Aug. 23, 1932. C. C. HORMEL 1,873,764

GRAB BUCKET AND SKIP HOIST

Filed Dec. 4, 1929 3 Sheets-Sheet 1

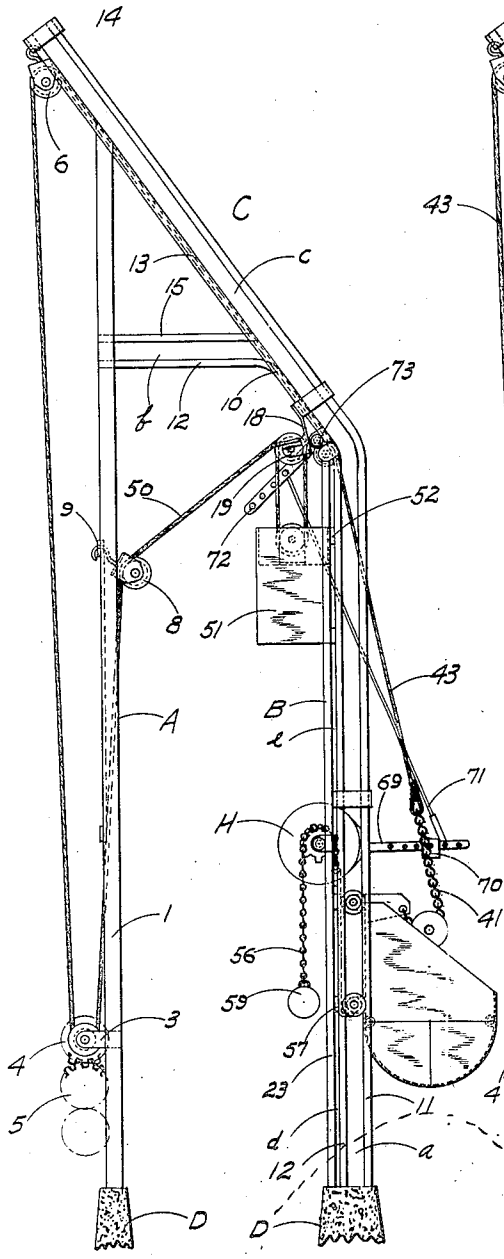


Fig. 1

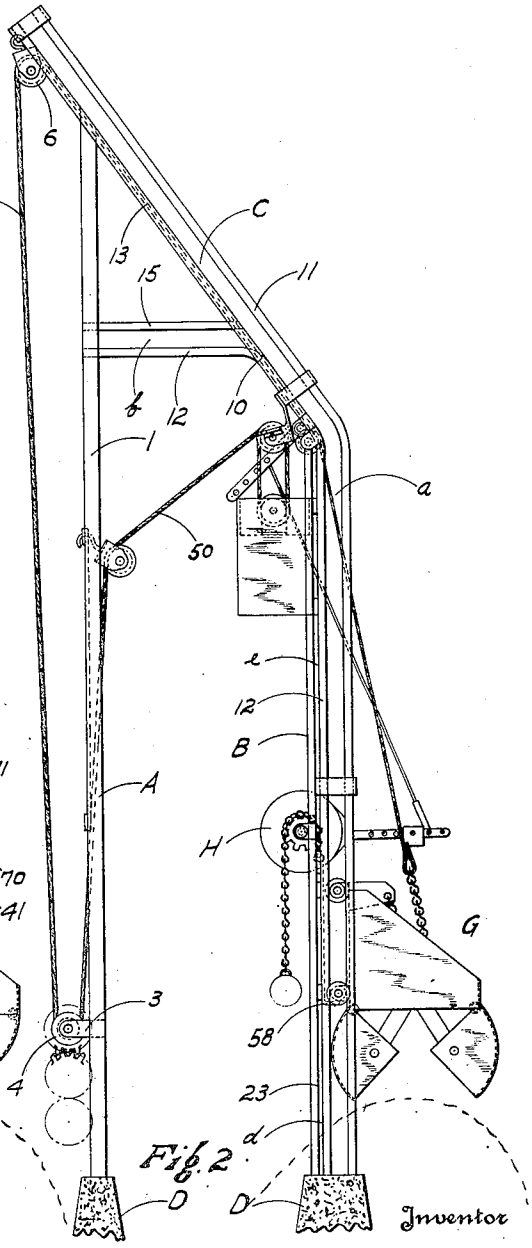


Fig. 2

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GRAB BUCKET AND SKIP HOIST

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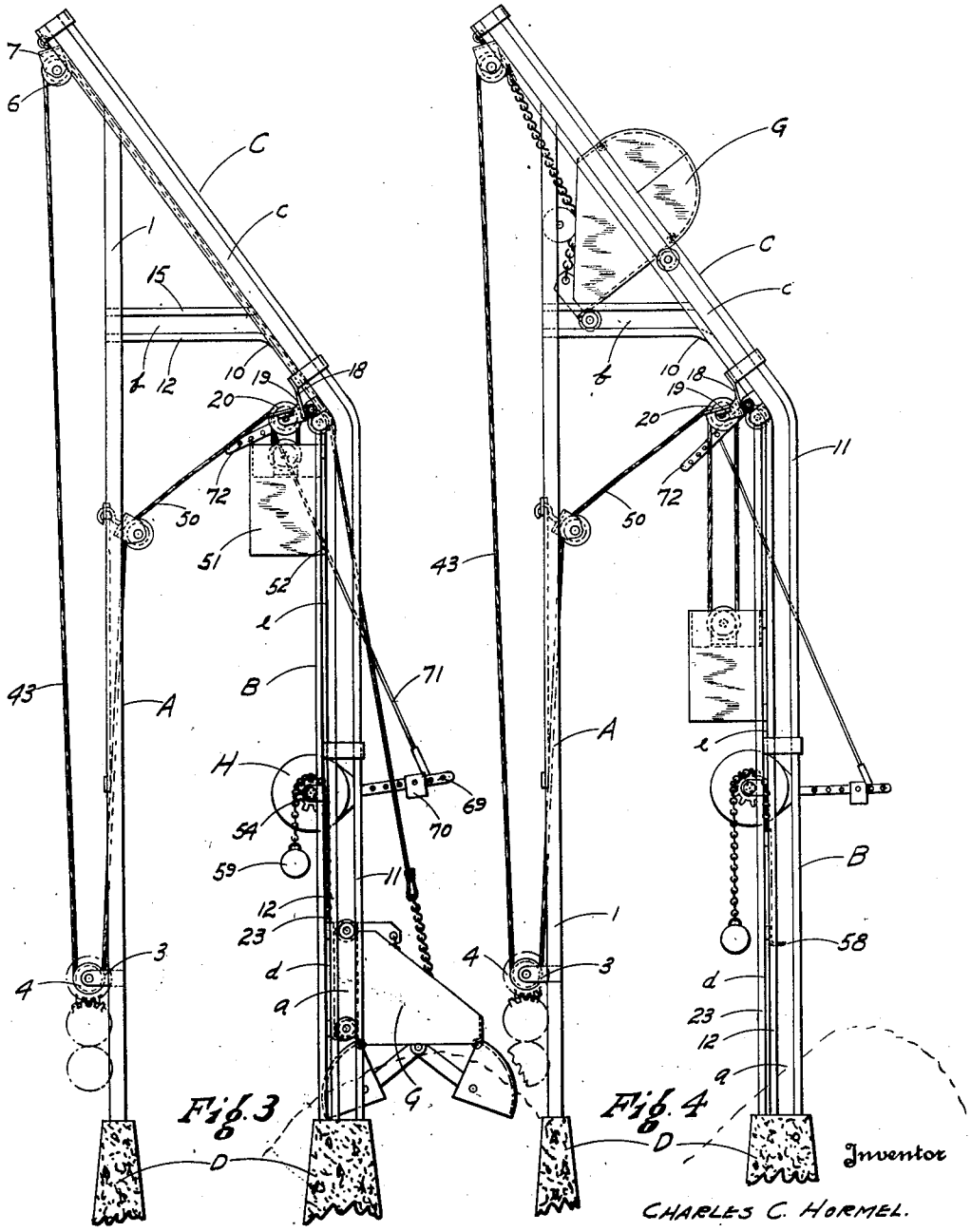


Fig. 3

Fig. 4

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GRAB BUCKET AND SKIP HOIST

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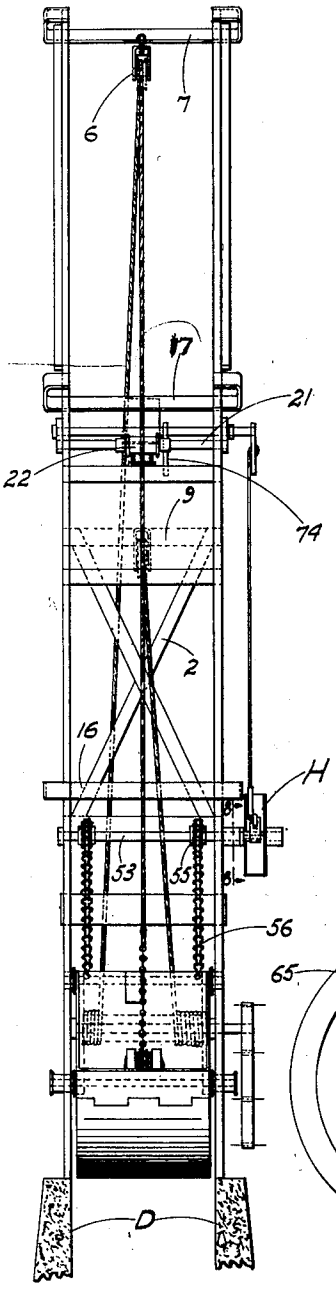


Fig. 5

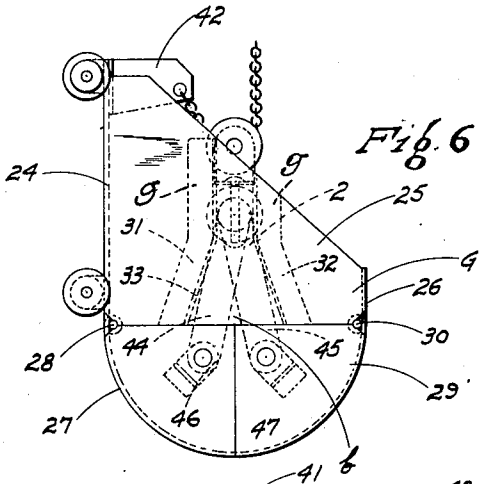


Fig. 6

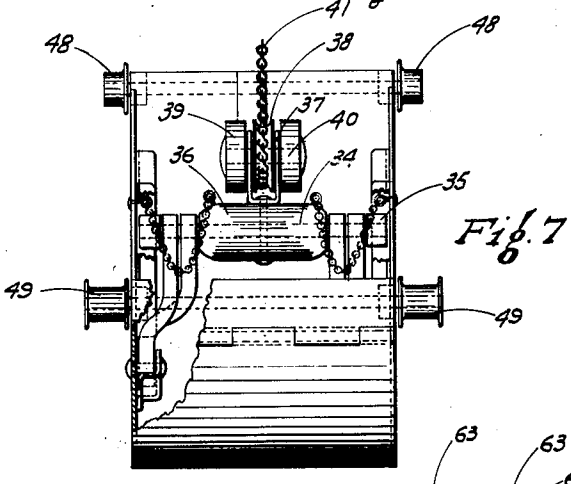


Fig. 7

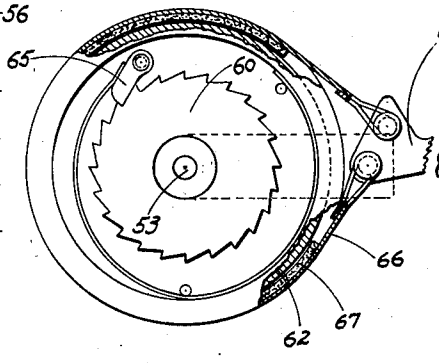


Fig. 8

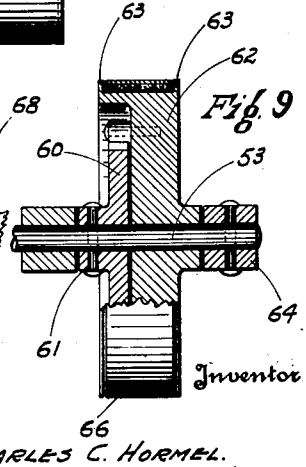


Fig. 9

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Patented Aug. 23, 1932 1,873,764

UNITED STATES PATENT OFFICE

CHARLES C. HORMEL, OF DENVER, COLORADO, ASSIGNOR TO THE ALLEN-SHERMAN-HOFF COMPANY, A CORPORATION OF PENNSYLVANIA

GRAB BUCKET AND SKIP HOIST

Application filed December 4, 1929. Serial No. 411,619.

This invention has to do with the art of material handling and is particularly concerned with novel apparatus characterized by the inclusion of a combination skip and grab bucket.

Conditions associated with the handling of certain materials peculiarly adapt a material receiving bucket which loads like a clam shell and dumps like a skip to the handling operations. This invention therefore has in view the provision of apparatus including a combination skip and clam shell bucket together with suitable instrumentalities for properly operating the same.

In providing a practical embodiment of the above noted thought several conditions arise which must be accommodated. One of the more noticeable features is that of the operation of the clam shell bucket. Inasmuch as conventional buckets of the clam shell type dump by opening the clam shell parts the latter are always in proper digging or biting position when the bucket is lowered. However, in a construction such as contemplated hereby, the bucket dumps as a skip, hence suitable mechanism is required for affecting the clam shell parts to open them at the proper time and in accordance with my inventive thought this action is rendered automatic.

More particularly, the invention comprehends material handling apparatus including a combination skip and clam shell bucket which is mounted on rollers that move in trackways. The latter are arranged to provide the dumping effects. Counterweights are also included in the construction to render the operation more even so that there is a substantially constant drain on the power source.

Other more detailed objects and advantages of the invention will in part become apparent and in part be stated as the description of the invention proceeds. For a full and more complete understanding thereof reference may be had to the following description and accompanying drawings, wherein:

Figure 1 is a view in side elevation of apparatus made in accordance with this invention. In this view the bucket is shown in position just prior to the opening of the clam shell parts.

Figure 2 is a view similar to Figure 1 showing the bucket with the clam shell partly open.

Likewise Figure 3 is a view similar to Figures 1 and 2 showing the clam shell completely open, while

Figure 4 is still another side view developing the bucket in dumping position.

Figure 5 is a front view in elevation of the apparatus shown in Figures 1 to 4, inclusive.

Figure 6 is an enlarged detailed illustration of the bucket taken from the side with operating parts shown in dotted lines.

Figure 7 is a front view of the bucket with parts broken away and shown in section.

Figure 8 is a detailed showing of certain brake mechanism employed, this view is taken from the side, while.

Figure 9 is an illustration of the same mechanism taken from the front.

Referring now to the drawings a supporting framework constituting the main body of the construction is shown as comprising a back section A and a front section B which are connected at the top by a structure C which is really a continuation of the front section B. This structure A, B and C is mounted on a suitable base as indicated at D.

The back section A comprises vertically extending side members 1 which are connected together by an X frame 2. Near the lower end each of the side members 1 carries a bracket 3. A skip hoist drum 4 is mounted between the brackets 3 and is driven from any suitable power source by the driving connections indicated diagrammatically at 5. A sheave 6 is carried by a cross piece 7 at the top of the construction while a second sheave 8 is mounted intermediate the extremities of another cross piece 9. The functions of these sheaves 6 and 8 will be hereinafter more fully set out.

The construction of the front and top sections B and C includes as the main side members a system of trackways. This system comprises tracks running from the base D up

to the fork indicated at 10 and defined by aligned front and back pieces 11 and 12. The front pieces 11 are parallel and spaced apart equidistantly the entire distance to the top of the construction to which they extend. However, the pieces 12 are bent over at 10 and extend back to the side members 1 of the section A. These back pieces 12 are also equidistantly spaced apart throughout their entire extent. Connected to the outside of each of the pieces 12 at the fork 10 are upper back pieces 13. The latter extend to the top of construction and are connected to the cross piece 7 which has upturned ends attached to the front pieces 11 as shown at 14. The pieces 13 are spaced apart a greater distance than are the pieces 11 and 12 as will be later more fully set out. Upper track pieces 15 are connected at the front to the pieces 13 and at the back to the side members 1. The trackway system above described may be said to comprise the track *a* extending from the base D to fork 10 and defined by pieces 11 and 12, the track *b* running horizontally from fork 10 to the back section A and being defined by pieces 12 and 15, and the track *c* connecting the fork 10 with the top of the construction and being defined by piece 11 and the pieces 13 which are spaced further apart than the other track pieces. Of course this construction is duplicated on each side of the apparatus.

Substantially intermediate its extremities the front section A is braced by a cross piece 16 similar in every respect to the cross piece 7. Another corresponding bracing member 17 is included in the construction of the lower portion of the top section C. Depending from the cross member 17 is a bracket 18 having ears 19 between which is mounted a pulley 20. A shaft 21 is mounted at each end in the rear of the track pieces 12 and rotatably carries a sheave 22.

Guideways *d* and *e* are defined by the rear track piece 12 and a guide member 23 that extends from the base D to the top of the front section B. The guide way *d* is the portion below the cross brace 16 while the guideway *e* is positioned above this cross-piece.

A combination skip and clam shell bucket is shown in Figure 6 and referred to generally as G. This bucket G comprises a back member 24 from which extend side members 25 that are connected at their smaller ends by a front member 26. One-half 27, of a clam shell is pivoted to the back member 24 by a hinge connection shown at 28 while the other half 29 of the clam shell is hinged to the front 26 at 30.

Each of the side members 25 is provided with guide means of duplicate construction. One of these means consists of bent angle bars 31 and 32 which are fastened to the inside of the side members in any preferred manner to provide the inwardly projecting flanges 33. The bend in the angle bars provides the flare *f* and the neck *g*. A transverse shaft 34 carries at each end rollers 35 that operate in the guide means comprising flares *f* and necks *g*. At the central portion of the shaft 34 is a sleeve 36 which is connected to a bracket 37, the side pieces of which enclose therebetween a pulley 38. End discs 39 are carried by a shaft 40 which extends through the bracket 37 and pulley 38. Any suitable form of line such as a chain 41 has one end anchored to an ear 42 projecting inwardly from the back piece 24 and this chain 41 passes around the pulley 38 and is connected to a hoist line 43. The shaft 34 carries, between each of the end rollers 35 and the sleeve 36 a pair of links each consisting of arms 44 and 45. One end of the arm 44 is pivotally connected to the clam shell 27 as shown at 46 while the arm 45 is pivotally connected to clam shell 29 as shown at 47.

The foregoing bucket construction operates the clam shell in a manner which may be briefly understood from the notation that relative upward movement of the shaft 34 with respect to the side members 25 closes the clam shell while relative downward movement opens the grab parts.

The skip bucket G is provided with carriage means in the form of rollers which are located at the top of the back members 24 and roller 49 at the bottom thereof. These rollers 48 and 49 are designed for operation in the system of track ways *a*, *b* and *c* and it is notable that the rollers 48 are of such narrow dimension that upon reaching the fork 10 upon upward movement they miss the back tracks 13 and operate on the back piece 12 while the rollers 49 are wider and flanged on the ends so that they engage with and operate on the pieces 13 when they pass the fork 10. As the skip bucket G is moved upwardly past the fork 10 this system of trackways and rollers serves to invert the bucket into a position wherein it dumps as a skip.

As previously noted the hoist line 43 is connected at one end to the chain 41. From there it passes over the sheaves 22 and 6 down to the hoist drum 4 about which it is wound. A counterweight line 50 is wound about the drum 4 in a reverse direction with respect to the hoist line 43 and this counterweight line passes over the sheave 8 and the pulley 20 to the counterweight 51. The pulley 20 is of the multiple type to provide the effects of mechanical advantage needed as the counterweight is positioned so that it can move only a relatively short distance and is therefore several times heavier than the loaded bucket G. This weight 51 has cross guides 52 attached thereto and these members 52 have their ends projecting into the guides *e* to control movement of the counterweight.

Mechanism for automatically operating the clam shell of the bucket G coincident with

movement of the latter is shown as comprising a cross shaft 53 which is rotatably mounted at each end in an ear 54 carried by the guide 23. At one end the shaft is provided with a one way brake mechanism referred to generally as H and to be later described in detail. Between the guides 23 and adjacent thereto the shaft 53 is provided with a pair of toothed wheels 55 over which pass chains 56. At their lower ends the latter carry a transverse bar 57 which has its ends movably seated in the guide *d*. Projecting frontwardly from the bar 57 and engageable by the roller 49 are abutments 58. The chains 56 pass over the wheels 55 and carry at their other ends a counterweight 59. The latter has sufficient weight to co-operate with the brake H, when the latter is applied to stop the empty skip bucket G in its downward movement, but is not heavy enough to prevent the downward movement of bucket G when the brake H is not applied.

The one way brake mechanism H comprises a ratchet 60 keyed to the shaft 53 as shown at 61. A brake drum 62 is freely rotatable on the shaft 53 and has a braking surface defined by flanges 63. A bushing 64 maintains the drum 62 assembled on the shaft. A pawl 65 is pivotally carried by the drum 62 and engages the teeth of the ratchet 60. A brake band 66 having lining 67 has its ends connected to an operating member 68 which is preferably integrally formed on a lever arm 69 projecting frontwardly. The lever arm 69 is weighted by a weight 70 which is adjustable thereon and this weight is normally positioned so that it will affect the brake band to apply the brake sufficiently to hold the empty bucket against downward movement.

A link 71 is connected to the outer end of the arm 69 and to an arm 72 extending from a shaft 73. A second arm 74 extends inwardly from the latter and is engageable by the counterweight 51 upon upward movement of the latter to rotate the shaft 73 to lift the lever arm 69 against the weight 70 to release the brake H.

The operation of the above described apparatus may be described by starting with the bucket in the position shown in Figure 3 wherein the clam shell is widely open. Power is applied to rotate the hoisting drum 4 which takes up the hoist line 43 and at the same time pays out the counterweight line 50. At first the taking up of the hoist line 43 affects the chain 41 and associated mechanism in the bucket G to close the clam shell parts 27 and 29. It is notable that the pulley arrangement disclosed provides a clam shell closing force substantially twice that of the hoisting force due to the mechanical advantage afforded thereby. This is important because conditions sometimes require the use of such a great force to close the grab bucket.

After the clam shell is closed the skip bucket is moved upwardly under the influence of the hoist drum 4 to the point where it is dumped by the forked trackway. This position is shown in Figure 4. Attention is called to the showing of the rollers 49 as above the roller 48 as the bucket G is being dumped. When the dumping operation is completed the hoist drum 4 is rotated in a reverse direction to permit the skip to lower and raise the counterweight 51. This action takes place in an ordinary manner until the rollers 49 engage the abutments 58 on the cross bar 57. The downward movement tends to move the cross bar 57 downwardly and the counter weight 59 upwardly which action must be accompanied by a rotation of the shaft 53. However, the brake H is applied and is effective due to the ratchet mechanism to resist this rotation on the part of the shaft 53. Hence the bucket G is held against downward movement as the hoist drum 4 continues to unwind. This unwinding operation serves to lower the shaft 34 together with its associated construction in the bucket with respect to the sides of the latter to open the clam shell. As the hoist drum 4 is unwinding the line 43 to open the clam shell it is, at the same time, taking up the line 50 to raise the counterweight 51. Just about at the time the clam shell parts are fully opened the counterweight 51 engages the arm 74 to release, through connections 73, 72, 71 and 69, the brake H. The bucket is then permitted to be lowered with the clam shell open in biting position. This cycle is repeated in the normal operation of the apparatus.

While a preferred specific embodiment of the invention is herein set forth it is to be understood that I am not to be limited to the exact constructions illustrated and described because various modifications of these details may be made in putting the invention into practice.

What is claimed is: —

1. Material handling apparatus comprising a material-receiving bucket provided with clam shell members, means for operating the clam shell members to load the bucket, and means for inverting the bucket to dump the latter.

2. Material handling apparatus comprising a combined skip and clam shell bucket, means for operating the clam shell parts of the bucket to load the latter, and means for hoisting and inverting the bucket to cause it to dump as a skip, said hoisting means constituting a part of the clam shell operating instrumentalities.

3. Material handling apparatus comprising a skip bucket provided with clam shell parts, means for opening and closing said parts to load the bucket, carriage means for the bucket, and a trackway system in which

the carriage means travels during operation of the bucket, said system including an arrangement of tracks for dumping the bucket by inverting the same.

4. Material handling apparatus, comprising, a material receiving bucket including a clam shell construction, means for dumping the bucket like a skip, and instrumentalities for operating the clam shell, said clam shell operating instrumentalities consisting of a counterweight and brake mechanism for holding the bucket against downward movement while the clam shell is being opened, and means for automatically releasing the brake after the clam shell is opened.

5. Apparatus of the class described, comprising, in combination, a material receiving skip including a clam shell mechanism, means for hoisting the skip, a counterweight associated with the hoisting means, and instrumentalities for operating the clam shell including a counterweight for the skip when empty.

6. Apparatus of the class described, comprising, in combination, a material receiving skip including a clam shell mechanism, means for hoisting the skip, a counterweight associated with the hoisting means, said hoisting means constituting a means for closing the clam shell, and instrumentalities for opening the clam shell consisting of a counterweight, a brake mechanism, and abutment means for rendering effective the counterweight and brake to hold the skip against downward movement as the clam shell is being opened.

7. A combination skip and grab bucket comprising a skip portion, clam shell parts hinged to the skip portion, and means associated with the skip portion for opening and closing the clam shell parts.

8. A combination skip and grab bucket comprising a skip portion, clam shell parts hinged to the skip portion, and means associated with the skip portion for opening and closing the clam shell parts, said means including links attached to the clam shell and guide means for the links for guiding them into a position wherein the clam shell parts are closed.

9. A combination skip and grab bucket comprising, in combination, back, front and side members defining a skip, clam-shell parts hinged to the front and back pieces, a cross shaft movable in the bucket and having its end located in guides in the side pieces, links connecting the clam shell parts to the cross shaft, a pulley carried by the shaft, and a line having one end anchored to the bucket and passing over the pulley.

10. In material handling apparatus, the combination, with a trackway construction of a combination skip and grab bucket operable in said trackway, said trackway including a forked point for dumping the bucket like a skip and a vertical extending portion over which the bucket moves when operating as a clam shell, and means associated with the vertically extending portion to automatically open the grab bucket upon downward movement of the latter.

11. Apparatus of the class described, comprising a combination skip and clam shell bucket, carriage means on said bucket, a trackway system in which the carriage operates, said system including a fork in the tracks and designed so that a part of the carriage means operates in one branch of the fork while another part operates in the other branch to dump the bucket, means for moving the bucket in the system, and instrumentalities for automatically operating the clam shell to open the latter during downward movement of the bucket.

12. Apparatus of the class described, comprising a combination skip and clam shell bucket, carriage means on said bucket, a trackway system in which the carriage operates, said system including a fork in the tracks and designed so that a part of the carriage means operates in one branch of the fork while another part operates in the other branch to dump the bucket, means for moving the bucket in the system, and instrumentalities for automatically operating the clam shell to open the latter during downward movement of the bucket, said instrumentalities consisting of a counterweight, a one way brake, and means for automatically releasing the brake after it has been applied during opening of the clam shell.

13. Apparatus of the class described, comprising, in combination, a material receiving skip including a clam shell mechanism, means for hoisting the skip, a counterweight associated with the hoisting means, and instrumentalities for operating the clam shell including a counterweight for the skip when empty, a one way brake mechanism, and linkage between the brake mechanism and the first mentioned counterweight whereby upward movement of the latter affects the linkage to release the brake.

14. A combination skip and grab bucket provided with clam shell parts for loading the bucket at the bottom with a clam shell action and having a lip at the top over which the contents of the bucket are discharged in the dumping of the bucket.

15. A material handling bucket of the class described consisting of a bucket including grab mechanism for loading it at the bottom and having a lip at the top whereby it discharges its contents when inverted with a skip discharge action.

In testimony whereof I hereunto affix by signature this 13th day of November, 1932.

CHARLES C. HORMEL.