No. 607,255. Patented July 12, 1898.

A. MARANGOS.

ELEVATOR FOR GRANULAR MATERIAL.

(Application filed Sept. 13, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

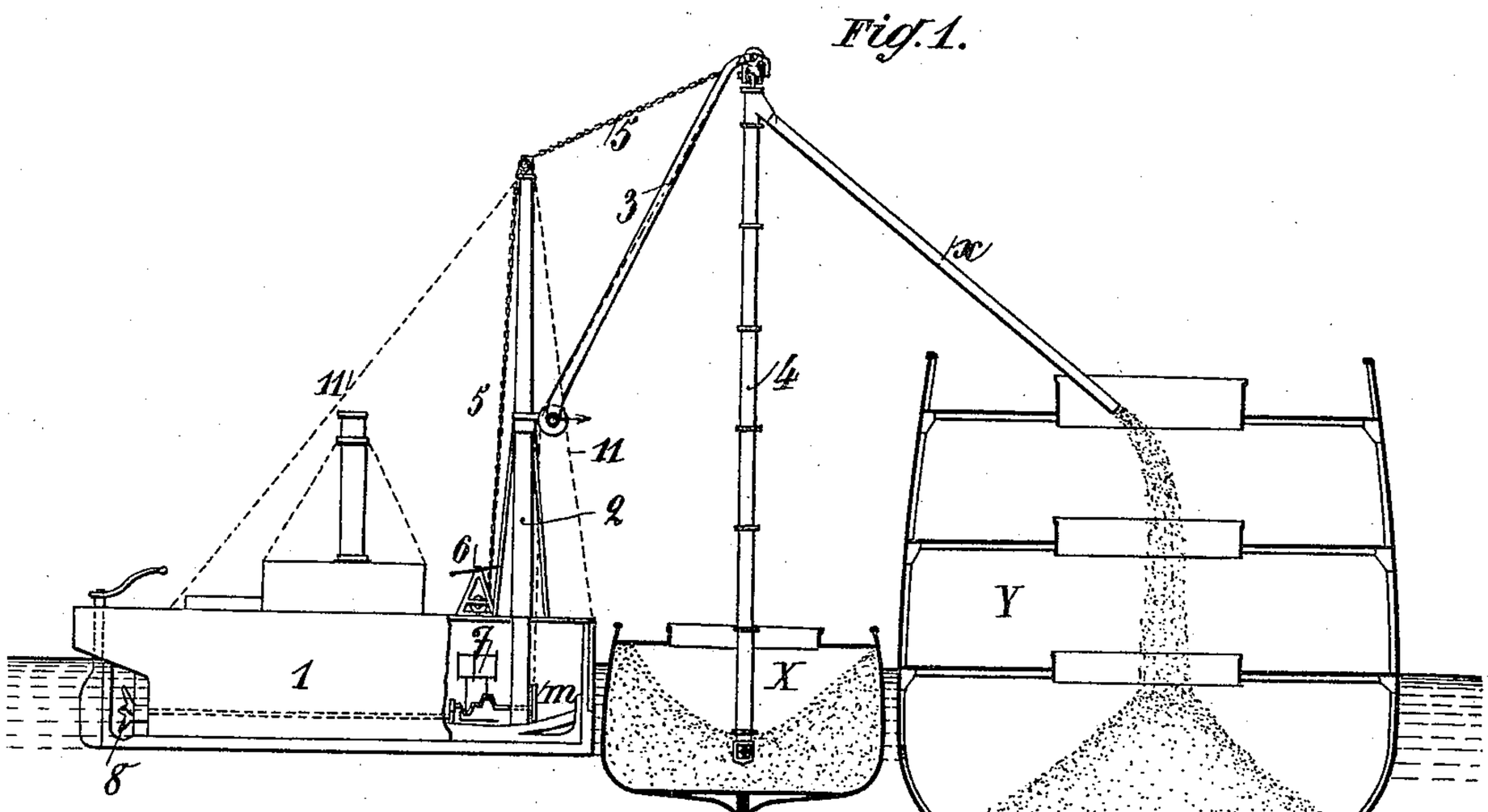

Fig. 2.

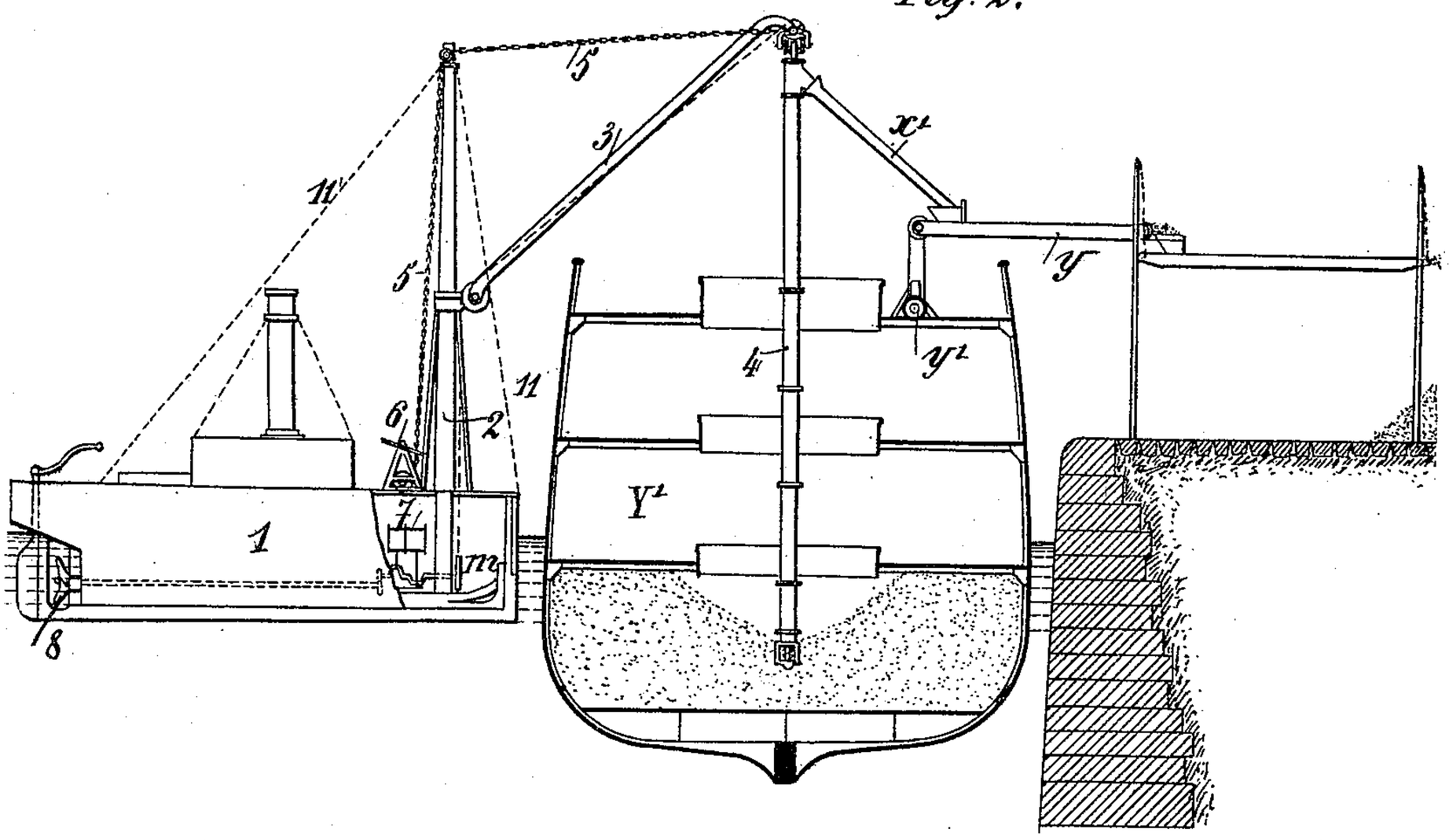

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Fig. 3.

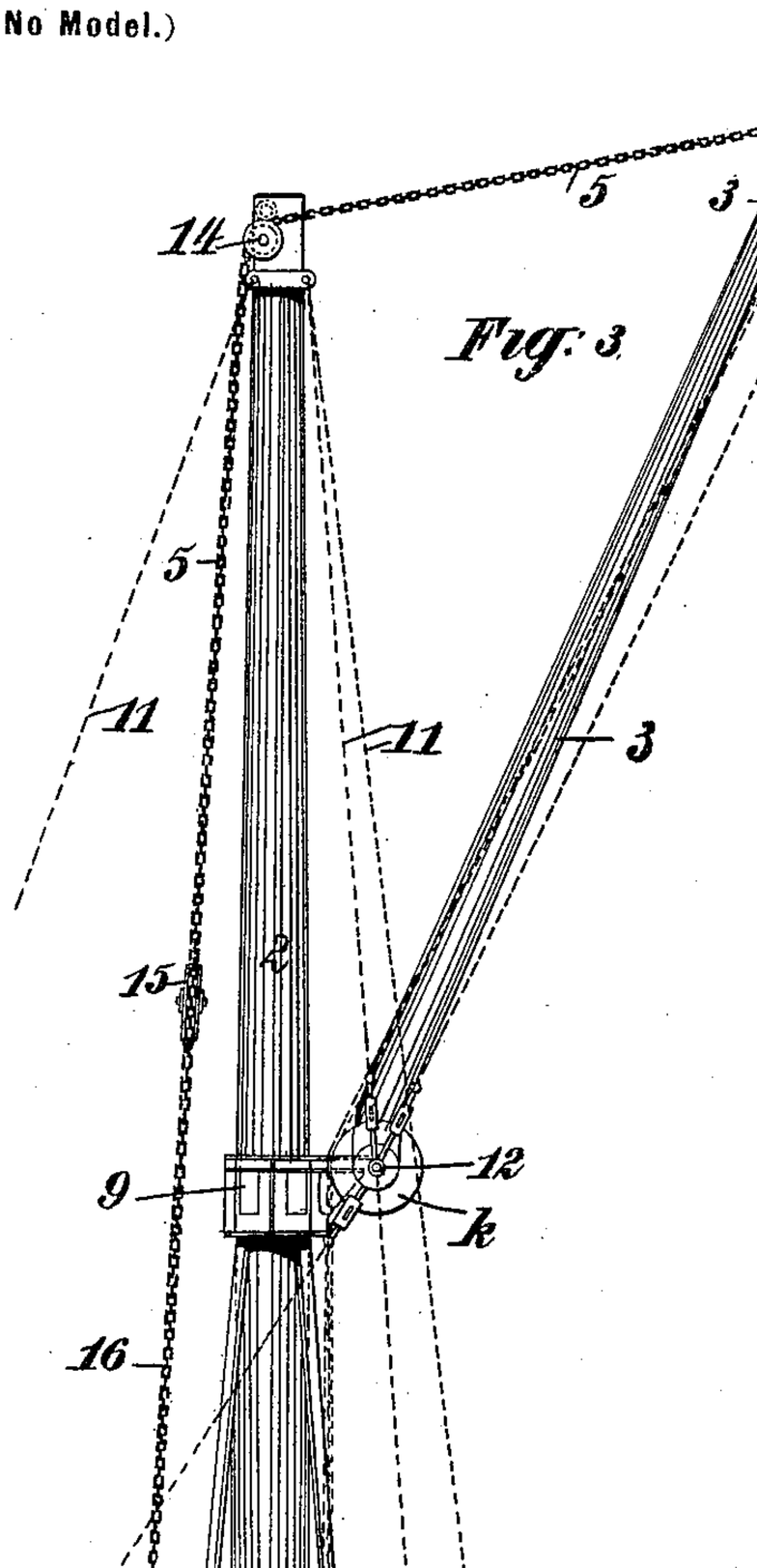
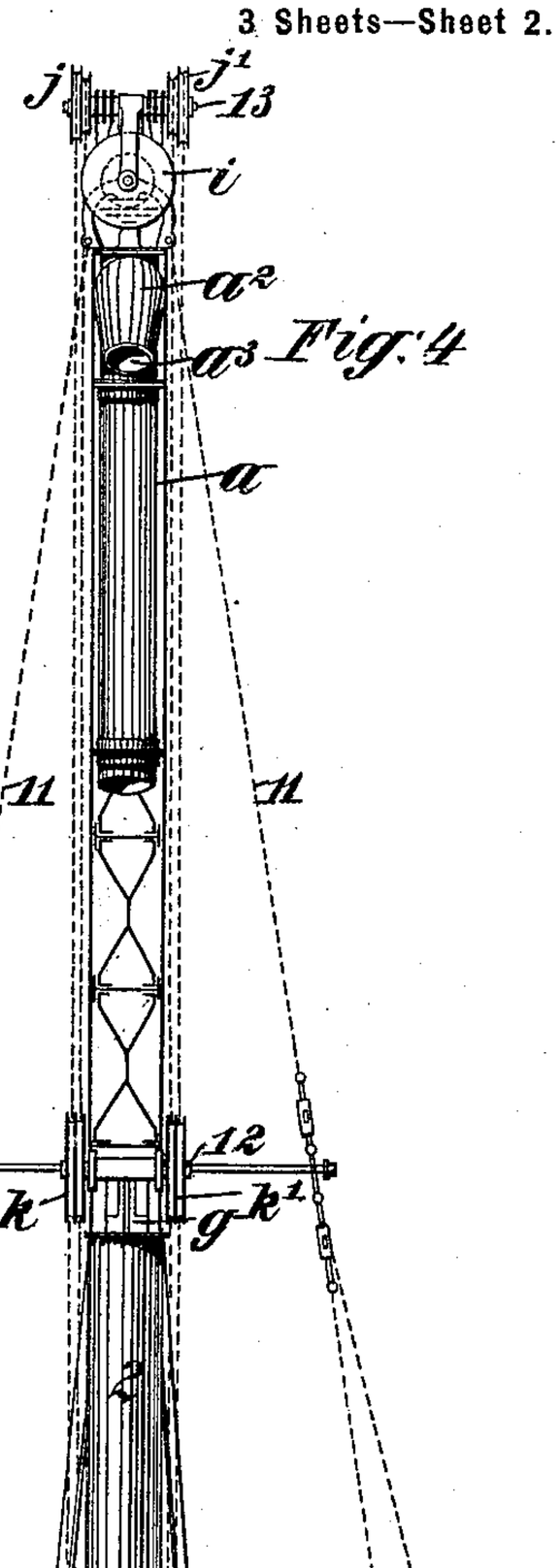


Fig. 4.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

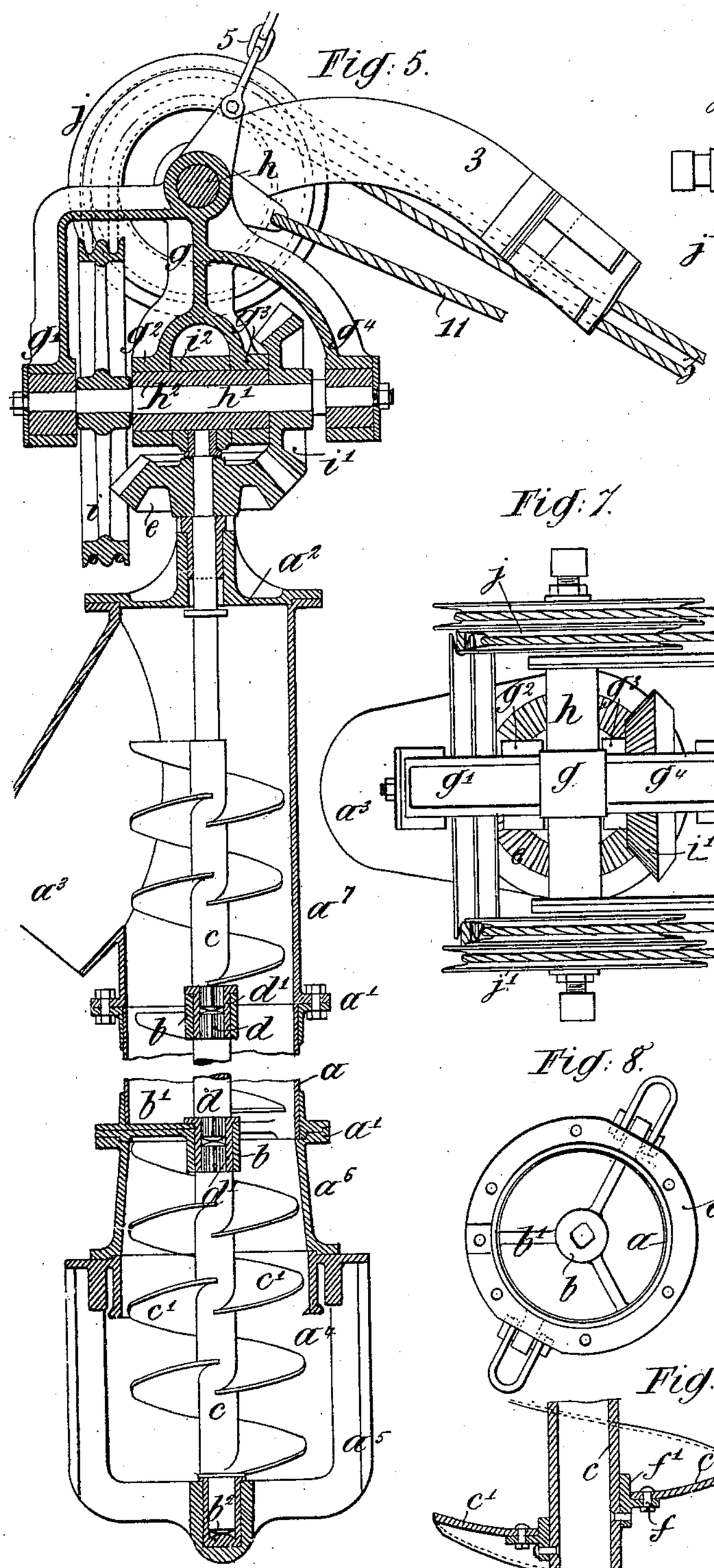

Fig. 6.

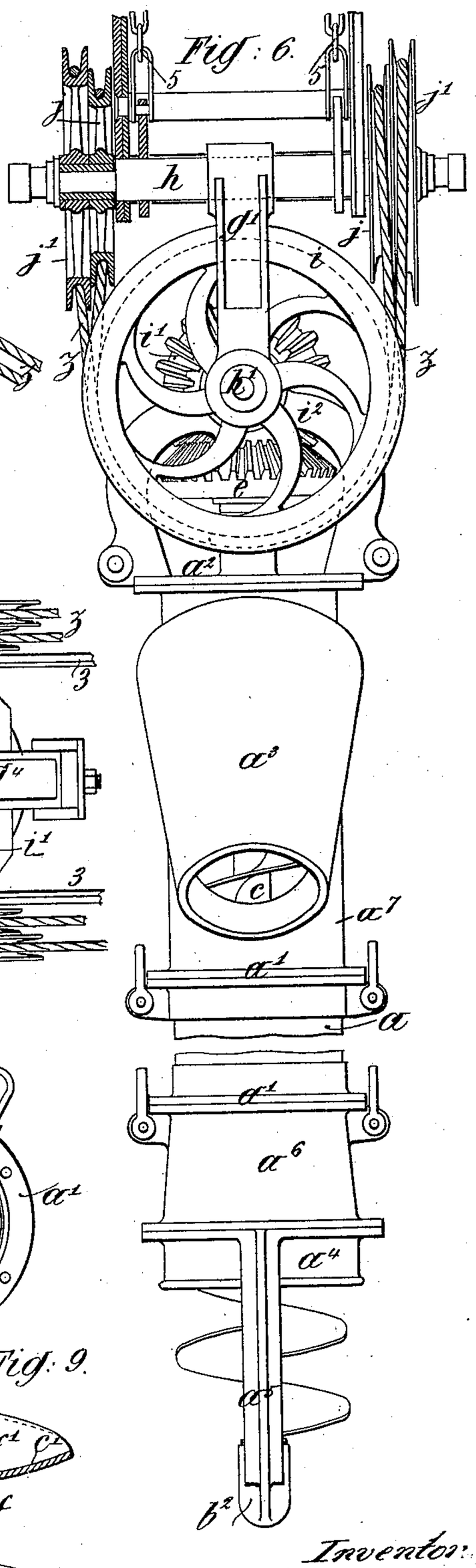

Fig. 7.

Fig. 8.

Fig. 9.

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UNITED STATES PATENT OFFICE.

APOSTOLOS MARANGOS, OF MARSEILLES, FRANCE.

ELEVATOR FOR GRANULAR MATERIAL.

SPECIFICATION forming part of Letters Patent No. 607,255, dated July 12, 1898.

Application filed September 13, 1897. Serial No. 651,551. (No model.) Patented in France August 13, 1897, No. 266,356.

To all whom it may concern:

Be it known that I, APOSTOLOS MARANGOS, a subject of the King of Greece, formerly of Cyclades, Greece, now residing in Marseilles, Bouches-du-Rhône, France, have invented certain new and useful Improvements in Elevators for Raising Granular or Pulverulent Material or Substances, (patented in France, No. 266,356, dated August 13, 1897,) of which the following is a full, clear, and exact description.

My invention relates to elevators, particularly such as are located on floats or pontoons to be used in loading or unloading ships, and has for its object to provide a construction which will not be affected by the pitching and rolling motion of the float and which will be highly efficient.

To this end my invention consists in the novel construction and arrangement of parts, as will be hereinafter described and claimed.

In order that the construction, arrangement, and operation of the elevator may be clearly understood, I will describe the invention with reference to the accompanying drawings, in which—

Figure 1 represents an elevator constructed according to my invention and applied, by way of example, for loading a vessel. Fig. 2 is a view similar to Fig. 1, showing the elevator arranged for unloading a vessel and conveying the material to a distance. Fig. 3 represents in elevation the front part of the floating pontoon with the crane which supports and operates the elevator proper. Fig. 4 is a front elevation of Fig. 3, partly in section. Fig. 5 represents a vertical section of the elevator proper. Fig. 6 is a front elevation of the said elevator, partly in section. Fig. 7 is a plan showing the movable suspension-joint thereof, and Figs. 8 and 9 are constructional details.

In Figs. 1 and 2, 1 represents the floating pontoon, upon which the elevator proper is arranged. 2 is the mast of the said floating pontoon, constituting the fixed part of the crane. 3 is the boom of this crane. 4 is the elevator proper, suspended from the boom 3 by a movable joint. 5 5 are connecting-chains of the boom 3. 6 is the windlass for operating the boom 3. 7 is the engine, actuating both the elevator proper, 4, and the screw-propeller 8 of the pontoon. Fig. 1, moreover, shows the lighter or barge X, in which the merchandise to be loaded is stored, and the vessel Y to be loaded. The discharge-conduit x is likewise shown, which passes the material raised from the barge X into the vessel Y.

Fig. 2 shows the vessel Y′ to be unloaded, the discharge-conduit x' delivering the raised material into a transporter or conveyer y' consisting of an endless band actuated by an independent motor y', which may be supplied with steam from a flexible tube starting from the pontoon 1 and not represented in the drawings.

The mast 2, hereinbefore referred to, is fixed to the bottom of the pontoon in the ordinary way, supported toward the middle of its height by means of a chair formed by a collar 9 and stays 10, rigidly fixed to the deck, (see Figs. 3 and 4,) while shrouds 11, with coupling-screws, stay or support its top. The collar 9 comprises a spindle 12, on which the pole 3 can oscillate in a vertical plane.

The connecting-chains 5 5 are fastened at 13 to the pole 3, pass over guide-rollers 14 14, in connection with the iron hoop fitted to the top of the mast 2, and over the equalizing-pulley 15 of the pulley-frame, from which starts a chain 16, which is wound upon the drum of the windlass 6.

The elevator proper is composed of a series of tubes a, a top section or upper tube a^7, and a bottom section a^6, connected with each other by bolts, Fig. 5, and in the interior of which moves an elevator-screw c with helicoidal blades c'. These tubes a are cylindrical and are provided with flanges a' to insure their connection. The upper tube a^7 is closed by a cap a^2 and has a discharge-nozzle a^3, while the lower tube a^6, shorter than the others, is completely open and is provided with a mouth or inlet a^4 and a spider a^5, carrying a central step-bearing b^2. It will be seen that the upper portion of the lower tube-section a^6 widens downwardly and that the lower end of the elevator-screw projects beyond the tube formed by the sections a a^6 a^7, so that the lower end of the screw is exposed and engages the material to be raised.

The elevator-screw is formed by as many elements, Fig. 5, as there are tube-sections a

a^6 a^7, and each of these elements comprises a central axis c and a series of helicoidal wings or blades c'.

The axis c is a steel tube, to the extremities of which square ends d are fixed, which engage with sockets d', capable of turning in bearings b of the cross-bars b', forming part of one of the flanges a' of the tubes a. The square ends d and the sockets d' form the junction between the various elements of the elevator-screw.

The axis of the upper element passes through the cap a^2 and receives a gear-wheel e, by the aid of which a rotary movement can be imparted to the elevator-screw, while the lower element extends into the casing formed by the spider a^5 and rests with its axis upon the step-bearing b^2 in the said spider.

The wings or blades c' receive the shape of spoons with helicoidal surfaces and are severally fixed to the central axis c, Fig. 9, by means of small bolts f, engaging with a small T-iron f', firmly riveted to the said axis. These blades are so arranged around the axis c that the upper part of the one is situated a few centimeters above the lower extremity of that blade which lies immediately above and in line therewith. The whole arrangement of these blades thus forms, as it were, a spiral staircase, the steps of which are formed by the blades themselves.

Owing to the arrangement of the lower end of each blade below the upper end of the next blade below the material raised by one blade and dropping off from the upper end thereof will fall directly upon the lower end of the next blade above and is thus added to the material already raised by the said blade directly. Thus if, as shown in Fig. 5, the lower portion of the elevator, where the elevator-screw extends into the spider a^5, be dipped into the material to be raised this material will be taken up by the blade which is entirely immersed into it and the next blade above, which is partly immersed into it. The material raised by the first blade is deposited upon the second blade, which thus receives an additional load. Any foreign matter or body that may find its way between the inner wall of one tube and a continuous elevator-screw would before being set free have to traverse the whole generatrix of this screw, (about five meters per one meter,) whereby the apparatus would be wedged up and worn by friction, while with the use of the overlapping helicoidal blades these disadvantages need not be apprehended.

The elevator thus formed is, as has been illustrated, suspended from the extremity of the boom 3 of the mast 2, which is done by means of a joint so arranged that the said elevator always occupies a vertical position irrespective of the rolling and pitching movements to which the pontoon 1 is subjected and in such a manner that the vibrations and displacements of the elevator do not affect the pontoon.

The suspension device is formed, Figs. 5, 6, and 7, by a hanger g, provided with four branches g' g^2 g^3 g^4 and jointed to the top of the pole 3 through the intermediary of a shaft h, connecting the two supports of the pole 3. The shaft h is fixed, and the hanger g can oscillate thereon. The branches of this piece are situated in one and the same plane. The two exterior branches g' and g^4 support a shaft h', the central portion of which is inserted into a hollow shaft h^2, supported by the two interior branches g^2 and g^3.

Upon the shaft h' is mounted a double-grooved pulley i, over which passes the transmission-rope z, the action of which is hereinafter described, and a bevel-wheel i', gearing with a bevel-wheel e on the central axis of the elevator-screw. The pulley i and the wheel i' are respectively mounted between the branches g' g^2 and g^3 g^4, whereby any overhanging is prevented.

Upon the hollow shaft h^2, between the branches g^2 and g^3, a socket i^2 is freely slid, which is connected with the cap a^2 of the upper tube of the elevator.

It will be seen that the shaft h and the shaft h' are perpendicular relatively to each other, and that together with the piece g they constitute a universal joint. Under these conditions the elevator is enabled to oscillate in all directions. Now, as the pivot constituted by the shaft h' lies below the pivot afforded by the shaft h, the result is that the oscillatory movements of the elevator in all directions are almost unlimited. During the oscillation around the shaft h (pitching) the whole transmission mechanism participates in the same movement. In order that during this movement the transmission-rope z may not leave the grooves in the pulley i, this rope is passed over loose guide-pulleys j and j', arranged on the shaft, around which the movement takes place. These pulleys are of different diameters, as shown. During the oscillation around the shaft h' (rolling) all that portion of the structure which lies above this shaft remains immovable, while that which lies below oscillates around this shaft and thus actuates the gearing e, which remains always in gear with i'. In constructions used hitherto for similar purposes only a slight adjustability of the angle between the driven elevator-shafts and its supports has been obtained, and on account of the use of shafts geared together in some special way a large loss of power by friction has been entailed. In my construction, however, only two bevel-wheels and a pulley are used for transmitting power. The range of adjustment is practically unlimited, and the efficiency of the power-transmitting device is the same in every position of the elevator. In both cases and irrespective of the extent of these movements the transmission-rope z, as well as the gear-wheels e and i', acts always normally, and the transmission of the movement to the axis c of the elevator is insured.

The endless driving-rope z passes, as has been above shown, over the pulley i and over the guide-pulleys j and j'. Its runs pass, respectively, over the pulleys k and k', arranged, Figs. 3 and 4, at the point where the boom 3 is jointed to the mast 2, then over the pulleys l and l', arranged at the foot of the mast 2. It finally passes around the drum m, directly mounted upon the shaft of the motor 7, Figs. 1 and 2. The rope is subjected to the action of a tension device consisting of a roller n, movable upon a guide n', connected to a counterweight n^2. The operation of the elevator is as follows: The pontoon is brought as close as possible either to the barge, Fig. 1, or to the vessel, Fig. 2, from which the material is to be unloaded, and the said pontoon is firmly secured. Thereupon the elevator-tube is immersed into the material by inclining the boom 3 more or less by means of the windlass 6. Subsequently the motor 7 is started, which, through the medium of the rope z, rotates the elevator-screw. The conveyer-blades raise the material, under the conditions above indicated, until the latter has reached the top part of the elevator, whence it is discharged into the discharg-nozzle a^3, which transmits it to the delivery-conduit x, Fig. 1, or to x', the function of which is to convey it to a horizontal transporter. It is to be observed that the elevator cannot in any way be affected by the pitching and rolling action of the pontoon carrying the same, owing to the universal joint above described and owing to the fact that the transmission is always effected under normal conditions by reason of the special arrangement of the said joint.

The shape, dimensions, and materials of all the constituent parts of the elevator may of course be varied to suit the requirements in each case.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of a stationary support or mast, a boom movably connected to the mast, an elevator, and a universal joint by which the elevator is suspended from said boom, said universal joint comprising two horizontal pivots or axes arranged at different heights and crosswise, substantially as described.

2. The combination with a stationary support or mast, a boom movably connected to the mast, a hanger suspended from the boom to swing about a horizontal axis, a horizontal shaft journaled in said hanger below said axis and extending crosswise thereof, an elevator freely suspended on said horizontal shaft, and comprising a vertical screw-shaft and a casing surrounding the same, engaging gear-wheels located on said horizontal shaft and vertical shaft, and means for rotating the horizontal shaft, substantially as described.

3. The combination of a stationary support or mast, a boom movably connected to the mast, a hanger suspended from the boom to swing about a horizontal axis, a horizontal shaft journaled in said hanger below said axis and extending crosswise thereof, an elevator freely suspended on said horizontal shaft, and comprising a vertical screw-shaft and a casing surrounding the same, engaging gear-wheels located on said horizontal shaft and vertical shaft, a pulley mounted upon the horizontal shaft and connected to rotate with the gear-wheel thereon, pulleys mounted to rotate about the suspension-axis of the hanger, and a driving connection passing over said pulleys, substantially as described.

4. The combination of a stationary support or mast, a boom movably connected to the mast, an elevator, and a universal joint by which the elevator is supended from said boom, the universal joint comprising two horizontal pivots or axes arranged crosswise, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

APOSTOLOS MARANGOS.

Witnesses:

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JOSEPH SERRE.