

C. A. BUNKER.
 MATERIAL EXCAVATOR AND SEPARATOR FOR OIL WELLS.
 APPLICATION FILED APR. 10, 1920.

1,362,775.

Patented Dec. 21, 1920.

2 SHEETS—SHEET 1.

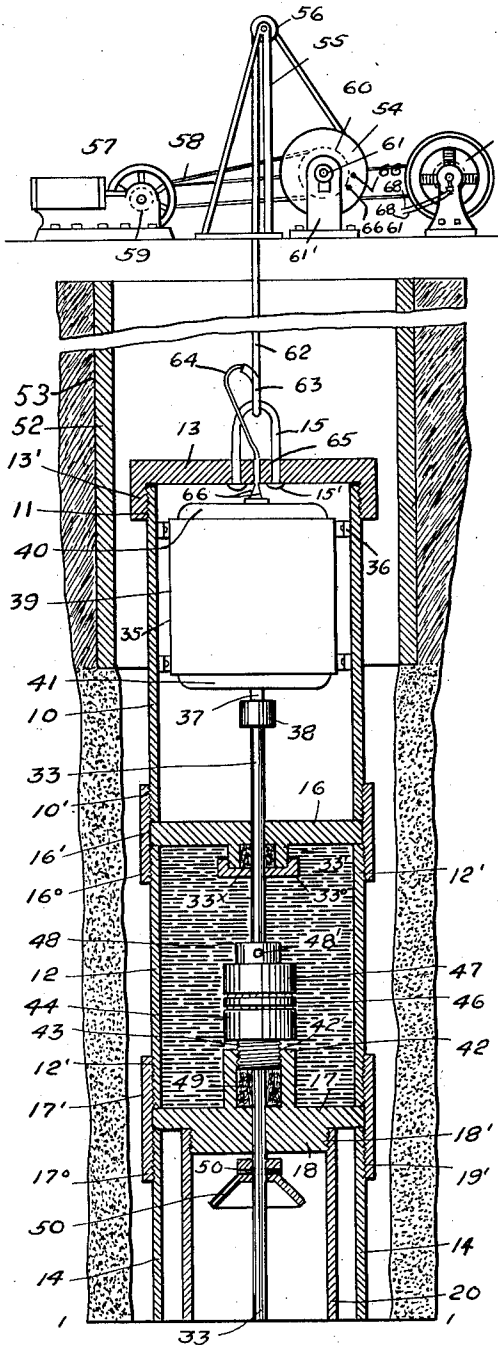


Fig. 1

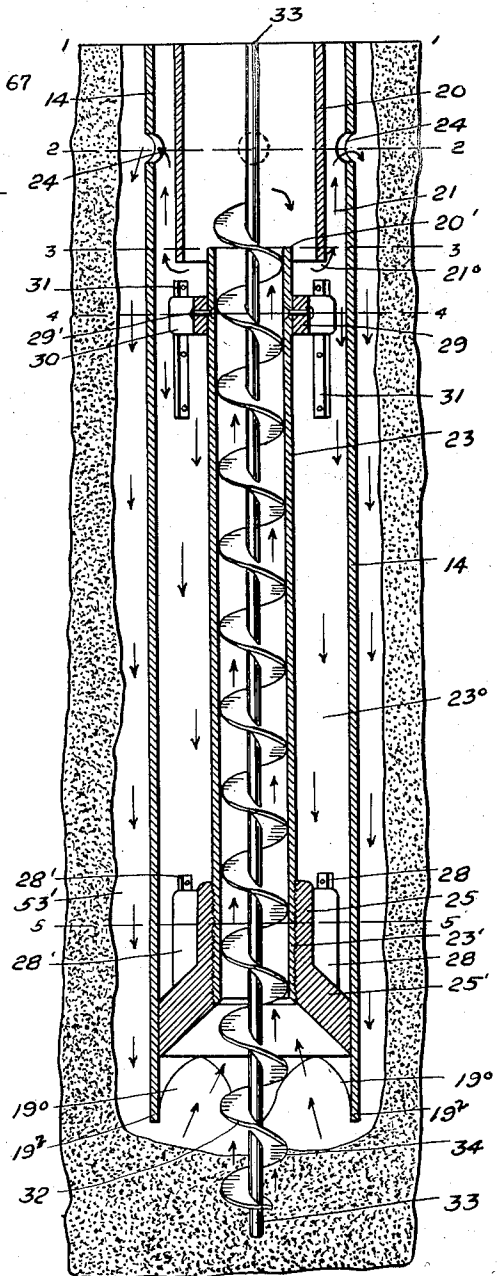


Fig. 1 A INVENTOR
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Richard Manning ATTORNEY

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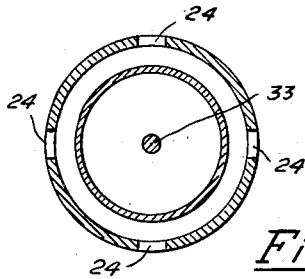


Fig. 2

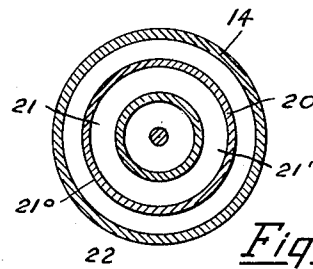


Fig. 3

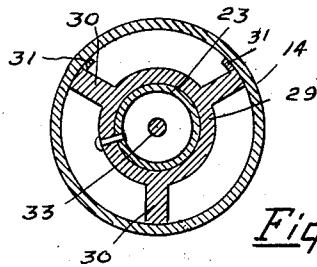


Fig. 4

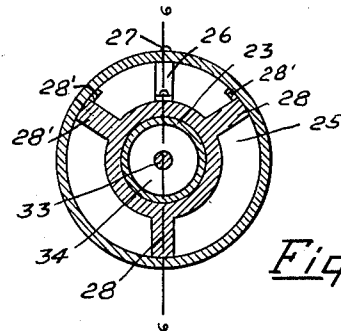


Fig. 5

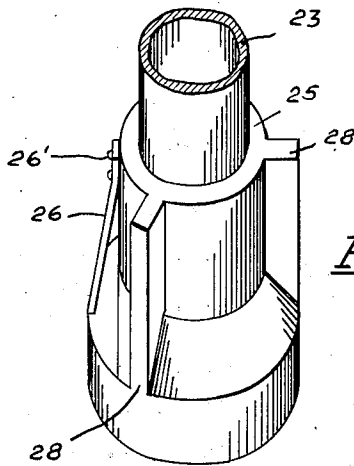


Fig. 7

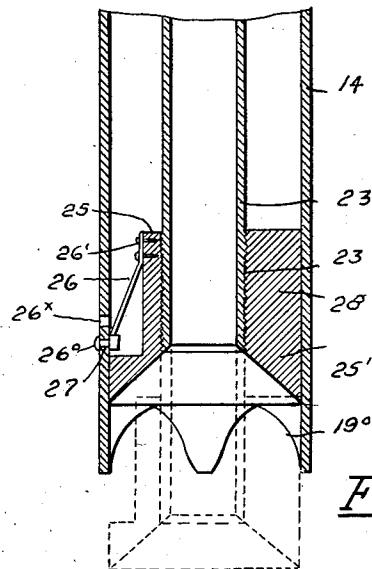


Fig. 6

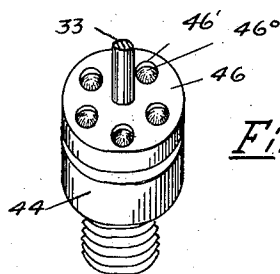


Fig. 8

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UNITED STATES PATENT OFFICE.

CHARLES A. BUNKER, OF KANSAS CITY, MISSOURI.

MATERIAL EXCAVATOR AND SEPARATOR FOR OIL-WELLS.

1,362,775.

Specification of Letters Patent.

Patented Dec. 21, 1920.

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To all whom it may concern:

Be it known that I, CHARLES A. BUNKER, a citizen of the United States of America, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Material Excavators and Separators for Oil-Wells; and I do hereby declare that the following is a full, clear, and exact description of the invention, reference being had to the accompanying drawings, forming a part of this specification.

The cessation of the flow of the oil in oil producing wells is caused principally by an accumulation of sand in the pocket below the well casing, the accumulation being the result of the caving of the sand around the casing, or the sediment carried in by the oil, the only action of the oil pump being upon the accumulation of the oil above the accumulation of sand.

The object of the invention is:

First, to effect the separation of the sand from the oil and water as a preparatory step in the well and then remove the sand from the well to expose the oil, sand or rock prior to the stimulation of the flow of the oil, or the application of the oil pump.

Second, to loosen the sand and convey the material to a separating receptacle during the sand excavatory movements.

Third, to afford a system of separation for separating disintegrated ores in ore flotation, and

Fourth, to combine the protected motor operatively with the excavating devices. The invention consists in the novel material excavating and separating apparatus and the construction and combination of parts, such as will be first fully described and then specifically pointed out in the claims.

In the drawings:

Figure 1 and Fig. 1^A are vertical sectional views of the lower portions or pocket of an oil well in two upper and lower sections respectively, the former showing the lower end of the well casing and also showing the novel sand and storage cylinder, the excavator and separator in two upper and lower sectional parts, respectively, the former showing the protected motor and its chamber and the latter part showing the separator and sand excavator.

Fig. 2 is a horizontal sectional view of the sand storing cylinder or casing and the cas-

ing of the separator taken on the line 2—2 on Fig. 1^A.

Fig. 3 is a horizontal sectional view taken through the adjacent portions of the sand storage casing and excavator casings taken upon the line 3—3 on Fig. 1^A.

Fig. 4 is a horizontal sectional view taken through storage cylinder and excavator tubular casing on the line 4—4 on Fig. 1^A.

Fig. 5 is a horizontal view taken through the storage cylinder and excavator tubular casing on the line 5—5 on Fig. 1^A.

Fig. 6 is a detail vertical sectional view of the lower portion of the sand storage and excavator tubular casings at right angles to that seen in Fig. 1^A, showing one of the spring retainers for supporting the excavator tubular casing in position within the sand storage casing during the operation, also showing in dotted lines the spring retainer detached and the excavator tube dropped below the line of the lower end of the sand storage casing for the discharge of the accumulated sand within the excavator casing.

Fig. 7 is a detail isometric view of a portion of the lower end of the material conveying tube and the closure.

Fig. 8 is a detail view of the thrust bearing between the collars on the elevator shaft showing the balls.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

The apparatus constructed consists of a tubular power inclosing hermetical case 10, a tubular lubricating hermetical case 12, and the material storing casing 14, carrying the excavating, conveying and separating members.

The side member of the tubular case 10, at its upper end is externally screw threaded at 11, and fitted to said end is an internally screw threaded flange 13', of the cap 13, closing said upper end of the case.

Through the central portion of the cap extends the two prongs of a staple, 15, the ends being upset at 15', on the inner surface of the cap.

The lower end portion of the side member of case 10, is also externally screw threaded at 10', and closing said lower end of the case is a flat bottom plate 16, having an annular internally screw threaded coupling 16', one portion extending upwardly and

fitted to the screw threaded portion of the lower portion of case 10, and the other portion 16°, extending downward an equal distance below the line of the lower surface of the bottom plate 16.

The upper portion of the side member of the tubular case 12, is externally screw threaded at 12', and said end fitted to the externally screw threaded flange 16°, on the bottom plate 16.

The lower end of the side member of the tubular case 12, is screw threaded at 12', and closing said lower end of the case is a flat bottom plate 17, connected with which plate is an internally screw threaded coupling, 17', one portion extending upwardly and fitted to the screw threaded lower portion 12' of the case 12.

Upon the lower surface of the bottom plate 17, and formed integrally therewith, is a downward annular extension or cap 18, smaller in circumference than the plate 17, and screw threaded at 18'. The outer material storing shell or casing of the apparatus is in the form of and consists of a hollow cylinder 14, of the same circumference as the hermetical case 12, its upper end being externally screw threaded at 19' and fitted to the downwardly extended screw threaded portion 17°, of the coupling 17'.

The lower end of the hollow cylinder or casing 14, extends downwardly a considerable distance and forms a receptacle for holding a body of sand.

The lower portion of the storage casing or cylinder 14, is cut away to form semi-circular openings 19°, for the passage of the water and sand into the lower portion of the casing which is also open, the portion 19°, forming anchors and preventing a rotation of the cylinder. Within the upper end portion of the material storing casing 14, is a tubular material separating receiver 20, smaller in circumference than the casing or cylinder 14, its upper end portion being internally screw threaded and secured to the screw threaded portion 18', of the extension or cap 18, on the bottom plate 17, which cap closes the upper end of the tubular receiver 20. The lower end of the receiver 20, extends downwardly approximately one fifth the distance from the upper to the lower end of the hollow cylinder 14.

Within the lower end of the receiver 20, is located the upper end of a material conveying tube 23, an annular opening 21, extending around the tube and between said tube and the receiver. The lower end of the tube extends downwardly to a position a short distance upwardly from the line of the lower end of the hollow casing 14. In the side of the hollow cylinder 14, a short distance upwardly from the line of the lower end of the receiver 20, are siphonage

openings 24, for the escape of the water during the separation process, these openings being spaced equal distances apart in the direction of the circumference of the cylinder, see Fig. 2. The lower portion of the receiver 20 and the upper portion of the tube 23, form a trap for the liquid and material within the case.

The space 23°, between the tube 23, and the inner surface of the outer casing or cylinder 14, forms the receptacle for storing the sand. Upon the lower screw threaded end 23', of the tube 23, is fitted an internal screw threaded sleeve 25, from the outer surface and lower end of which sleeve extends downwardly a convex plate or closure 25', to the lower portion of the hollow cylinder 14, its outer edge fitting movably against the inner surface of the said cylinder.

With the sleeve 25, is connected by suitable rivets 26', the upper end of a spring plate 26, the lower end of the plate extending downwardly toward the convex closure 25', and resting upon the square head of pin 26°, which pin extends through an opening 27, in the side of the hollow cylinder 14 and is riveted or upset on the outer surface of the cylinder, and prevents movement of the conveyer tube until the sand is to be discharged as further described. Upon the sleeve 25, are vertical guide flanges 28, and upon the inner side of the casing 14, are secured the vertical guide plates 28'.

Above the opening 27, in the side of the cylinder or casing 14, is a separate opening 26°, through which a tool is inserted to force backward spring plate 26, and release the spring plate.

In order to prevent a turning movement of the tube 23, upon the upper end 20', of the material conveying tube 23, is a collar 29, secured by rivets 29', to the tube, said collar having radial flanges 30, which come into contact with the inner surface of the outer casing or cylinder 14, see Fig. 4. Upon the inner surface of the hollow cylinder 14, are secured the vertical guide strips 31, which prevent a turning movement of the flanges.

Within the material conveying tube 23, is an auger and conveyer 32, which is employed to loosen the sand and at the same time act as a conveyer, for the sand upwardly in the tube 23. The auger as shown consists of a vertical shaft 33, within the axial center of the tube, the lower end of which shaft extends downwardly a short distance below the line of the lower end of the hollow cylinder 14, and around which shaft extends spirally, the excavating and conveying spiral flange 34, which begins at the lower end of shaft 32, and extends upwardly a short distance above the upper end of the tube 23, within the separating re-

ceptacle 20, the outer edge of the spiral flange coming nearly into contact with the inner surface of the tube 23.

The upper end of the shaft 33, extends upwardly through the receptacle 20, thence through the bottom plate 17, to the case 12, thence through the bottom plate 16, to the case 10, and to a position midway between the top and bottom plates 13, and 16 respectively of case 10.

35 indicates an electric motor of an approved type arranged within the case 10, immediately below the top member 13. Angle plates 36, on the motor casing 39 are connected rigidly with the inner side of case 10. The driving shaft 37, of the motor is in a vertical position and is coupled by the joint coupling 38, with the upper end of the auger shaft 33.

Above and below the outer case 39, are shown the upper and lower end fields 40 and 41 respectively. The case 39 serves to prevent dirt and liquid impairing the operation of the motor.

In order to relieve the weight of the motor and compensate for the upward thrust upon the auger 32, during an excavating movement within the case 12, and connected rigidly with the upper surface of the bottom plate, is a stuffing box 42, extending around shaft 33, and internally screw threaded at 42'. Within the box is fitted a screw threaded plug 43, having a head 44, larger in circumference than the plug through which head and plug the shaft extends.

Above the upper surface of cap 44, and mounted on shaft 33 is a plate 46, having openings 46' in which openings are bearing balls 46°, see Fig. 8. Above the balls 46°, and mounted on said shaft 33, is a collar 47, having a neck 48, connected rigidly therewith, a pin 48', extending through said neck into shaft 33. Within the stuffing box 42, is a packing 49.

In the upper portion of case 12 and secured to the lower surface of the bottom plate 16, to case 10, is a stuffing box 33', extending around shaft 33, and externally screw threaded, and provided with a flanged screw threaded cap 33°, fitted to said stuffing box. Within the box is a packing 33°.

The case 12 is filled with lubricating oil. Within the separating receptacle 20, and extending around shaft 33, is a convex collar 50, which is located near the opening for shaft 33, and secured by a pin 50', which collar serves to protect the shaft opening from the sand and the wear on the shaft and also forms the upper thrust resistance to the shaft 33.

53 indicates the well shaft and 52 the well casing.

53' indicates the pocket or basin between the lower end of the well casing and the oil sand or rock.

At the upper end of the well shaft and upon the surface of the ground is a cable winding drum 54, and a standard 55, at the upper end of which standard is a pulley 56.

57 indicates a steam engine and 58 an endless band which extends over a band pulley 59, on the driving shaft of the engine and also over the band wheel 60, on the drum shaft 61—which shaft is mounted rotatably on the standards 61'.

62 indicates a hoisting cable for the excavating, storing and separating apparatus described which is looped over the staple 15, on the top plate 13 of the motor inclosing case 10, at one end and said loop secured by a band 63. This cable carries within a casing 64, surrounding said cable an insulated cord which extends through a small opening 65, in the cap 13, from which cord electric conducting wires 66—66 extend to the electric motor 35. The upper end of the cable 62, is wound upon the drum 54, in coils of an aggregate length more than equal to the depth of the well. The cable is wound on the drum by the power of the engine upon a winding movement being imparted to the drum 54. The free end of the cable is fastened to the drum 54, and the free ends of the conducting wires 66—66 extend through the sides of the drum. After the apparatus is lowered into the well the drum is stationary and the said wires 66—66 are connected to wires 68—68 leading outwardly from the generator 67, which generator is also operated by the engine 57.

In operation the apparatus is lowered by means of the cable 62, within the casing 52, of the well 53, until the lower end of the hollow cylinder or casing 14, come into contact with the material to be excavated.

The wires 66—66 being now connected with the wires 68—68, from the generator 67, the motor 35 within case 10, is energized and rotary movement from the shaft of the motor communicated to shaft 33 of the auger and the sand is loosened and carried upwardly in tube 23 with the water in suspension within the separating case 20, where the liquid and material is trapped and passes through the annular opening 21°, extending around tube 23, thence through the spaces between the radial flanges 30, on the collar 29, thence downwardly as indicated by the arrows, between the outer surfaces of the tube 23, and the inner surface of the hollow cylinder 14, and lodging upon the closure 25', to said cylinder, at which point the sand accumulates in a body. During the deposit of the sand and water upon the closure the water rises to the top and this continues until the space 23°, is filled at which time the water level in the receiver 20, remains stationary; the surplus water being siphoned off through the open-

ings 24, in the case 14, the circuit of the water being continued through the openings 19°, up the tube 23, carrying with it the loose sand, the lower end of the casing 14, resting at all times on the sand at the bottom of the well. The auger revolves continuously during the excavation while the points 19' or the lower end of the cylinder 14, keeps the cylinder from any rotary movement contrary to the direction of movement of the auger, while the auger is boring into the sand and at the same time causes an agitation of the material.

When the space between the tube 23 and the hollow cylinder 14, is filled by the sand, the wires 68—68 on the generator are disconnected from the wires 66—66 on the drum and the drum 54, is rotated to wind the cable 62 on the drum, and the apparatus is raised to the surface of the ground. The spring catch 26, is now released by the insertion of a tool through opening 26*, and the tube 23, falls under the weight of the sand upon the ground carrying with it the closure 25' which is removed from casing 14, into the position seen in Fig. 6 and the sand is discharged upon the ground from the casing. The tube and closure are then replaced and the apparatus is in readiness for lowering into the well for a repeated operation.

As a separator for other uses and systems, the apparatus may be introduced within any ore holding tank or basin and the agitation and separating of ore and lime water or with water and oil and complete ore separation effected with such metallic bases in solution as are commonly used for flotation, at the same time subjecting the oleaginous ores to constant circulation and then removing the metals precipitated. Such modifications of the invention may be employed as are within the scope of the appended claims.

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

1. In a material elevator and separator, the combination with the outer casing having a top member, of a material separating receiver, having material separating openings, a tube extending within said receiver, means for forcing the material and liquid through the tube, and means whereby a trap is formed for the material and liquid within the casing at the bottom of the receiver and the upper portion of the tube for a separation process.

2. In a material elevator and separator for oil wells, the combination with the outer casing having a top member, of a material separating receiver having material separating openings and a removable closure for the casing below the receiver

and means for conveying the material past the closure of the material separating receiver.

3. In a material excavator and separator for oil wells the combination with an outer casing having a top member, of a material separating receiver within said casing, having material separating openings, a tube leading upwardly within said receiver and a removable closure for the lower end of said outer casing extending from said tube, and a material excavating device within the said tube having a discharging portion extending upwardly in the direction of said receiver.

4. In a material elevator for oil wells comprising an outer casing having a top member, and a tube within the said casing having discharge openings, a closure between said tube and casing, means for elevating the material and discharging it upon the closure, and means for opening the closure and discharging the material.

5. In a material elevator for oil wells, the combination with the outer casing having a top member, and with a receiver for the material having material separating openings, of a material conveying tube, means for forcing the material up the tube within the material separating receiver, and means for siphoning the liquid within the receiver through the outer casing.

6. In a material elevating and separating apparatus, the combination with the outer casing having a top member and a material separating receiver having material separating openings, of a tube within said casing having its upper end leading to the receiver a closure at the lower end of said tube extending to the inner side of said outer casing, a rotary shaft within said tube, and a material elevating spiral flange on said shaft.

7. In a material excavating and separating apparatus the combination with the outer casing having a top member and with a receiver, for the material having material separating openings, and with a material conveying tube leading within said opening to said receiver, of a sleeve on its lower end and a closure to said cylinder upon said sleeve, and means for securing said sleeve removably upon said tube.

8. In a material excavating and separating apparatus the combination with an outer casing having a top member, a receiver for the material having material separating openings within said outer casing and a material conveying tube within said casing leading to said receiver having an external screw threaded lower end, of an internally screw threaded sleeve on said end and a closure for said outer casing carried by said sleeve.

9. In a material elevating and separating apparatus the combination with an outer casing having a top member and with a receiver for the material within said casing
 5 having a material separating opening in the bottom of said receiver, of a material conducting tube having its upper end extending upwardly within the said openings, a removable sleeve on the lower end of said
 10 tube, and a closure for the lower portion of said outer casing carried by said sleeve.

10. A material excavating and separating apparatus, comprising an outer casing having a top member, a material separating receiver within said casing, connected there-
 15 with and an excavator tube having its upper end leading within said receiver, said receiver having a material separating opening in the bottom thereof co-axial to said
 20 tube, a material excavating and conveying auger within said tube and extending below said tube in one direction and within said material separating receiver in the other
 25 shaft within said casing connected with said auger, a removable closure on the end of said tube for the lower portion of said outer casing; said casing having openings
 30 for the siphonage of the water above the line of the outlet of the excavator tube within said material separating receiver.

11. In excavating apparatus for oil wells, the combination with a material storing outer casing, having a top member provided
 35 with a shaft opening and with a receiver within said casing having an opening for the inlet and exit of the material and with a rotary shaft extending through said receiver, and with means on said shaft for
 40 excavating and conveying the material to said receiver, of a device on said shaft for

protecting the shaft opening in the top member from the material.

12. In a material excavating apparatus, the combination with the outer casing hav- 45
 ing a top member, of a removable material conveying tube within said casing and a closure for the lower end of said casing upon said tube, and releasable means sup-
 50 porting said tube within the said casing.

13. In a material excavating apparatus, the combination with the outer casing for receiving the excavated material, of a tube for conveying the material upwardly within
 the casing, and a closure upon said tube for 55
 the lower portion of said casing, means for excavating and conveying the material within said tube, and means for supporting said tube in a releasable position within the
 60 casing.

14. In a material excavating apparatus, the combination with an outer casing for receiving the excavated material having a top member, of a material conveying tube
 within said casing, a collar upon its upper 65
 end, guiding devices for said collar upon said casing, means for excavating and conveying the excavated material within said tube and a closure for the lower end of said casing and a releasable securing device for
 70 said closure engaging with said casing.

15. The combination in a material excavating apparatus with the outer casing and with a closure at its lower end of an excavating auger within the casing extending 75
 through said closure, means for imparting rotary motion to said auger, and downward extensions upon the lower end of said casing adapted to anchor the casing from a counter rotation to the direction of move- 80
 ment of said auger.

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