown by Figs. 1 and 5. The helical screw comprises a spirally wound screw conveyer, which is mounted on and is secured to a shaft 7. This screw conveyer may be made of a succession of metal plates 6, as shown in Fig. 4, or it may be constructed of a succession of metal disks, as shown in Fig. 9, the plates or disks being secured together end to end. The disks, in case they are used, are provided with a center aperture, and they are split through one side to their cen-

ter apertures, and are spread apart to the correct spiral pitch. The convolutions of the screw conveyer are arranged to give an inclination of approximately forty-five degrees to the axis of the shaft, and their inner edges which engage the shaft, may be provided at intervals with projecting ears 8, as shown in Fig. 4, which are riveted or otherwise secured to the shaft. The circle or spiral described by the circumferential edge of the screw conveyer, is of the same diameter as the inner peripheral wall of the casing, and the pitch of its windings is also the same as that of the thread 5 of the casing. The shaft 7 is of sufficient length to extend a suitable distance beyond each end of the casing, after the screw or helix has been inserted therein, which is done by turning it to cause its circumferential edge to engage the thread 5, as will be understood. The lower end of the shaft 7 is threaded and is passed loosely through an aperture in a cross bar 9, which bridges the lower end of the casing, and a nut 10 is screwed upon the lower end of the shaft against the cross bar 9, and by this means, the circumferential edge of the screw or helix is caused to fit tightly against the surface of the thread 5, and the helix is thereby held securely within the casing. A suitable cement may be run around the thread so as to make a water-tight joint between it and the helix. The shaft is journaled at its opposite ends in ball bearing journal boxes 11, which are secured to supporting frames 12. When a very long casing is required, the same may be supported intermediate of its ends by one or more rollers 13, which engage a circular tread band 14, mounted on the casing. In Fig. 1, a single roller 13 is shown, the same being mounted in bearings 15, suitably supported upon a foundation 16, on the bank of the stream or ditch. The tread band 14 is flared at an angle of forty-five degrees, so that at its point of contact with the roller 13, its tread face is on a horizontal plane, but the angle of the tread portion of the band will vary to correspond to variations in the inclination of the casing. This roller not only supports the conveyer, but it also prevents end thrust of the same. The upper end of the casing is provided with a flaring discharge rim 16, which stands above the chute 4. The casing with the helix may be rotated in any desired manner. In Fig. 1, however, a band gear wheel 17 is secured around the upper end of the casing, and is in mesh with a pinion gear wheel 18, on a power driven shaft 19, which is supported in bearings 20, on the supporting frame 12. In winding the plate 6, about the shaft 7, to form the helix, a spiral channel or passage is thereby formed, between the folds or spires of the plate and around the shaft, and this passage permits the air to travel the length of the helix and escape at the upper end of the casing, thus preventing air pocketing, which would retard the upward course of the water.

In order to remove the accumulations of sand and other substances from the casing, without removing the helix therefrom, the casing is provided at intervals, with manholes 21, which are tightly closed by caps or plates 22. By removing these plates, the casing may quickly and easily be cleaned, so that the efficiency of the elevator may be maintained at a minimum expenditure of energy.

The cross bar 9 is knife-edged on opposite sides, as shown most clearly in Figs. 7 and 8, in order that it may offer no resistance to the water, as the casing is rotated.

In Figs. 9 and 10 is illustrated a modification in the manner of securing the helix to the shaft, which is as follows: Upon the shaft is spirally wound a strip 23, the upper edge of which is outwardly flared, as shown by 24, the flared edge in conjunction with the shaft, forming a spiral gutter or groove around the shaft throughout its length. The upper edge of the plate 25, from which the helix is formed, is bent over at an angle throughout the length of the plate, to form an inturned lip 26, which, as the plate is wound upon the shaft, is adapted to fit into the groove or gutter formed by the flaring edge 24 of the strip 23, and thus secure the plate to the shaft. In this way, the plate may be wound from the top of the shaft downward, and solder or cement may be used to rigidly secure the lip 26 within the groove.

The operation of my improved rotary inclined water or material lifting elevator, is as follows: The elevator can be set at any desired angle in a well or an open cut in the ground, or in a ditch or flume or water receiving box, trough or hopper, and its lower end should be placed below the surface of the water or other liquid and well into any pulverulent material or ore pulp that is to be lifted by it. Where it is desired to raise water from the bottom of a body of water that is deep, the tube can be extended to its bottom, as the amount of the length of the tube that is immersed in the water makes no difference in its operation in lifting the same to any desired height. Having properly set the tube at the desired angle on a suitable foundation at its ends, and at the center of its length when necessary, power is connected to its rotating mechanism from any available source, as it can be rotated by a gasolene or steam engine or by an electric motor. The entire elevator tube, its shaft, and internal screw conveyer, rotate bodily, and it may be driven to make any desired number of revolutions per minute consistent with the attainment of practical results, and as the

tube is rotated the convolutions of its screw conveyer at its lower end worm the water or material into the tube, the direction of rotation of the tube relative to the direction of pitch of the screw being arranged to feed the water or material into the lower inlet end of the tube. The rotary movement of the screw exerts a positive lifting force movement on the water or material, as the water or pulverulent material stands between the convolutions of the screw in substantial horizontal or level positions, and the surfaces of the convolutions roll underneath the water or pulverulent material, and as they roll they lift. As the friction of this continuous rolling movement on the water or pulverulent material, is not sufficient to divert or move the water out of the level position it naturally and at all times assumes when at rest, and as the water or material raising elevator is rotated continuously, water or material is raised quickly and is discharged from the upper open end of the tube into a chute or flume, through which it is conveyed for use, as desired. Finely ground dry pulverulent material that is free enough to flow into a substantial level position when at rest, can be elevated or raised by it, or ore or other pulp that is mixed with water, cyanid or other chemical liquids into a flowing pulp can be raised by it. The construction permits of a free circulation of air at all times from the intake to the discharging end of the lifting elevator, thus making it impossible for air traps to form in the tube that would retard the free upward movement of water or material.

My invention is adapted to an extensive range of uses in connection with land and crop irrigation, ditch and reservoir work, and also in mine, quarry, railway and canal work; and while I have described the preferred construction and arrangement of my invention, I do not wish to be limited to the construction shown and described, as many changes might be made without departing from the spirit of my invention.

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

1. An inclined water and material lifting elevator comprising a tubular casing, a spiral flange secured to the inner peripheral wall of said tube, said flange comprising a limb of an angular member, one limb of which is secured to the inner peripheral wall of said tubular casing, and the other limb forms said flange and projects at an obtuse angle from the inner wall of said tube, a spiral conveyer of plate form having the same spiral pitch as said flange, screwed into said tube and in mesh against said spiral flange, a shaft extending through the axial center of said screw conveyer, means for securing said tube and screw conveyer to said shaft, a supporting frame arranged to rotatably support said shaft, and means for rotating said elevator.

2. In a hollow screw conveyer, the combination with a tubular inclined casing, having man holes at intervals and cap plates for said man holes, of a helical angle strip secured within said casing, a shaft extending axially through and beyond the end of said casing, an endles plate wound upon said shaft to form a helix, the marginal edge of which bears upon said helical strip, a bar which bridges the lower end of the casing having an aperture through which the lower end of said shaft passes loosely, said end being threaded, and a nut screwed upon said shaft against said bar, said bar being knife-edged on opposite edges, a roller supported adjacent to said casing, a flared band surrounding said casing, the lowermost point of which contacts with said roller, and means for rotating said casing.

3. In a hollow screw conveyer, a shaft, a spirally wound strip on said shaft having an outwardly flaring upper edge, which forms in conjunction with the shaft a spiral groove or thread, and an endless plate wound about said shaft to form a helix, the upper edge of said plate being inturned upon itself to enter said spiral groove.

4. In a hollow screw conveyer, a revoluble tubular casing, a helical angle strip inserted in said casing and secured thereto to form a thread, a helix in said casing engaging said thread, a shaft extending through said helix, means for securing said helix to the shaft, and means for clamping said helix to said thread.

In testimony whereof I affix my signature in presence of two witnesses.

ADOLPH W. HILLE.

Witnesses:
G. SARGENT ELLIOTT,
ELIZABETH SMITH.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."