No. 745,439. PATENTED DEC. 1, 1903.

B. HOLCOMB & S. AUSTIN.

WATER OR GRAIN ELEVATOR.

APPLICATION FILED JULY 30, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

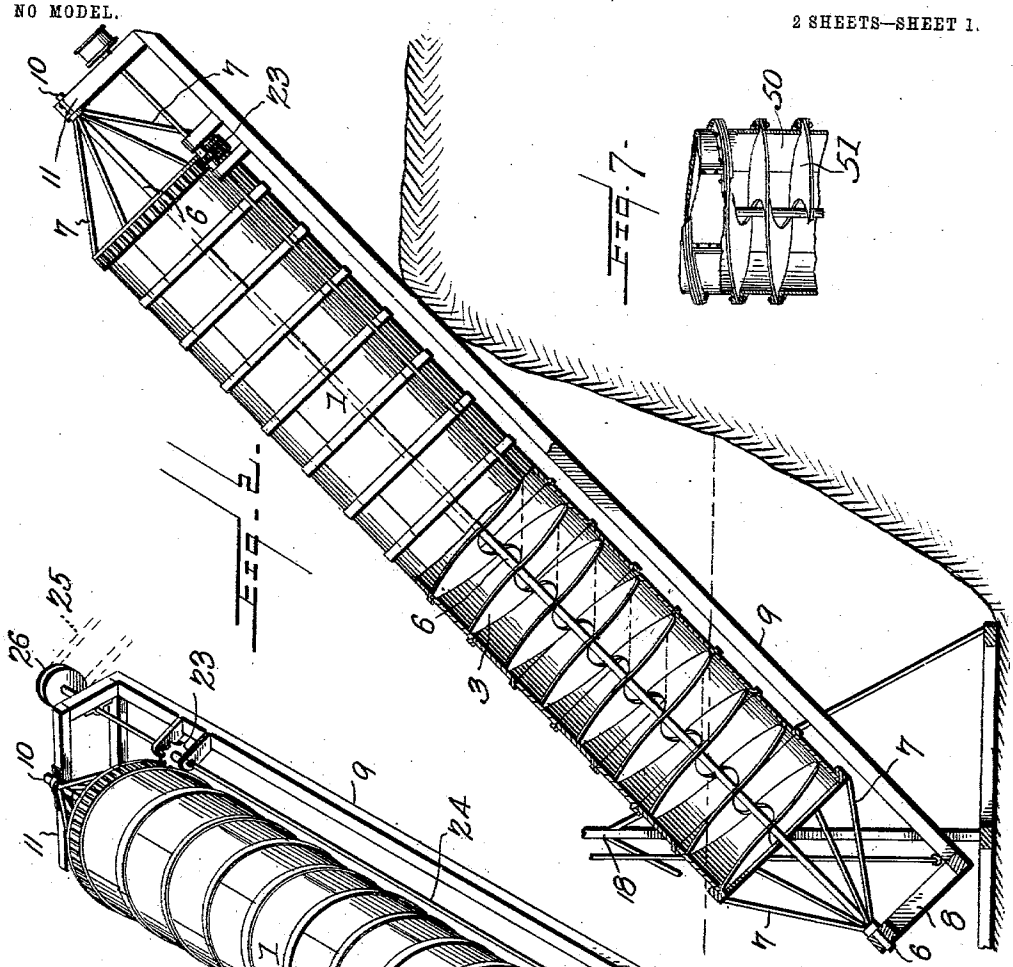


Fig. 2.



Fig. 7.

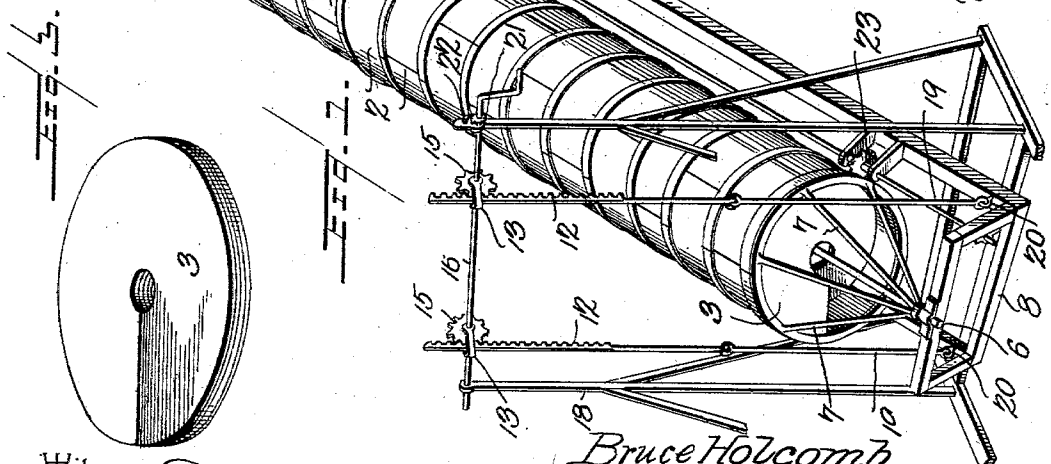


Fig. 1.



Fig. 5.

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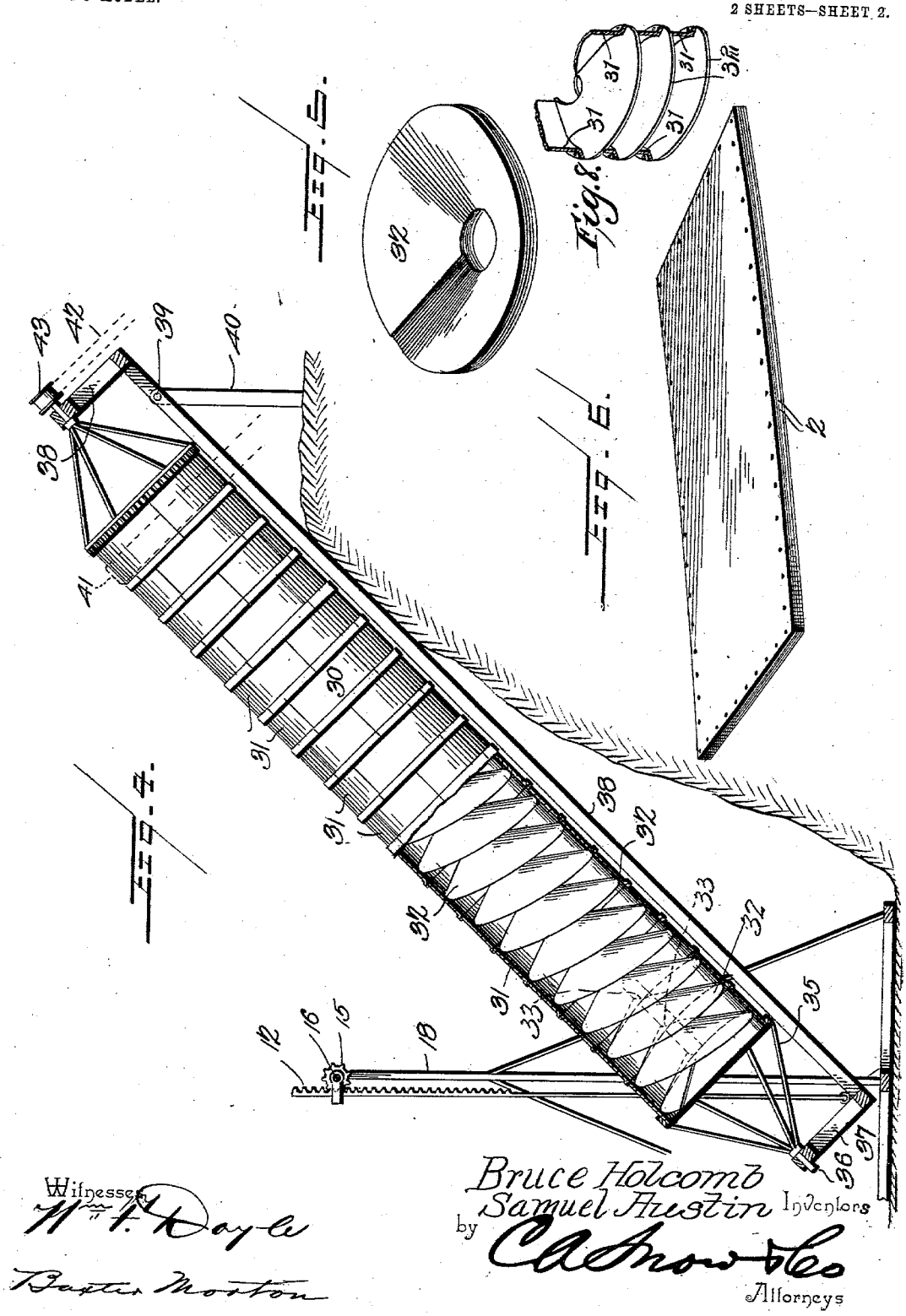
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NO MODEL. 2 SHEETS—SHEET 2.




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No. 745,439. Patented December 1, 1903.

# UNITED STATES PATENT OFFICE.

BRUCE HOLCOMB AND SAMUEL AUSTIN, OF GARDEN CITY, KANSAS.

## WATER OR GRAIN ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 745,439, dated December 1, 1903.

Application filed July 30, 1903. Serial No. 167,641. (No model.)

*To all whom it may concern:*

Be it known that we, BRUCE HOLCOMB and SAMUEL AUSTIN, citizens of the United States, residing at Garden City, in the county of Finney and State of Kansas, have invented a new and useful Water or Grain Elevator, of which the following is a specification.

This invention relates to screw-elevators for water and other materials.

The object of the invention is to provide an elevator of the class described in which pneumatic pressure within the hollow screw by means of which the material is elevated is positively prevented, in which clogging from accumulation of material at any point within the screw is entirely obviated, which is adaptable for use at any angle which may be desired, and which may be used with equal facility on water, grain, gravel, sand, or a mixture of water and earth obtained in dredging.

The invention consists in the construction and combination of parts hereinafter described, and illustrated in several different forms of embodiment in the accompanying drawings, forming part of this specification, in which corresponding parts are designated by the same characters of reference throughout the several views, it being understood that changes in the form, proportions, and exact mode of assemblage of the parts may be resorted to without departing from the spirit of the invention or sacrificing any of its advantages.

In the drawings, Figure 1 is a view in perspective of one form of embodiment of the invention. Fig. 2 is a view, partly in side elevation and partly in section, of the form of the invention illustrated in Fig. 1. Fig. 3 is a view of the spiral removed from the casing and collapsed for shipment. Fig. 4 is a view, partly in side elevation and partly in section, of a modified form of the invention. Fig. 5 is a view of the spiral shown in Fig. 4 collapsed for shipment. Fig. 6 is a view of a number of the plates for making a casing nested for shipment. Fig. 7 is a detail view showing the construction of a modified form of elevator. Fig. 8 is a detail view showing the inclined spiral screw between two sections of the cylindrical casing.

Referring to the drawings, 1 designates the outer casing of the elevator-screw, which is preferably formed in sections, as shown, and united by rivets. The sections designated 2 are of the same size and curvature and may be shipped in nests, as shown in Fig. 6, and may be assembled when the materials have reached the point where the elevator is to be erected.

3 designates a spiral arranged within the casing 1 and joined to the casing at the outer margin thereof only, the inner margin being free and an air-shaft being left at the center of the screw, as shown. The spiral 3 is shown as disposed at right angles to the wall of the casing 1, and it may be secured within the casing in any preferred manner, the essential feature being that the joint between the spiral and the casing must be water-tight.

The casing 1 is supported by means of a shaft 6, which extends through the casing from end to end in the axial line and upon which the casing is secured by the converging rods or bars 7 at both ends of the casing. The shaft 6 is supported in bearings of any suitable character formed in brackets 8 at the ends of a narrow rectangular frame 9, the upper end of which is supported by trunnions 10, extending laterally therefrom and engaging bearings in a suitable supporting structure, as shown at 11. The lower end of the frame is supported for vertical adjustment by means of a pair of rack-bars 12, mounted in suitable guideways 13 and engaging pinions 15 upon a crank-shaft 16, which is rotatably mounted in a suitable supporting structure at 18. The rack-bars are connected by links 19 with the eyebolts 20 at the lower end of the frame, and a ratchet 21 and pawl 22 may be provided upon the supporting structure 18 to prevent backward rotation of the shaft 16, with the consequent descent of the lower end of the frame.

In the form of invention described in the preceding paragraph rotary movement is imparted to the casing 1 by means of pinions 23 upon a shaft 24, which extends longitudinally of the frame 9 and is mounted in bearings in the brackets 8. The pinions 23 engage with cogs formed on the outside of the casing 1 at the ends thereof, as shown, so that the rotation of the shaft 24 will cause rotation in the

opposite direction of the casing 1. Power is imparted to the shaft 24 from any suitable motor through a belt 25 over a pulley 26 at the upper end of the shaft.

In the form of the invention illustrated in Fig. 4 there is shown a casing 30 made up of sections 31 similar to those employed in the construction of the casing 1, already described, and having secured within the interior thereof a spiral 32, the width of which is less than the radius of the casing, so that an air-shaft is left at 33. The spiral 32 is not disposed at right angles to the casing-wall, as in the embodiment of the invention previously described, but is so formed that when secured in position within the casing the upper surface of the spiral is disposed at an acute angle to the wall of the casing. This form of spiral is that which is best adapted for use when the elevator is to be operated at a steep incline, and the angle of inclination of the spiral to the wall of the casing will be varied according to the steepness of the incline at which the elevator is intended to operate, it being understood that the steeper the incline of the casing the more acute will be the angle formed between the upper surface of the spiral and the casing-wall. In this form of embodiment of the invention no shaft is shown extending through the casing, but instead there extends from the group of converging bars 35 at each end of the casing a short rod 36 to form a journal for engagement with the bearings formed in brackets 37 at the ends of the frame 38. The brackets 37 are slightly different from the brackets 8 in the form of elevator first described, as the means of rotating the elevator-casing in this form of the invention is different from that employed in the other form, and the shaft external to the casing shown in the form of the invention first described is omitted. The frame 38 is supported at its upper end on trunnions 39, resting in bearings in a suitable supporting structure at 40, and the lower end of the frame is supported for vertical adjustment in the manner already described in connection with the frame 9. The casing 30 is rotated directly by a belt 41, running over a suitable surface formed for that purpose on the exterior of the casing near the upper end, or by means of a belt 42, traveling over a pulley 43 at the end of the upper rod 36.

While the casing with the spiral arranged at right angles to the wall thereof has been described in connection with a particular form of driving mechanism and with a shaft extending axially through the casing and the casing with the obliquely-disposed spiral has been described with another form of driving mechanism and without a shaft extending through the casing, it is to be understood that the driving mechanism shown in either case may be applied to either form of casing and spiral and that the shaft may be extended through the casing or not, as desired, the mode of driving the apparatus and the arrangement of the supporting devices thereof being matters determinable by the conditions under which the elevator is to operate and by the size of the elevator.

In the operation of the elevator the lower end of the frame will be so adjusted in position that the lower end of the casing will enter the water or extend down into the grain or other material to be raised thereby and the casing will be continuously rotated at a speed dependent upon the character of the material and the rate at which it is desired to raise it.

When the apparatus has been in operation long enough to raise material from the lower to the upper end, the discharge of the material at the upper end will be continuous as long as the apparatus is kept in operation, and when the operation ceases the material in the casing at that time will remain stationary instead of slipping downward, so that as soon as the apparatus is again put in operation the discharge of material at the upper end will begin.

As the action of the apparatus is entirely independent of atmospheric pressure, it may be employed to elevate water and other materials to any desired height, and by suitably inclining the spiral to the wall of the casing the apparatus may be adapted for operation at substantially any desired angle to the horizontal.

A special feature in the construction of the apparatus is the provision of the air-shaft throughout the entire length thereof, so that there is free communication between all the whirls of the spiral even when the apparatus is in use, thus preventing any clogging of the apparatus by the material elevated, because whenever an obstruction occurs at any point in the spiral the material below the point of obstruction will rise over the margins of the spiral and drop back, thus preventing any choking by packing of the material solidly in whirls of the spiral which are not readily accessible. A further advantage afforded by the air-shaft through the axis of the apparatus is that it affords means whereby any obstructive material may by reached with comparatively little difficulty and removed.

As the apparatus is especially designed for use in raising water for purposes or irrigation and the water-level in streams employed in irrigation is subject to more or less variation, means for adjusting the height of the lower end of the apparatus is provided and the upper end is supported on trunnions, so that the movement of the lower end may be perfectly free and no adjustment of the upper end be required.

A feature of great practical value in the construction of the elevator is found in the fact that the sections of the cylindrical casing and the spiral may be shipped separately in very compact form, the sections of the cas-

ing being nested, as above stated, and the spiral, whether of the form first described or the form afterward described, may be collapsed into very compact form, as illustrated in Figs. 3 and 5, and the whole structure may be readily constructed at the point where it is to be used by persons possessing but little mechanical skill.

In the form of casing shown in Fig. 7 there is shown, partly in side elevation and partly in section, a portion of an elevator having the casing 50 formed of plates arranged in spiral lines and having their edges bent outward, as shown, so that the spiral 51 may be secured in position within the casing by riveting the outer margin of the spiral between the outwardly-turned edges of the plates forming the casing. This mode of constructing the elevator-casing and securing the spiral therein is one especially adapted for use in the construction of comparatively small elevators and one which facilitates the fastening of the spiral within the casing in water-tight association with the casing-wall.

Having thus described the construction and operation of the invention, what we claim as new, and desire to secure by Letters Patent, is—

1. An elevator of the class described, comprising a rotatable outer casing and a spiral within the casing joined to the casing at its outer margin and having its inner margin free.

2. An elevator of the class described, comprising a cylindrical outer casing and a spiral arranged within said casing and having a width less than the radius of the casing, the spiral being joined to the casing at its outer margin and having its inner margin free.

3. An elevator of the class described, comprising a rotatable outer casing and a spiral within the casing disposed at an oblique angle to the wall of the casing, the spiral being joined to the casing at its outer margin and having its inner margin free.

4. An elevator of the class described, comprising a rotatable cylindrical casing and a spiral within said casing having its upper surface disposed at an acute angle to the wall of the casing and being attached to the casing at its outer margin, the inner margin being left free.

5. The combination in an elevator of the class described, of an inclined frame, means for adjusting the height of the lower end thereof, a cylindrical casing rotatably mounted in said frame, and a spiral rigidly mounted within the casing at its outer margin and having its inner margin free.

6. The combination in an elevator of the class described, of an inclined frame pivotally mounted at its upper end, means for adjusting the height of the lower end, said means comprising a rack and pinion, a cylindrical casing rotatably mounted in said frame, a spiral rigidly secured within said casing at its outer margin and having its inner margin free, and means for rotating said casing.

7. An elevator of the class described, comprising a cylindrical casing formed of plates arranged spirally and having outwardly-turned edges, and a spiral rigidly secured within the casing by having its outer margin riveted between the outwardly-turned margins of the spirally-arranged plates forming the casing.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

BRUCE HOLCOMB.
SAMUEL AUSTIN.

Witnesses:
B. F. SIMONDS,
A. HOSKINSON.