

Feb. 21, 1939.

C. W. MILLER

2,147,663

METHOD OF AND APPARATUS FOR HANDLING LOOSE MATERIAL

Filed Feb. 18, 1937

3 Sheets-Sheet 1

Fig. 1.

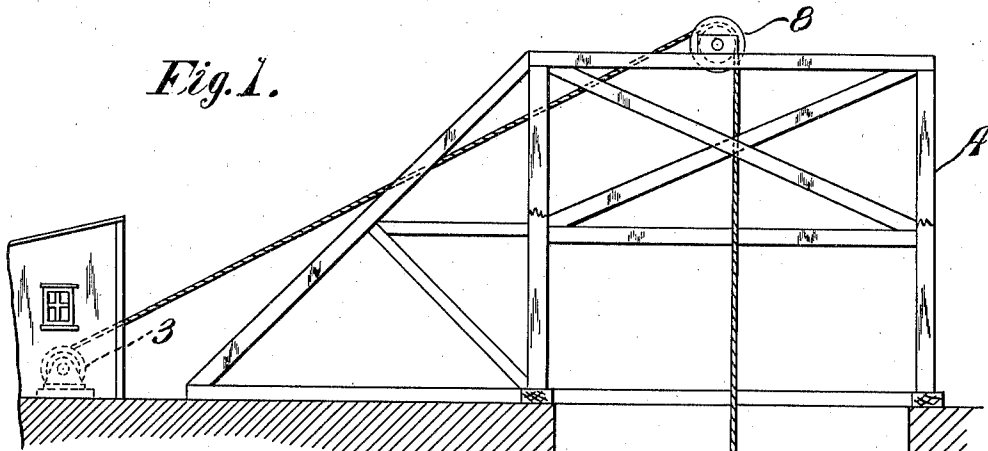


Fig. 2.

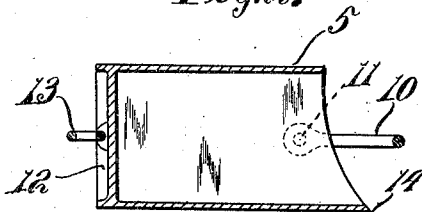
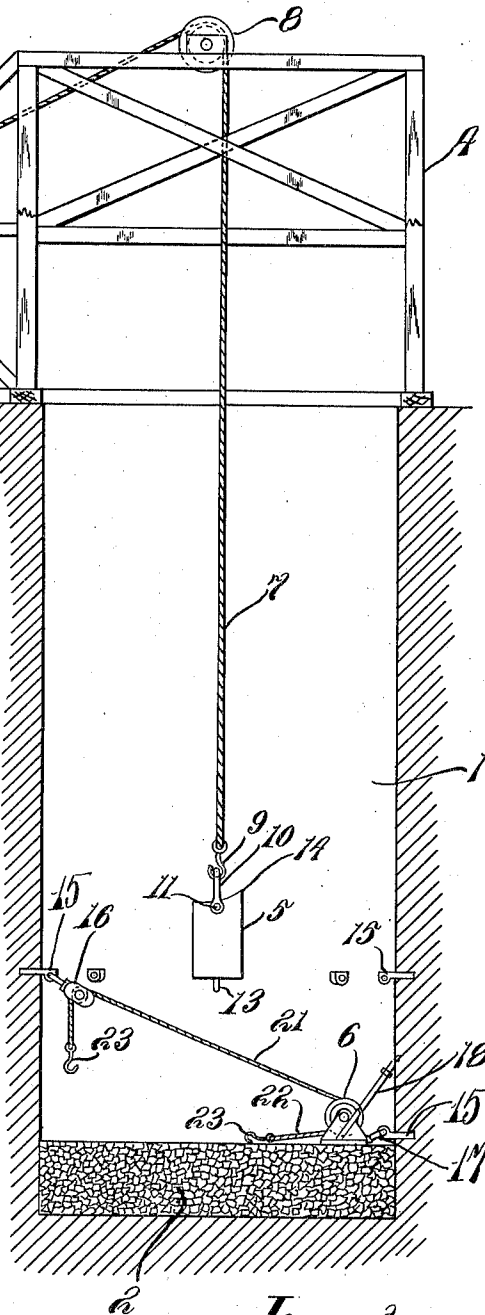
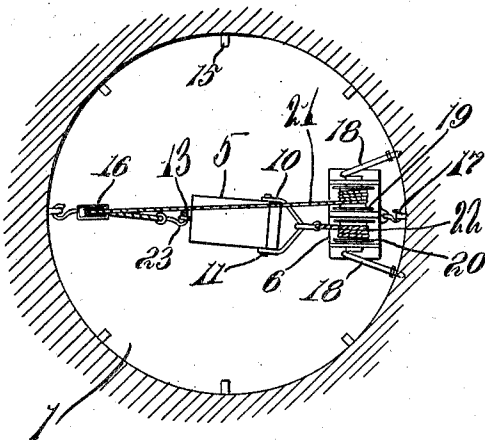


Fig. 3.



Inventor:
Clifton W. Miller.
by Louis A. Munson
Att'y.

Feb. 21, 1939.

C. W. MILLER

2,147,663

METHOD OF AND APPARATUS FOR HANDLING LOOSE MATERIAL

Filed Feb. 18, 1937

3 Sheets-Sheet 2

Fig. 4.

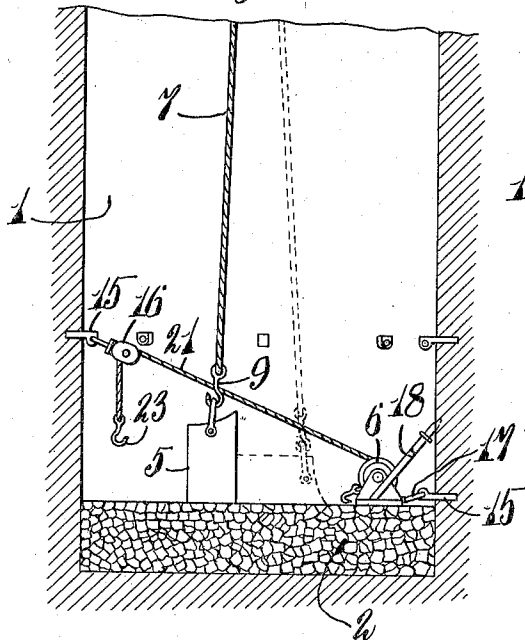


Fig. 5.

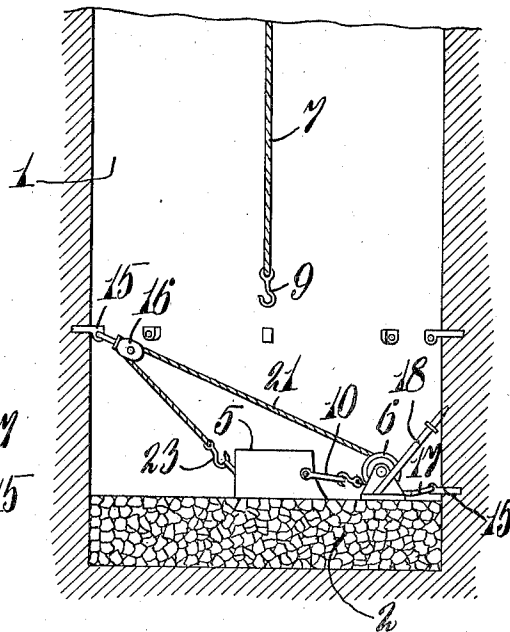


Fig. 6.

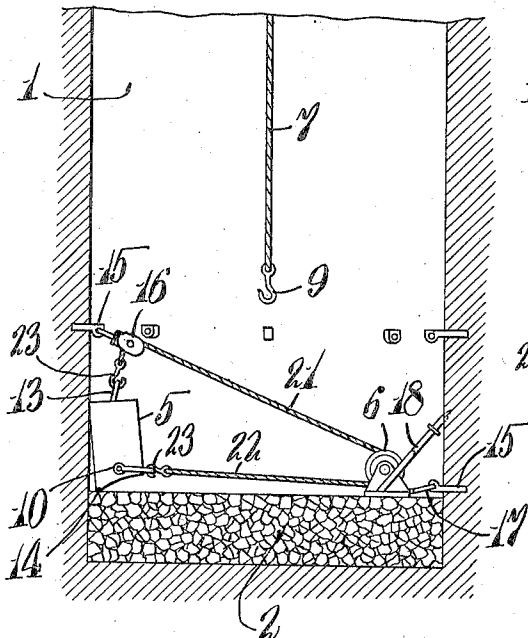
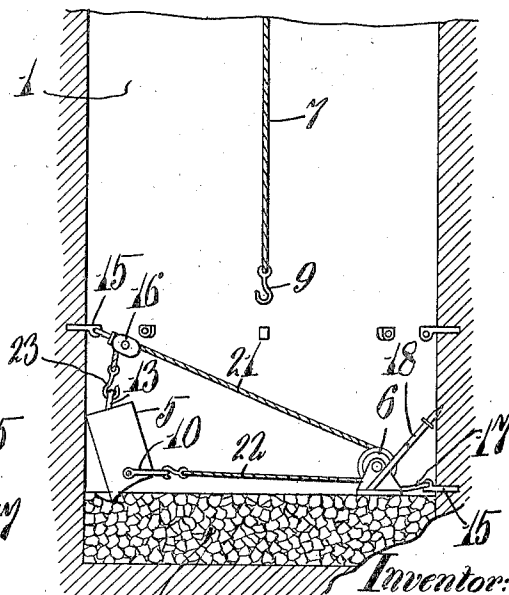


Fig. 7.



Inventor:
J. Clifton W. Miller.
by Louis A. Maxson.
Att'y.

Feb. 21, 1939.

C. W. MILLER

2,147,663

METHOD OF AND APPARATUS FOR HANDLING LOOSE MATERIAL

Filed Feb. 18, 1937

3 Sheets-Sheet 3

Fig. 8.

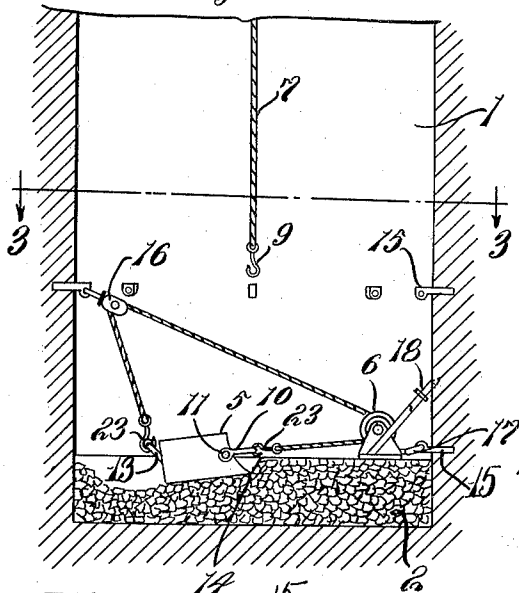


Fig. 9.

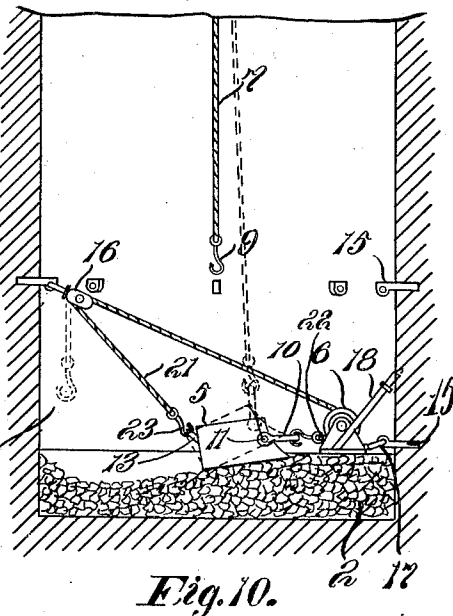


Fig. 11.

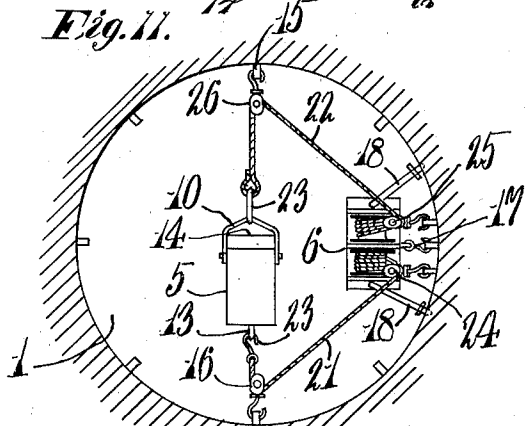


Fig. 10.

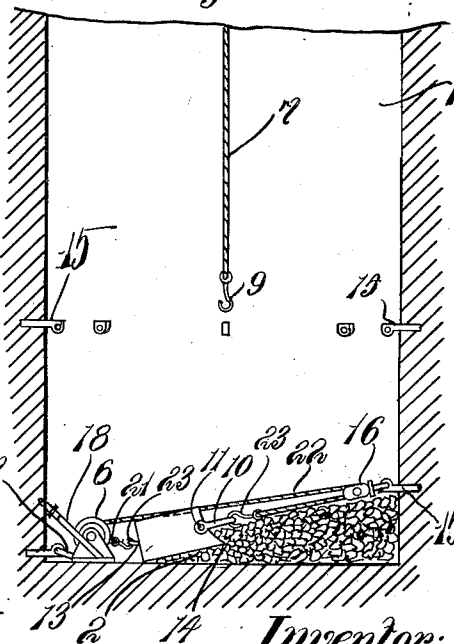
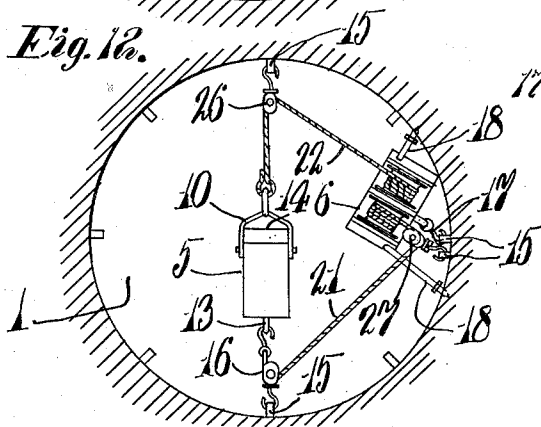


Fig. 12.



Inventor:
Clifton W. Miller.
By Louis A. Maxson.
Att'y.

UNITED STATES PATENT OFFICE

2,147,663

METHOD OF AND APPARATUS FOR HANDLING LOOSE MATERIAL

Clifton W. Miller, New York, N. Y., assignor to
Sullivan Machinery Company, a corporation of
Massachusetts

Application February 18, 1937, Serial No. 126,346

9 Claims. (Cl. 214—120)

This invention relates to methods of and apparatus for handling loose material, and more particularly to improved methods of and apparatus especially adapted for tunnel work such as shaft sinking, for loading and removing the excavated material, such as debris commonly known as "muck", from the bottom of a shaft.

In shafts connecting with horizontal, or substantially horizontal underground workings such as tunnels, haulages, cross cuts, drifts, drives, etc., in accordance with modern practice, a number of headings may be advanced simultaneously, and a number of shafts may connect the headings with the ground surface to obtain entrance to the headings and to provide passages for the removal of debris from the heading faces. During the sinking of the shafts, the excavated material, that is, debris such as loose rock and dirt commonly known as "muck", must be removed as sinking of the shaft progresses, and, prior to this invention, the muck was usually manually loaded into a receptacle, such as a hoisting bucket, and hoisted or otherwise raised to the ground surface—an extremely laborious task, necessitating manual lifting of the muck into the receptacle by means of shovels.

An object of the present invention is to provide improved methods of and apparatus for handling loose material. Another object is to provide an improved method of and apparatus for loading and removing the debris, such as loose rock and dirt commonly known as "muck", from the bottom of the shaft during the sinking of the shaft in tunnel work, whereby the laborious task of manually loading the "muck" is substantially eliminated.

A further object is to provide an improved method of and apparatus for scraping and loading the muck from a shaft bottom by means of a hoist operated scraper apparatus located at the bottom of the shaft. Yet another object is to provide an improved combined hoisting bucket and scraper. A still further object is to provide an improved apparatus for controlling and handling the scraper bucket during the scraper operation. Another object is to provide an improved apparatus for scraping and loading the muck from the bottom of a shaft, the scraper operated by a hoist located at the shaft bottom, together with improved means for controlling and guiding the scraper during the scraping operation, and the scraper hoisted from the shaft by means of the cable of the surface hoist. Other uses and advantages of the invention will, however, hereinafter more fully appear.

In the accompanying drawings there are shown for purposes of illustration one form and two modifications which the invention may assume in practice.

In these drawings,—

Fig. 1 is a somewhat diagrammatic, vertical sectional view through a shaft, showing the preferred illustrative form of the improved material handling apparatus.

Fig. 2 is a detail sectional view illustrating the combined scraper and hoisting bucket.

Fig. 3 is a horizontal sectional view taken on line 3—3 of Fig. 8.

Figs. 4 to 10, inclusive, are somewhat diagrammatic, fragmentary, vertical sectional views taken through the lower portion of the shaft shown in Fig. 1, illustrating the different steps in the improved method of use of the material handling apparatus.

Figs. 11 and 12 are cross sectional views similar to Fig. 3, showing modified arrangements of the hoist at the shaft bottom.

In this illustrative embodiment of the invention, the reference character 1 designates the shaft, 2 the debris or so-called "muck" on the shaft bottom, 3 the surface or shaft hoist, 4 the head-structure at the top of the shaft, 5 the combined scraper and hoisting bucket and 6 the double drum hoist at the bottom of the shaft. The hoisting cable 7 of the hoist 3 extends from its winding drum around a top sheave 8 supported by the head structure above the shaft, and the drop line of the cable carries a hook or other form of attaching means 9. The cable hook or attaching means 9 is attachable to a bail 10 on the scraper bucket 5. As shown in Fig. 2, the scraper bucket 5 is of generally rectangular box-like form having closed sides and end and the bail 10 swivelly secured thereto at 11, and provided with a recessed bottom 12 to which is pivotally secured an eye-link 13, the latter, as the bucket is lowered in an endwise position on the shaft bottom, folding up within the recess on the bottom of the bucket so that the bucket rests firmly on its end. One side of the open end of the bucket is formed with a penetrating edge 14 so that the bucket may act as a scraper when it is turned on one side, and this penetrating edge may be either straight or serrated in a well known manner. Secured as in holes drilled in the walls of the shaft at different radially located points, are wedge clamps or so-called eye-wedges 15 of a conventional form, and a pulley block 16 provided with a hook, or other form of attaching means, is attachable within an open-

ing on one of the wedge clamps in the manner shown, while the hoist 6 is held in position by means of a connecting element, herein a hook 17, to another of the eye-wedges, and the hoist is held in position on the shaft bottom by wall jacks 18. The double drum hoist 6 is of a conventional form and comprises relatively rotatable winding drums 19 and 20 independently controlled and driven and having respectively wound thereon cables 21 and 22 provided at their free ends with hooks 23 adapted for attachment to the bottom eye-link 13 and swiveled bail 10, respectively, of the scraper bucket. The double drum hoist is located near the shaft wall at one side of the shaft, and the pulley block 16 is secured to the shaft wall at a directly opposite point in the manner shown in Fig. 3. In a modification shown in Fig. 11 the double drum hoist 6 is arranged at one side of the shaft in the manner shown, and the cables 21 and 22 are extended around guide sheaves 24 and 25 located near the shaft wall, and the cable 21 passes around the pulley of the pulley block 16, while the cable 22 passes around a pulley block 26 attached to a wedge clamp located on the shaft wall directly opposite from the pulley block 16. In Fig. 12 the double drum hoist is located at one side of the shaft wall, and the cable 22 extends directly from its winding drum around the pulley of the pulley block 26, while the cable 21 extends from its drum around a guide sheave 27 to the pulley of the pulley block 16. By these arrangements, shown in Figs. 11 and 12, it is possible to locate the hoist at one side of the shaft, out of the path of movement of the scraper bucket, thereby to enable movement of the scraper substantially across the bottom of the shaft, an operation not entirely possible with the arrangement shown in Fig. 3, due to the location of the hoist.

The mode of use of the improved material handling apparatus is as follows: The empty scraper bucket 5 is lowered within the shaft by the cable 7 of the surface hoist 3 in the manner shown in Fig. 1, and when the bucket is in its lowered position, it rests on its end on the shaft bottom in the manner shown in Fig. 4. The cable 7 is then slackened and the bucket manually turned on its side from the position indicated in full lines in Fig. 4 to the dotted line position in that figure with the penetrating edge at the floor level. If desired, one of the cables of the double drum hoist may have its hook attached to the top edge of the bucket when the latter is in the full line position shown in Fig. 4, and as the cable is wound in the bucket may be turned down on its side, thereby eliminating the manual tipping of the scraper bucket, and, under certain conditions, the bottom of the bucket, i. e. the end of the bucket to which the eye-link is connected, may be rounded or angled so that the bucket will fall on its side when the cable 7 is slackened, thereby eliminating either manual or mechanical tilting. This design of the bucket bottom will, in some cases, be desirable also from the standpoint of facilitating the movement of the empty bucket as it is pulled from its "on end" position at the side of the shaft rearwardly over the muck pile, and also to facilitate the dumping or unloading of the filled bucket after it is raised to the desired unloading point. The double drum hoist 6 is located at one side of the shaft wall and held in hoisting position by the hook attachment 17 and jacks 18, and the cable 21 of this hoist is extended from its winding drum across the shaft and around the pulley

of the pulley block 16, and the hook 23 of this cable is attached to the eye-link 13 at the rear end of the scraper bucket, and the hook of the cable 22 attached to the bail 10 at the front end of the scraper bucket in the manner shown in Fig. 5. When the parts assume the position shown in Fig. 5, the cable 21 of the double drum hoist is wound in by its drum, while the cable 22 is payed out, dragging the empty scraper bucket over the shaft bottom from the position shown in Fig. 5 to a position at the opposite wall of the shaft, and upon continued winding in of the cable 21, the empty scraper bucket is raised into the endwise position shown in Fig. 6 with the penetrating edge of the bucket pointed downwardly toward the muck pile on the shaft bottom. When the scraper bucket is in the position shown in Fig. 6, the cable 22 of the double drum hoist is wound in by its drum, while the cable 21 is payed out, thereby moving the bucket downwardly and away from the shaft wall into the position shown in Fig. 7 with its penetrating edge penetrating the muck pile on the shaft bottom. Upon continued winding in of the hoist cable 22, the scraper bucket is moved across the shaft bottom, as shown in Figs. 8 and 9, scraping the muck from the bottom and loading the same within the bucket. The cables of the double drum hoist are then detached from the scraper bucket and moved out of the way and the hook of the surface hoist cable 7 is attached to the scraper bucket bail 10, and upon winding in of the surface cable 7, the loaded bucket is tilted upwardly, as indicated in dotted lines in Fig. 9, until the scraper bucket assumes its upright position shown in Fig. 4, and when the scraper bucket is properly centered within the shaft, it is hoisted from the shaft. When the bucket reaches the top of the shaft at the head structure 4, the muck is discharged therefrom in any suitable manner and the empty bucket is then again lowered, and the positioning, scraping and loading operations above described are repeated. After the scraping of the muck from the shaft bottom at one side of the shaft is completed, the cables are deached from the bucket, and suitably connected to the opposite wall of the shaft, so that when the cables are wound in, the hoist is moved under its own power over the shaft bottom until it assumes the position shown in Fig. 10. The hoist is then secured in position and the cables connected to the bucket, so that when the hoist is operated, the bucket is moved from its position at the hoist side of the shaft toward the other side thereof in the manner shown, to gather and load the muck. The cables are then detached from the bucket and the latter hoisted from the shaft by the surface hoist cable, in a manner similar to that above described.

In some shaft sinking operations, the stationary surface hoist 3 and head frame 4 are not used for hoisting and lowering the bucket, and in their stead, a derrick, crane, dragline machine, or some similar mechanism may be employed, and therefore it is not intended to limit the invention to the particular form of surface hoist disclosed. However, regardless of the form of mechanism employed for elevating and lowering the bucket, the means at the shaft bottom for handling and loading the bucket is the same.

As is usual in shaft sinking operations of the character described, suitable signalling apparatus may be provided at the shaft bottom, so that the operator in the shaft may signal the operator of the surface hoist, and the operator of the sur-

face hoist is provided with suitable depth gauging means so that the position of the scraper bucket within the shaft, as the bucket is raised or lowered, is known to him. If desired, the double drum hoist 6 may be used also as means for raising and lowering the bucket, and, in certain instances, may be located at the ground surface, instead of at the bottom of the shaft.

As a result of this invention, it will be noted that an improved material handling apparatus is provided whereby the muck at the bottom of a shaft, during shaft sinking, may be loaded and removed from the shaft in an improved manner. It will further be noted that by combining the scraper with the hoisting bucket, the bucket is not only used as a hoisting means for the muck, but is also used to gather and load the muck prior to the hoisting operation. It will further be evident that the improved material handling apparatus is of an extremely simple character which may be readily controlled and operated by but a few operators at the shaft bottom, and which may be adapted to shaft sinking without modifying the usual shaft sinking practice. These and other uses and advantages of the improved material handling apparatus will be clearly apparent to those skilled in the art.

While there are in this application specifically described one form and two modifications thereof of which the invention may assume in practice, it will be understood that this form and modifications of the same are shown for purposes of illustration and that the invention may be further modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. A method of removing muck from a shaft comprising lowering a receptacle in an endwise direction within the shaft into a position wherein the same rests on end on the shaft bottom, tipping the receptacle onto its side on the shaft bottom, moving the receptacle when supported on its side rearwardly into muck-receiving position at one side of the shaft, moving the receptacle forwardly across the shaft bottom to gather the muck, and thereafter tilting the receptacle into an endwise position and when in such position hoisting the loaded receptacle from the shaft.

2. A method of removing muck from a shaft comprising lowering a receptacle in an endwise direction within the shaft into a position wherein the same rests on end on the shaft bottom, tipping the receptacle onto its side on the shaft bottom, moving the receptacle when supported on its side rearwardly into a position in adjacency to one side of the shaft, tilting the receptacle into an endwise muck-digging position at said side of the shaft with the receptacle bottom resting against the shaft wall, moving the receptacle downwardly from its tilted position onto its side into muck-penetrating position, moving the receptacle forwardly across the bottom of the shaft to gather the muck, and thereafter tilting the receptacle into an endwise position and when in such position hoisting the loaded receptacle from the shaft.

3. In a material handling apparatus, in combination, a combined scraper and bucket adapted to be lowered in an endwise direction in a shaft, said bucket when resting on end on the shaft bottom turnable onto its side and movable when so supported on its side rearwardly over the shaft bottom into a position adjacent one side

of the shaft and then tiltable against the shaft wall with its scraping edge facing downwardly, said scraper bucket then being movable downwardly to penetrate the muck on the shaft bottom, then movable forwardly across the shaft bottom to gather the muck, said scraper bucket when loaded being tilted on end and raised from the shaft, and means for moving the bucket as aforesaid comprising a hoisting mechanism having pull and tail ropes connectible to the scraper bucket.

4. In a material handling apparatus for tunnel shafts, a scraper bucket, a hoisting mechanism having a hoisting cable in the shaft attachable to the scraper bucket for lowering the latter in the shaft, said cable detachable from the scraper bucket when the latter assumes a position on the muck pile on the shaft bottom, and a hoisting mechanism located at the shaft bottom and having cable means attachable to the scraper bucket for moving the empty scraper bucket rearwardly over the shaft bottom into a scraping position at one side of the shaft, for moving the scraper bucket downwardly and forwardly to penetrate the muck and for thereafter moving the scraper bucket forwardly over the muck pile on the shaft bottom to gather and load the muck, said cable means thereafter being detached from the scraper bucket and said hoisting cable of said first mentioned hoisting mechanism reattached to the bucket for hoisting the loaded scraper bucket from the shaft.

5. In a material handling apparatus for tunnel shafts, in combination, a scraper bucket, a hoisting mechanism having cable means in the shaft for lowering the empty scraper bucket in the shaft and for raising the loaded scraper bucket from the shaft, and a hoisting means distinct from said hoisting mechanism and operative when the empty scraper bucket is disposed on the muck pile on the shaft bottom for moving the empty scraper bucket rearwardly over the muck pile into scraping position at one side of the shaft with the scraper bucket resting in tilted position against the shaft wall, said second mentioned means operative to move the scraper bucket downwardly and forwardly to penetrate the muck pile and to move the scraper bucket forwardly over the muck pile to gather the muck, said second mentioned means being detached from said scraper bucket during lowering and hoisting of the scraper bucket.

6. A method of handling loose material comprising the following steps: lowering a scraper bucket in a shaft by means of the cable of a surface hoist until the bucket rests on end on the shaft bottom, turning the scraper bucket onto its side on the shaft bottom, moving the empty scraper bucket while on its side rearwardly over the shaft bottom, tilting the bucket into an endwise tilted position with its bottom side resting against the shaft wall at one side of the shaft and with its penetrating edge facing downwardly, moving the bucket downwardly and forwardly to penetrate the material and to locate the scraper bucket in scraping position on the shaft bottom and when in such position moving the scraper bucket forwardly over the shaft bottom to gather and load the material, and thereafter raising the loaded scraper bucket from the shaft by means of the cable of the surface hoist.

7. A method of handling loose material comprising the following steps: lowering a scraper bucket in a shaft by means of the cable of a surface hoist, turning the scraper bucket onto its

side on the shaft bottom, moving the scraper bucket, by means of a hoist located at the shaft bottom rearwardly into an endwise tilted position at one side of the shaft wall with the penetrating edge of the bucket facing downwardly, 5 moving the bucket downwardly and forwardly to penetrate the material and to locate the bucket in scraping position by means of the hoist at the shaft bottom and when in such position moving 10 the bucket over the shaft bottom to gather and load the material, and thereafter raising the loaded scraper bucket from the shaft by means of the cable of the surface hoist.

8. In a material handling apparatus, in combination, a combined scraper and bucket adapted to be lowered in an endwise direction in a shaft, said bucket when resting on end on the shaft bottom turnable onto its side and movable when so supported on its side rearwardly over the shaft bottom into a position adjacent one side of the shaft and then tiltable against the shaft wall with its scraping edge facing downwardly, said scraper bucket then being movable downwardly to penetrate the muck on the shaft bottom, then 20 movable forwardly across the shaft bottom to gather the muck, said scraper bucket when loaded being tilted on end and raised from the shaft, and means for moving the scraper bucket as aforesaid, said moving means including a surface hoist having its cable connectible to said 30

scraper bucket and further including a hoisting mechanism at the bottom of the shaft having pull and tail ropes connectible to the scraper bucket for moving the scraper bucket over the shaft bottom into penetrating and gathering position and to move the scraper bucket to load the same. 5

9. In a material handling apparatus for tunnel shafts, in combination, a scraper bucket, cable haulage means in the shaft attachable to the scraper bucket for lowering the empty scraper bucket in the shaft onto a muck pile on the shaft bottom and for hoisting the loaded scraper bucket from the shaft, and cable haulage means in the shaft attachable to the scraper bucket for moving the empty scraper bucket rearwardly over the muck pile at the shaft bottom into a position at one side of the shaft to penetrate the muck, for moving the scraper bucket downwardly and forwardly to penetrate the muck and for thereafter moving the bucket forwardly over the muck pile to gather the muck, said first mentioned cable haulage means being detached from said scraper bucket during movement of the latter by said second mentioned haulage means and said second mentioned cable haulage means being detached from the scraper bucket during lowering and hoisting of the latter by said first mentioned cable haulage means. 10 15 20 25

CLIFTON W. MILLER. 30