No. 859,089. PATENTED JULY 2, 1907.

J. D. LOWRY.

ELEVATING MECHANISM.

APPLICATION FILED JAN. 9, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

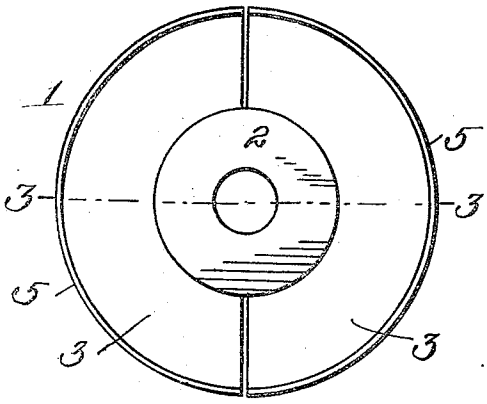


Fig. 4.

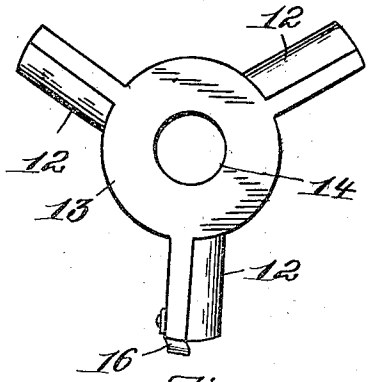


Fig. 2.

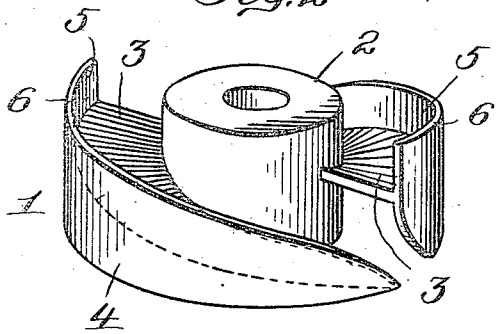


Fig. 5.

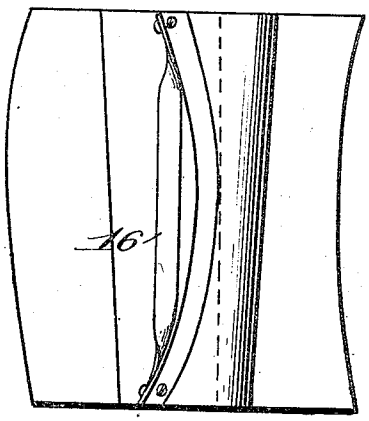


Fig. 3.

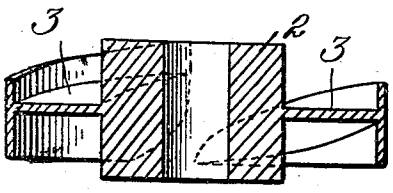
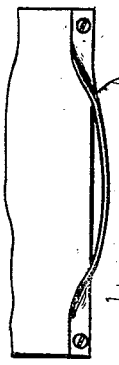


Fig. 6.



Witnesses:
C. D. Kesler
James L. Norris, Jr.

Inventor
John D. Lowry
By James L. Norris
Atty.

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2 SHEETS—SHEET 2.

Fig. 7

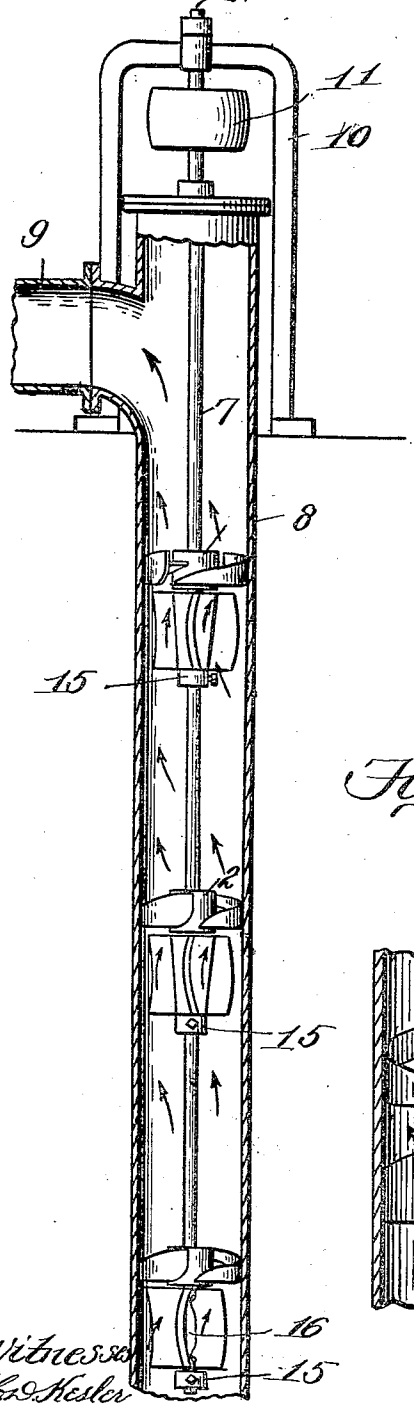


Fig. 8.

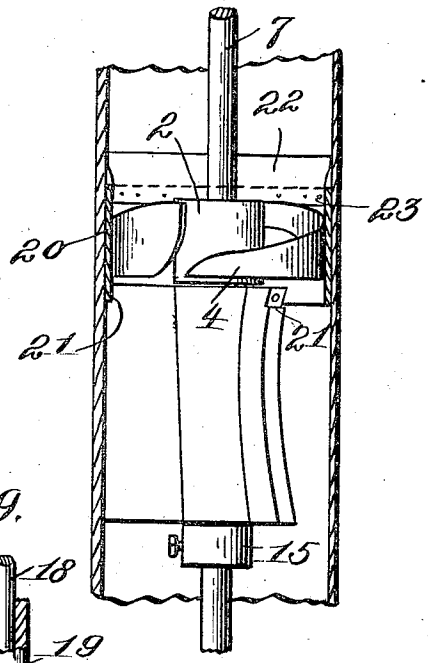
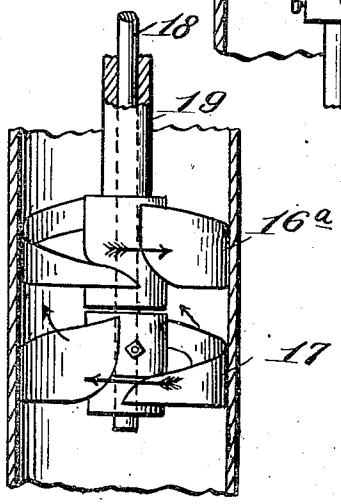


Fig. 9.



Witnesses
Geo. Kesler
James L. Norris, Jr.

Inventor
John D. Lowry
By James L. Norris.
Attys

UNITED STATES PATENT OFFICE.

JOHN D. LOWRY, OF WILMINGTON, NORTH CAROLINA.

ELEVATING MECHANISM.

No. 859,089. Specification of Letters Patent. Patented July 2, 1907.

Application filed January 9, 1905. Serial No. 240,279.

To all whom it may concern:

Be it known that I, JOHN D. LOWRY, a citizen of the United States, residing at Wilmington, in the county of New Hanover and State of North Carolina, have invented new and useful Improvements in Elevating Mechanism, of which the following is a specification.

This invention relates to a water or other liquid elevating means, or pump organization, wherein a lifting or pump element may be attached either singly or in series to a rotary shaft or the like, which may be lowered into the casing of a well or other inclosure leading to a source of water or other liquid supply. It is also proposed to utilize the elevating mechanism embodying the features of the invention in raising or lifting material or substances other than liquids, or in other words to utilize the advantageous structure of the mechanism wherever the latter may be found operatively serviceable.

The main element of the improved mechanism consists of a lifting device embodying the principles of the screw and having distinct spirally arranged downwardly inclined wings terminally spaced apart to form passages, and provided with outer bearing members specially arranged to serve in manifold capabilities and with efficiency in the general operation of the lifting element. The bearing members are projected above the upper surfaces of the downwardly inclined spirally arranged wings to form guards to retain sand, grit, or other abrading material on the wings and prevent such material from being centrifugally thrown against the adjacent wall of the casing or inclosure, and thereby materially reduce wear on the casing or inclosure. The upper edges of the guards have a downward inclination similar to that of the wings and assist in the lifting operation of the wings. The proportions of the parts of the lifting device or element are such that a slower movement of the operating mechanism as compared with devices of this nature heretofore constructed is permitted without in the least detracting from the lifting power of the element and with a constant prolongation of effectiveness of the operating mechanism and material saving in the expense of repair and reinstallation of such mechanism. The hub or center support of the lifting element is enlarged to such an extent as to relieve resistance as much as possible from the center of the element or adjacent to the periphery of the hub or support and counterbalance the inthrow or tendency to return of the liquid or material elevated to the center of the element, and also reduce the width of the wing or lifting element considerably from the center of the shaft to the outer edge of the said wing or element to arrive at the reduction of resistance desired and also increase the quantity of material elevated by decreasing the weight directly on an exposed surface of the wing and which would be the case where a greater width of wing was used. This latter operation ensues with material disadvantages in lifting devices of this character as now commonly constructed and embodying a reduced hub or center support and correspondingly extended wing area and results in imposing on the driving shaft or other device a correspondingly increased resistance which must be overcome by augmenting the speed of the driving mechanism for such shaft and reducing the life and durability of said mechanism. The proportions adopted in the present lifting element do not detract from the necessary speed of revolution between the hub and periphery of the lifting device or element, and in fact practical experience has demonstrated that such proportions or the enlargement of the hub with respect to the maximum diameter of the lifting device gives the same and even better results in the lifting operation than where a reduced hub or center support is used.

The main lifting element will be effective in its operation to practically elevate liquids or other material without the addition of attendant mechanisms, but to meet various contingencies, reduce the wear on the casing or inclosure to a minimum, and facilitate the elevating operation of the element, auxiliaries are provided, and consist primarily of a deflector frictionally held beneath the element and forming a centering bearing for the shaft of the latter, and having an essential operation in obstructing the whirl of the liquid or material raised adjacent to the underside of the element, especially where a plurality of the elements are used. A second effective auxiliary employed in some instances is a compensating tube or thimble which is adapted to correct irregularities in diameter of the casing or other inclosure in which the lifting element is disposed. It is well known that pump casings, tubes, or other cylindrical inclosures often embody irregularities in their structure, and to modify such discrepancies would entail a material expense and also render the lifting elements of the class under consideration less effective in their operation by failure of the lifting element to have a snug, rotatable engagement with the casing. By the use of the compensating tube or thimble which is accurately dressed, irregularities in the casing structure are overcome and a practical seat for the lifting element provided. To render the compensating tube or thimble fully practicable for its intended purpose it has an occluding means attached to its upper extremity above the lifting element located therein and consisting of any suitable packing or flexible material which is pressed outwardly firmly against the wall of the casing by the weight of liquid or material above the lifting element and liquid is prevented from entering or working into the joint between the tube or thimble and the casing and wear on the latter and the casing is thus obviated.

Other advantages and objects of the several features of construction will hereinafter more specifically appear, and to present the invention in practical form, a preferred embodiment thereof is illustrated in the accompanying drawings, in which,

Figure 1 is a top plan view of the lifting element embodying the features of the invention. Fig. 2 is a perspective view of the same. Fig. 3 is a section on the line 3—3, Fig. 1. Fig. 4 is a top plan view of a deflector adapted for use with the lifting element. Fig. 5 is an elevation of deflector. Fig. 6 is a detail elevation looking towards the face of one of the wings of the deflector and showing the mode of applying a bearing spring thereto. Fig. 7 is a sectional elevation of a pump casing or other inclosure and a portion of the operating mechanism for a shaft therein and illustrating the arrangement of a series of the lifting elements and deflectors with respect to the shaft and casing. Fig. 8 is a sectional elevation of a portion of the casing or other cylindrical inclosure, the lifting element and deflector, and a compensating tube or thimble. Fig. 9 is a sectional elevation of a portion of the casing or inclosure and shaft showing the lifting elements disposed in reverse position for conjoint operation.

Similar characters of reference are employed to indicate corresponding parts in the several views.

The numeral 1 designates the essential feature of the invention and consists of a lifting element or device embodying an enlarged central support or hub 2, oppositely disposed spirally arranged wings 3, having a downward inclination and an outer bearing member 4 on each wing, which is concentric with relation to the center support or hub 2. The wings 3 have flat working surfaces, and the bearing members 4 project above said surfaces to form guard flanges 5. The upper edges 6 of the guard flanges 5 incline equally in a downward direction with respect to the wings 3 and assist materially in the elevating operation of the wings with respect to the material above the element. As before indicated, the enlargement of the hub or center support 2 is a decidedly advantageous feature in that the width of the wing is reduced considered from the center of the shaft to the outer edge of the wing, which will decrease the surface resistance and also the dead resistance at the center of the lifting element or adjacent to the shaft, and consequently the working force or lifting operation of the element is uniformly preserved at a given speed of rotation of the element without requiring an increase of such speed, as in the case of a hub or center support of reduced diameter, and an increase in wing area. A further advantage in the adoption of the proportions of the lifting element, or the increase in diameter of the center support or hub is that the impelling strength or power of the element with respect to the liquid or material above the same will be practically uniform over the entire superficial area of the element. This latter advantage in the operation of the lifting element is due not only to the regularity of the elevation of the liquid or other material by the wings, but also to the material reduction of the inthrow or center return of the material or liquid raised resulting from centrifugal action and the corresponding coacting force. The proportionate differences in velocity of movement between the hub and the periphery of the element is also maintained, and furthermore, by the arrangement of the wings 3, as set forth, they have an increased velocity as well as a material value in the lifting operation. As clearly shown by Fig. 1, the wings 3 are of equal width throughout their length, and by this means the upper working surfaces thereof regularly and equally operate on the liquid or other material elevated. It will be understood, of course, that the maximum velocity of movement when the lifting element is in operation is resident in the bearing members and at about a central point of the wings considered with respect to their width the velocity is slightly less, and adjacent to the hub such velocity is further reduced, but the parts are so proportioned that the velocity of the wings is effectively applied in the lifting operation and therewith the enlarged hub or center support coöperates to reduce the dead resistance at the periphery of the hub or support to a minimum, as heretofore indicated. The guards 5 stand high enough above the upper working surfaces of the wings 3 to prevent contact or engagement of sand, grit or other abrading material that may be centrifugally thrown outwardly with the casing or the seat means for the lifting element which will be more fully hereinafter set forth. Therefore, in view of this function of the guard, the sand grit or other abrading material that is carried by the liquid elevated by the wings 3 is regularly forced upwardly with the liquid above the lifting element. Another advantage in the construction of the lifting element is that it has two intake points between the terminals of the wings with which the uniform width or radial extent of the wings throughout the length of the latter effectively coöperates. Incidentally, and from a structural standpoint, the enlargement of the hub or center support gives to the lifting device greater strength and durability.

As before indicated, one or a series of the lifting devices may be used, and the number employed will depend upon the work to be performed and the length of the casing or inclosure in which the said lifting devices are disposed. As shown by Fig. 7, a plurality of the lifting devices are applied to a shaft 7, which is centrally arranged and held in the casing or inclosure 8, the latter being shown with an outlet 9, and the shaft held by an upper supporting yoke 10, and having thereon a drive wheel or band pulley 11, or other analogous driving device. The shaft 7 extends centrally through the hubs 2 of the lifting elements, and the latter are suitably secured in positive position on the said shaft and have such diameter relative to the casing or inclosure as to cause the outer surfaces of the bearing members 4 to snugly fit within the casing, yet be free to rotate without undue friction or resistance. The shaft 7, through the medium of the driving wheel or pulley 11 is operated by a suitable motive means, such as an engine, and in the simplified operation of the lifting element or elements, the said shaft is set in motion and the liquid or other material to be elevated is forced upwardly through the casing or other inclosure through the outlet of the latter.

Where a plurality of lifting elements are used they conjointly operate in raising the liquid or other material to different elevations within the casing or inclosure, the successive lifting elements operating to force the liquid or other material upwardly by a cumulative disposition of the liquid or other material between the

several elements. It will be understood that the operation of the lifting elements in raising a liquid, particularly where a series of elements are used on the shaft, that a material whirl will be set up in the liquid due to the spiral arrangement of the wings 3, and though the several elements would practically operate to lift the liquid to various elevations within the casing under these conditions, yet the elevating operation would not be as effective in some instances without the addition of a coacting influence or means for breaking up the whirling motion of the liquid adjacent to the underside of the successive elements. A particular form of deflector has been devised and adapted for use in connection with the elements to obviate lessening of the efficiency of the elements due to the whirling motion of the liquid, and consists of a series of radial longitudinally dished blades 12, projecting from a hub or sleeve 13, the latter tapering regularly from its upper enlarged end to the lower smaller end thereof, as clearly shown by Fig. 7.

The hub or sleeve 13 has a bore 14 therethrough of greater diameter than the diameter of the shaft 7, so that the shaft will loosely rotate within the said hub or sleeve and yet always be held centrally with respect to the casing by the said hub or sleeve. In other words, the bore 14 is only slightly greater in diameter than the diameter of the shaft 7, to permit the deflector to be free of rotative operation with respect to the shaft. The deflector is held closely under the lifting element in each instance by a set collar 15, and to prevent the deflector from rotating one of the blades 12 has attached to one face thereof close to the outer edge a yielding friction device or element 16, which, in the present instance is torsionally twisted and projected at its intermediate portion beyond the outer edge of the blade to which it is attached.

The blade 12 carrying the spring device or element 16 is slightly shorter or of less radial extent than the remaining blades, and when the deflector is disposed in the casing the intermediate portion of the spring 16 engages the wall of the casing or inclosure and forces the outer edges of the remaining blades in close contact with the said wall, and thereby prevents the deflector from rotating. The blades 12 will be so proportioned as to radial extent and the intermediate portion of the spring 16 will have such projection that when the deflector is inserted in the casing or inclosure 8, the hub or sleeve 13 will be centrally positioned with respect to the casing and maintained in such position by the frictional contact of the blades with the wall of the latter, through the operation of the spring. Hence, the portions of the wall of the casing engaged by the blades will not be in the least injured, and if any friction at all is presented it will be between the hub or sleeve 13 and the shaft 7. The longitudinal curvature of the blades 12 will be in such direction as to be opposed to the intake openings of the lifting element with which they coöperate, and as the whirling liquid strikes the said blades it will be thrown or effectively projected upwardly to and over the wings 3 of the lifting element and cause the latter to have a greater advantage in lifting or taking up the liquid from below the same. The same operation of deflection adjacent to the underside of the lifting element can be effected by the arrangement shown by Fig. 9, wherein two lifting elements 16^a and 17 are used, the lower element 17 being secured to the end of a shaft 18 movably extending through a tubular shaft 19 attached to the element 16^a. The element 17 has its wings and intake passages in positions reverse to the similar parts of the element 16^a, and as the whirling liquid strikes the lower element 17, the whirling movement thereof is broken up and the liquid more effectively delivered or caused to engage the upper element 16^a.

The arrangement of the elements as shown by Fig. 9 is particularly adapted for short lifts, such as in irrigation systems or uses, ship pumps, and other pumping devices used in connection with liquid that is required to be elevated, at not too great an elevation.

Another efficient auxiliary if the operation of the lifting element consists in a compensating tube, thimble, or cylinder 20, which, in its primary use is adapted to correct the irregularities often found in the diameter of casings, tubes, and analogous devices. It is obvious that a casing or tube could not be straightened or dressed to render the same perfect in circular contour without incurring considerable expense which would be detrimental to the installation of a pumping apparatus, but the thimble, tube, or cylinder 20 can be dressed at a minimum cost and provide means for establishing a snug rotative fitting or seat for the lifting element. This compensating thimble, tube or cylinder 20 is clearly shown by Fig. 8, and in some instances may be used alone with the lifting element and tightly held within the casing without utilizing the deflector therewith, as heretofore described. Under these conditions the means for securing the thimble, tube or cylinder in place may be any of those well known in the several arts, such, for instance, as the simple shrinking method, under the influence of heat. It is preferred, however, that the thimble, tube or cylinder be used conjointly with the deflector, and for this purpose the upper portions of the blades 12 of said deflector are recessed or shouldered, as at 21, to form recesses or seats for the lower end of the said thimble or tube, suitable fastenings being employed to secure the portion of the thimble or tube engaging the blades to the latter. To render the thimble, tube, or cylinder more effective in its operation, and particularly to prevent water or other liquid from flowing back over the upper edge thereof and into the joint between the tube or thimble, and the casing wall, an occluding means 22 is employed, and may consist of any suitable material, sheet lead, leather, rubber, or a composition of materials adapted for the purpose. The occluding means or strip 22 has its lower edge secured against the inner wall of the thimble, tube or cylinder, as at 23, and projects high enough above the upper edge of the tube or thimble to permit it to be pressed outwardly against the wall of the casing or other inclosure by the weight of the liquid thereabove, and thus forming a tight liquid proof joint. This occluding means or packing device is especially useful to prevent leakage of the liquid between the tube, or thimble and the wall of the casing when the irregularity in the casing is not fully compensated for by the tube or thimble, and it will be observed in this connection that the occluding means or packing device is automatic in its disposition to arrive at the result sought.

From the standpoint of a secondary consideration as to the use of the thimble, tube, or cylinder, and strongly recommended in certain pumping operations, said tube or thimble and deflector, together with the occluding means or packing device, should be inserted in the casing after the greater portion of the sand or grit has disappeared, the apparatus or mechanism shown by Fig. 7 and including the lifting elements and deflectors alone being used in the first operation of clearing a well, it being understood in this substitution that the lifting elements and deflectors shown by Fig. 7 will be first withdrawn from the casing and replaced by the arrangement illustrated by Fig. 8.

Changes in the proportions, dimensions, and minor details may be resorted to without departing from the spirit of the invention.

Having thus described the invention, what is claimed as new, is:

1. In an elevating mechanism of the class set forth, the combination of a casing, a compensating tube or thimble inserted in the casing to take up irregularities in the structure of the latter, and having a flexible strip attached to the inner surface of the upper edge thereof and projected above the said edge and loose for contact with the inner surface of the casing above the said upper edge of the thimble. the said strip being forced outwardly against the inner surface of the casing by the material elevated through the tube or thimble, and thereby automatically covering the joint between the upper extremity of the said tube or thimble and the casing, a shaft extending centrally through the tube or thimble, and a lifting device secured on the shaft within the tube or thimble and located below the point of attachment of the said flexible strip through the tube or thimble, the lifting device having frictional contact with the inner surface of the tube or thimble.

2. In an elevating mechanism of the class set forth, an inclosing casing, a shaft rotatably extending therethrough, a lifting element fixed on the shaft, a deflector surrounding the shaft on the fixed element and provided with longitudinally disposed dished blades, the deflector having portions of the blades thereof directly engaging the inner surface of the casing, and yielding means on the deflector for frictionally holding and centering the same within the casing and preventing rotation thereof.

3. In an elevating mechanism of the class set forth, the combination of a casing, a shaft rotatably extending therethrough, a plurality of lifting elements carried on the shaft, and a deflector arranged adjacent to the lower side of each lifting element and held solely in a movable position by frictional contact of portions thereof directly with the casing, each deflector having the shaft extending solely therethrough and also provided with a series of longitudinally disposed dished blades.

4. In an elevating mechanism of the class set forth, the combination of a casing, of a shaft rotatably extending therethrough, a lifting element secured on the shaft, a deflector arranged closely under the lifting element and through which the shaft loosely extends, said deflector having a series of longitudinally disposed dished blades, and a yielding frictional means carried at the outer end of one of the blades to center and hold the deflector immovable in the casing.

5. In an elevating mechanism of the class set forth, the combination of a casing, a shaft rotatably extending therethrough, a lifting element fixed on the shaft to rotate therewith, and an immovable deflector arranged under the lifting element and having a downwardly tapered hub, the hub of the said deflector having the shaft loosely extending therethrough.

6. In an elevating mechanism of the class set forth, the combination of a casing, a shaft rotatably extending therethrough, a plurality of lifting elements secured on the shaft, and an immovable deflector arranged adjacent to the lower side of each lifting element, each deflector having the shaft extending loosely therethrough and also provided with a series of longitudinally disposed dished blades.

7. In an elevating mechanism of the class set forth, the combination of a casing, a rotatable shaft extending through the casing, a lifting element secured to the shaft, and a deflector arranged adjacent to one side of the lifting element and provided with a hub tapering towards the end thereof farthest from the lifting element and also with longitudinally disposed dished blades.

8. In an elevating mechanism of the class set forth, the combination with an inclosing casing, of a shaft rotatably extending through said casing, a lifting element secured on the shaft, a deflector arranged adjacent to one side of the lifting element and through which the shaft loosely extends, said deflector having a series of longitudinally dished blades, and a hub tapering towards the end thereof farthest from the lifting element, and a yielding frictional device carried at the outer end of one of the blades to bear against the wall of the casing and center the deflector and also hold the latter immovable, the blade having the yielding frictional device attached thereto being of less radial extent than the remaining blades.

9. In an elevating mechanism of the class set forth, a casing, a shaft extending therethrough, a tube or thimble inserted within the casing, a lifting element fixed on the shaft and located within the tube or thimble, and a deflector having the upper portion thereof cut away to form a shouldered recess to receive the lower extremity of the thimble and dispose the said deflector adjacent to the lifting element, the deflector having blades radially projecting therefrom, and the shaft loosely extending therethrough.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN D. LOWRY.

Witnesses:
JAMES L. NORRIS,
FRANK O. PARKER.