April 16, 1946. A. W. DANIELS ET AL 2,398,360

DRAGLINE BUCKET

Filed April 22, 1944 2 Sheets-Sheet 1

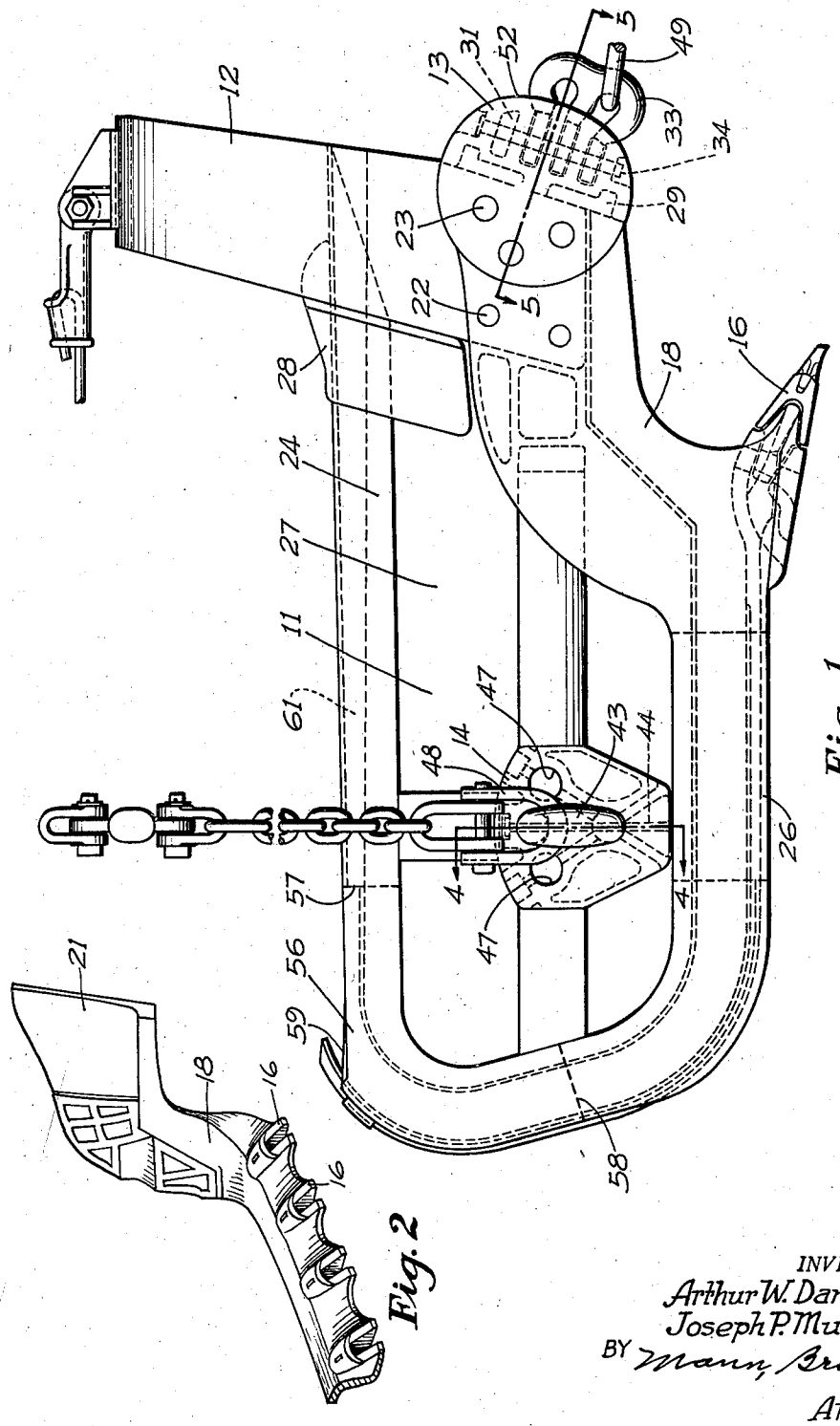


Fig. 1

Fig. 2

INVENTORS:
Arthur W. Daniels &
Joseph P. Murtaugh
BY Mann, Brown & Co
ATTORNEYS

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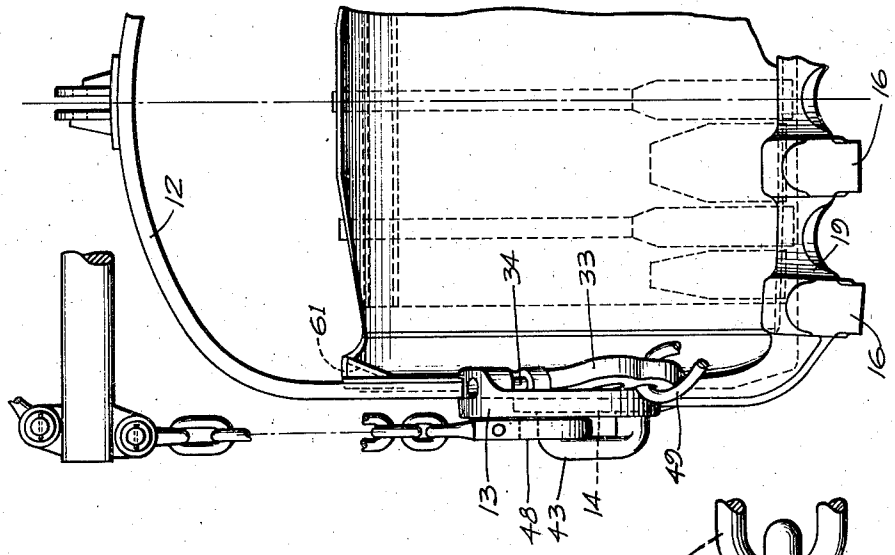


Fig. 3

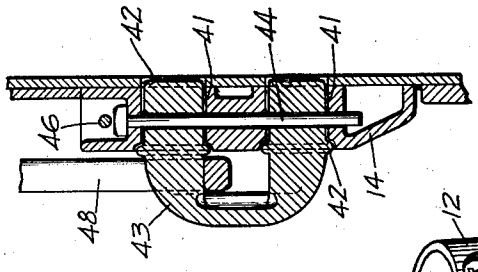


Fig. 4

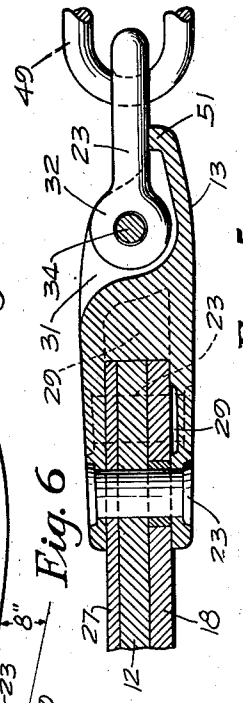


Fig. 5

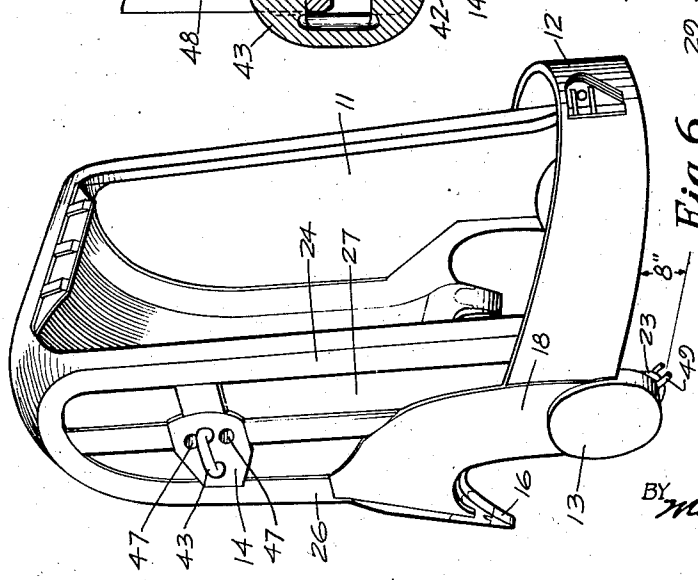


Fig. 6

INVENTORS:
Arthur W. Daniels &
Joseph P. Murtaugh
BY Mann, Browne & Co.
ATTORNEYS

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DRAGLINE BUCKET

Arthur W. Daniels, Cedar Rapids, Iowa, and
Joseph P. Murtaugh, Oak Park, Ill.

Application April 22, 1944, Serial No. 532,224

7 Claims. (Cl. 37—135)

Drag-line buckets are subjected to extremely heavy use. For example, a drag-line bucket embodying this invention is being used very successfully for stripping coal. The invention has been embodied in a bucket as large as six cubic yards capacity. After the bucket has been dragged in a generaly horizontal position to fill it, it is upended to dump it and with its front end down, is moved to a suitable starting position where it is lowered to begin a new stripping operation. It is not practicable to take time to lower it gently and hence it is dropped with more or less speed onto the coal or underlying rock surface. Probably most of the trouble experienced with drag-line buckets heretofore, from the standpoint of 'ailures, has been in their inability to take this punishment.

The present invention has overcome this cause of failure. One important feature contributing to the success of this invention is the provision of massive manganese steel bumpers which, for economy of materials, also serve as hitch plates for connecting the drag-line chains.

Another important feature is the combination with such a bumper of a hitch link pivoted to the inner side of the bumper plate so that it can swing inwardly. With this arrangement, the weight of the drag chains pulls both the drag chains and the link to such a position that they will not be damaged as the bucket strikes the ground.

Still another important feature, in combination with the bumper plates, is the shaping of the arch so that it extends only slightly forwardly from its point of departure from the bumper plate and hence it is practicable to so balance the bucket that with a bumper plate extending a reasonable distance forward, the arch will almost never strike the ground as the bucket is lowered. Furthermore, the arch is so shaped that if it does strike anything, as for example a rock considerably higher than the ground level, the blow will be taken in the plane of the arch so that the arch will have sufficient strength to resist crumbling.

Still another important feature is an exceptionally strong front end construction including both the arch of the previous paragraph and a downwardly extending arch forming the lip of the bucket, the two arches being rigidly secured together and overlapping at the position of the bumper plate so that both receive the thrust from the bumper plate and distribute it to the whole bucket.

The location of the connection between the bucket and the dump chain is very important both in obtaining proper balancing of the bucket as it is dropped so that the bumper will receive the entire blow, and also in assuring proper digging action. According to one feature of the present invention, a dump hitch is provided which can easily be adjusted to any one of three positions.

Furthermore, this dump hitch is exceedingly simple and trouble-free. It includes a U-shaped link or yoke, the legs of which extend horizontally into a bracket where they are retained by a relatively heavy pin, the latter being held in place by a locking pin which bears no load. The U-shaped yoke is tough, thick and extremely durable.

The reversibility of parts to distribute wear and prolong life is another feature of this invention. Each of the U-shaped dump hitch yokes is reversible so that the clevis connecting the dump chain to it can engage one leg of the yoke until it begins to be worn and then the other leg. In similar manner, the bumper and drag hitch plates are made symmetrically so that when they have worn down on their under side, they may be interchanged so that each presents an unworn portion to the wearing josition. It should be noted that an added feature of the invention in connection with these plates is that they are given a generally round shape so as to give them a sort of sledding effect and minimize their friction as the drag-line begins to pull the bucket while these are still resting on the ground; the ground, as previously noted, often being coal or rock.

Additional objects and advantages of the invention will be apparent from the following description and from the drawings, in which

Fig. 1 is a side elevational view of the form of the invention chosen for illustration;

Fig. 2 is a fragmentary perspective view of the lip casting of the structure shown in Fig. 1;

Fig. 3 is a fragmentary front elevational view of the same form of the invention;

Fig. 4 is a detailed sectional view taken approximately on the line 4—4 of Fig. 1;

Fig. 5 is a detailed sectional view taken approximately on the line 5—5 of Fig. 1; and

Fig. 6 is a more or less diagrammatic perspective view showing the bucket in its dropped position in which the impact of striking the ground is taken by the bumpers.

A preferred form of the invention has been chosen for illustration and description, in compliance with section 4888 of the Revised Statutes, but persons skilled in the art will readily perceive other means for accomplishing the same results, and the claims are therefore to be construed as

broadly as possible, consistent with the prior art.

The general construction of the bucket chosen for illustration can be seen best from Figs. 1 and 3. The bucket includes a body portion 11, an arch 12, a bumper and drag hitch plate 13, a dump hitch bracket 14 and teeth 16. An important part of the body portion of the bucket is the casting 18 which includes the lip portion 19 carrying the teeth 16.

In the illustrated form of construction, the arch 12 and the lip casting 18 form a sturdy frame or double arch construction. In short, they form a continuous heavy band of metal around the front end of the structure. Preferably, they overlap one another, at least in the larger sizes of buckets, and it will be seen from Fig. 2 that in this case, the casting 18 is provided with an open pocket 21 at each end into which the two ends of the arch 12 will fit. The entire structure is then made rigid by rivets 22 and 23. The rivets 23 also serve to hold the bumper plate 13 rigidly with the double arch construction. The top castings 24, the bottom side castings 25, and the side plates 27 are all welded to the double arch construction along spaced lines on both members thereof. If desired, an arch stiffener 28 may also be welded to the arch and the body of the bucket.

The bumper plate 13 straddles the double arch construction as seen best in Fig. 5. It is preferably cast from tough steel, such as manganese steel and the casting is desirably relieved as at 29 to facilitate close fitting of the casting to the double arch members 12 and 18. On its inner side, the bumper plate 13 is provided with a plurality of slots or recesses 31 for receiving the legs 32 of a hitch link 33. The hitch link 33 may be regarded as U-shaped, although in the illustrated from, it forms a W. Preferably there are more slots 31 than there are legs of the hitch link 33 so that it may be alternatively positioned in different sets of slots. A heavy pin 34 passes through apertures in the bumper plate 13 and in the legs 32 of the hitch link 33. The pin 34 will be held in place by a locking pin, such as a cotter pin.

The dump hitch bracket 14 is welded to the side plate 27. It is provided with recesses or apertures 41 into which legs 42 of dump hitch link 43 are inserted. As in the case of the drag hitch link 33, the dump hitch link 43 is retained in place by a heavy pin 44 which in turn is locked in place by a locking pin 46. Although the dump hitch bracket 14 may be provided with only the two apertures 41 in which the legs 42 are illustrated, one or more additional apertures 47 may also be provided so that the upper link 42 of dump hitch plate 43 may be positioned at any one of a plurality of positions for adjusting the balance of the bucket.

It will be observed that each of the hitch links 33 and 43 is reversible so that it can be positioned with either end up. One advantage of this is in distributing wear so that the hitch links will have a longer life. Thus, the hitch link 43 may be retained in the position shown until the wear on the upper leg 42 approaches the limit of safety, whereupon the pins 46 and 44 may be removed and the hitch link 43 reversed so that the unworn leg 42 will be placed in the upper position and engaged by the clevis 48 of the dump means.

In the case of the link 33, reversing the link not only distributes the wear, but it also permits minute adjustments in the position of application of the drag force to the bucket applied through link 49 of the drag-chain. Because the link 33 is a W-shaped link, having two positions for the link 49 and because it may be reversed and because it may be shifted between two positions in the bumper plate or drag hitch plate 13, there are 8 positions of adjustment for the link 49 with respect to the drag hitch plate 13.

The direction of application of force of the bucket manipulating members 49 and 43 varies over a wide range of directions with respect to the bucket as the bucket is up-ended. It will be observed, however, that the wear produced throughout this range of directions occurs on entirely separate parts of the links before and after reversal of the links. This results from the fact that the center lines of the legs are outside of the range of directions or lie at an angle to all directions within the range.

When a bucket has been dumped, it assumes approximately the position shown in Fig. 6 and is in that position as it is lowered to the ground. In commercial use, it is not practicable to lower this very slowly and gently and accordingly the buckets often strike the ground with considerable force. If they strike an area of coal or rock, it is obvious that there must be a terrific impact. In the past, there has been rapid deterioration of the buckets due to this impact. According to the present invention, the deterioration is greatly retarded and in fact, it is ordinarily confined to the bumper plates 13. The deterioration, as a matter of fact, is due to gradual wear rather than due to any destruction by impact.

To this end, the bumper plates 14 are made quite massive and project well forwardly of the body of the bucket. Furthermore, the arch 12 extends nearly vertically from the position of the bumper plate 13 so that when the bucket is in the position shown in Fig. 6, the arch is well spaced from level ground when the ground is struck by the bumper plates 14. In the illustrated form, the minimum spacing of the arch 12 is eight inches from the level of the tip of the bumper plate 13. Of course it is important that the bucket be so balanced and the dump hitch link 43 so positioned that the bucket will assume the proper inclination to this end. Of course, with uneven ground or with loose rocks around, the arch 12 may occasionally strike some raised object. It is, therefore, highly desirable that this arch be capable of withstanding such impact. According to the present invention, this is ensured by shaping the arch 12 so that its cross section will be vertically disposed when the bucket is in the position shown in Fig. 6. Thus any impact from downward movement of the bucket in this position is longitudinal with respect to the larger dimension of the cross section so that there is no tendency to cave in the arch in its weaker direction.

Having the bucket strike the ground in the vicinity of the drag hitch means would seem to be a step in the wrong direction since it would be likely to land on the drag hitch means and cause breakage or rapid deterioration thereof. According to the present invention, however, the drag hitch link is mounted on the inside of the drag hitch plates or bumper plates 13 and is prevented by wall 51 from swinging past the position shown in Fig. 5 while being free to swing inwardly. As a matter of fact, the weight of the drag chains always turns the link 33 somewhat inwardly from the position shown in Fig. 5. Accordingly, these links swing inwardly very easily

as they strike the ground and hence they do not absorb the impact between the bucket and the ground, this being taken entirely by the bumper plates 13.

After the bucket comes to rest in the position shown in Fig. 6, the rear end is lowered to bring the teeth into engagement with the ground. At about this time and preferably before drag hitch plate 13 is raised from the ground, the dragging movement of the bucket begins. This will, of course, tend to drag the drag hitch plate 13 through or along the ground.

According to the present invention, the drag of the drag hitch plates 13 in the ground is minimized by the smooth front surface 52 which slopes upwardly and rearwardly of the bucket, i. e. upwardly and forwardly of the direction of drag. Thus this surface 52 has a sledding action which tends to make it move more easily through or along the ground.

Of course there is, nevertheless, considerable wear on the surface 52 which drags along the ground. However, it will be observed that the plate 13 is symmetrical and hence when the wear reaches an undesirable stage, the two plates 13 may be interchanged, each one being moved to the other side and reversed so that a new surface is placed in the position to receive the wear. Thus the bumper plates 13 have about twice the wear that they otherwise would have.

Although the double arch construction comprising the arch 12 and the casting 18 transmits the impact from the bumper plates 13 to the entire bucket in a very satisfactory manner, it has been observed in the past that there is sometimes failure in the upper rear corner of the bucket. This is largely eliminated according to the present invention by providing upper rear corner castings 56 extending a substantial distance forwardly of the corner and downwardly from the corner approximately to the dotted lines 57 and 58 and by providing a relatively heavy bead 59 extending along the inside and around the corner of this casting. It should be understood that this casting is welded to adjacent castings and to the side plate 27 and that a stiffening plate 61 extends inside the angular castings along the top of the bucket from the front to the back thereof.

The teeth 16 are preferably those disclosed in copending application, Ser. No. 485,272, since issued as Patent No. 2,369,285 and the disclosure of that application is hereby incorporated in this application by reference. This application is in part a continuation thereof.

From the foregoing, it is seen that a drag-line bucket is provided which is exceptionally satisfactory not only in its digging characteristics, but even more outstandingly in its durability. The impact of dropping the bucket ordinarily is taken entirely by a heavy tough bumper plate and is transmitted through a rigid double arch construction to the remainder of the bucket. The drag hitch links automatically swing out of the way and a smooth running surface is presented to the ground to minimize drag of the bumper plate in the ground as the dragging action begins. The yoke 12 is positioned so that it ordinarily does not strike the ground and is so shaped that on the occasions when it does, the impact is taken in its strongest direction. Both of the hitch links 33 and 43 are reversible and are so positioned and constructed that reversal distributes the wear to prolong the life of the parts. Both of these links are secured by heavy pins and in the case of the link 43 where failure would result in dropping the bucket with danger to workmen, the retaining link is not subject to wear and does not bear the load.

We claim:

1. A drag-line bucket including a body portion open at its front end, an arch extending upwardly therefrom, dump hitch means at the sides of the body portion and drag hitch means at the front of the body portion, characterized by the provision of a massive bumper plate secured to the body of the bucket on each side thereof at the front of the body portion and being symmetrical and interchangeable and having a runner surface which, when being dragged along the ground, extends upwardly and forwardly from the bottom portion thereof in either position whereby they may be interchanged to prolong their life.

2. A drag-line bucket including a body portion open at its front end, an arch extending upwardly therefrom, teeth at the bottom of the front end, dump hitch means at the sides of the body portion and drag hitch means at the front of the body portion, characterized by the provision of a massive bumper plate secured to the body of the bucket on each side thereof at the base of the arch and forming part of the drag hitch means, and a drag hitch link pivotally carried on the inner side of each bumper plate to swing inwardly thereon, said bumper plate having a smooth front surface which, when being dragged along the ground, extends upwardly and forwardly from the bottom portion thereof to minimize friction as it is dragged while resting on the ground, the sides of the bucket between the bumper plate and the teeth being shaped to provide substantial clearance above the ground when the bumper and teeth are both on the ground.

3. A drag-line bucket including a body portion open at its front end, an arch extending upwardly therefrom, teeth at the bottom of the front end, a dump hitch means at the sides of the body portion and drag hitch means at the front of the body portion, characterized by the provisions of a massive bumper plate secured to the body of the bucket on each side thereof at the base of the arch and forming part of the drag hitch means, and a drag hitch link pivotally carried on the inner side of each bumper plate to swing inwardly thereon, said bumper plate having a smooth front surface which, when being dragged along the ground, extends upwardly and forwardly from the bottom portion thereof to minimize friction as it is dragged while resting on the ground, the sides of the bucket between the bumper plate and the teeth being shaped to provide substantial clearance above the ground when the bumper and teeth are both on the ground, and said link being pivoted a substantial distance away from the front of the bumper to clear obstructions on the ground.

4. A dragline bucket including a body portion open at its front end and having teeth at the front of the bottom thereof, dump hitch means at the side of the body portion and drag hitch means at the front of the body portion characterized by the provision of a massive bumper plate secured to the body of the bucket on each side thereof at the front of the body portion and having their front ends directly below the side walls of the body portion as the bucket drops to transmit shock load to the body portion substantially without lateral thrust, said plate being pro-

vided on its inner face with integral formations adapted for pivoting a drag hitch link thereto, and the sides of the body portion between the bumper and the teeth being shaped to provide substantial clearance above the ground when the bumper and teeth are both on the ground and said bumper being spaced from the teeth to be substantially above the ground as the teeth are dragged in digging position, said body portion including an integral casting forming the digging lip of the bucket along the front of the bottom and extending up to the bumper plates to absorb the shock load from the bumper plates and transmit it to the remainder of the body portion.

5. A dragline bucket including a body portion open at its front end and having teeth at the front of the bottom thereof, dump hitch means at the side of the body portion and drag hitch means at the front of the body portion characterized by the provision of a massive bumper plate secured to the body of the bucket on each side thereof at the front of the body portion and having their front ends directly below the side walls of the body portion as the bucket drops to transmit shock load to the body portion substantially without lateral thrust, said plate being provided on its inner face with integral formations adapted for pivoting a drag hitch link thereto, and the sides of the body portion between the bumper and the teeth being shaped to provide substantial clearance above the ground when the bumper and teeth are both on the ground and said bumper being spaced from the teeth to be substantially above the ground as the teeth are dragged in digging position, said body portion including an integral casting forming the digging lip of the bucket along the front of the bottom and extending up to the bumper plates to absorb the shock load from the bumper plates and transmit it to the remainder of the body portion; and an arch extending upwardly from the casting and bridging between the ends thereof to reenforce the casting against lateral force.

6. A dragline bucket including a body portion open at its front end and having teeth at the front of the bottom thereof, dump hitch means at the side of the body portion and drag hitch means at the front of the body portion characterized by the provision of a massive bumper plate secured to the body of the bucket on each side thereof at the front of the body portion and having their front ends directly below the side walls of the body portion as the bucket drops to transmit shock load to the body portion substantially without lateral thrust, said plate being provided on its inner face with integral formations adapted for pivoting a drag hitch link thereto, and the sides of the body portion between the bumper and the teeth being shaped to provide substantial clearance above the ground when the bumper and teeth are both on the ground and said bumper being spaced from the teeth to be substantially above the ground as the teeth are dragged in digging position.

7. A drag-line bucket including a body portion open at its front end, an arch extending upwardly therefrom, teeth at the bottom of the front end, dump hitch means at the sides of the body portion and drag hitch means at the front of the body portion, characterized by the provision of a massive bumper plate secured to the body of the bucket on each side thereof at the base of the arch and forming part of the drag hitch means, said plate having a smooth front surface, and integral reinforcing ribs extending rearwardly therefrom along the inside of the plate and having aligned holes therethrough adapting them for the pivoting of a drag hitch link thereto, the sides of the bucket between the bumper plates and the teeth being shaped to provide substantial clearance above the ground when the bumper and teeth are both on the ground.

ARTHUR W. DANIELS.
JOSEPH P. MURTAUGH.