June 2, 1959 B. R. BODE 2,889,170

GRAPPLE DEVICE

Filed Dec. 12, 1956 2 Sheets-Sheet 1

Fig. 1

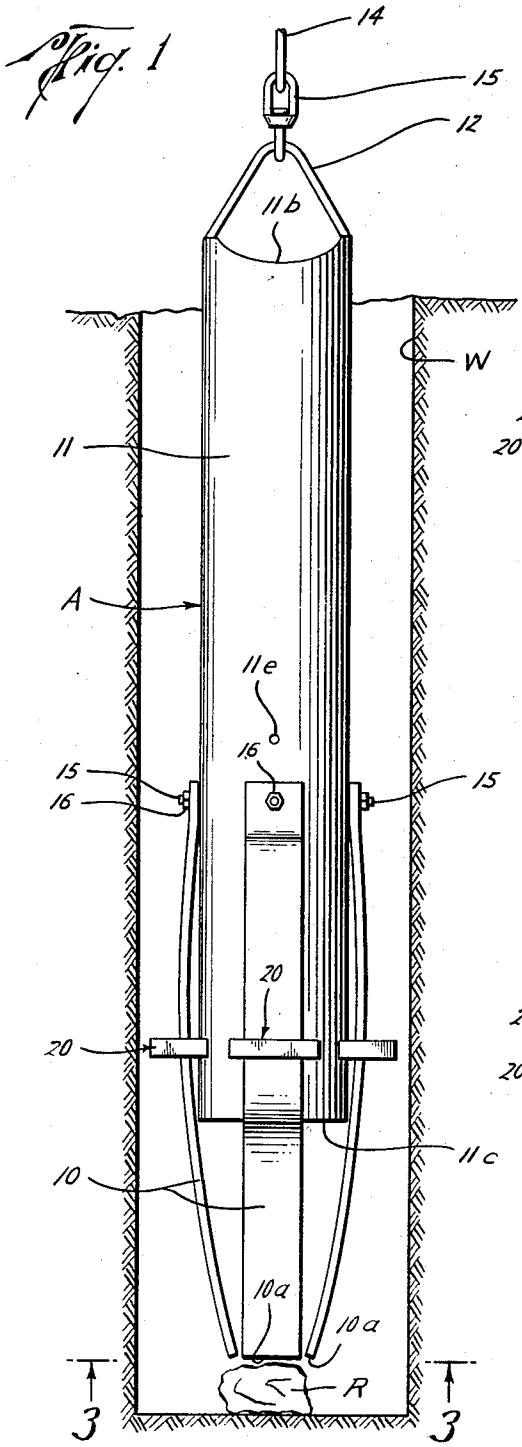


Fig. 2

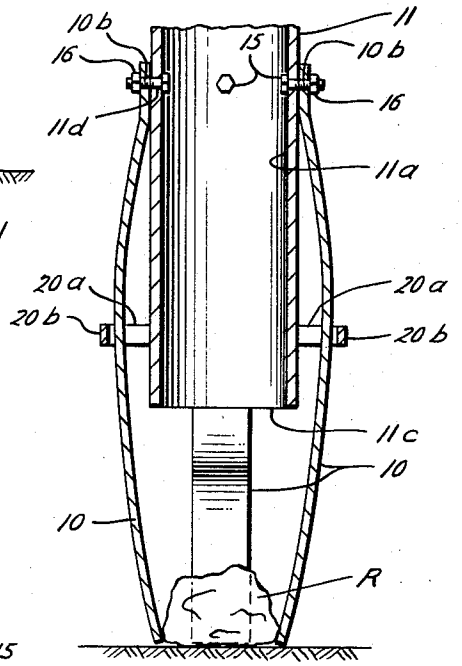
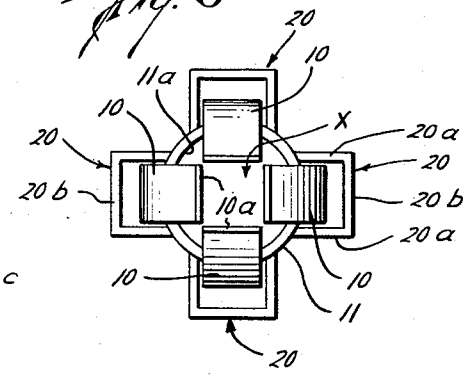


Fig. 3



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June 2, 1959 B. R. BODE 2,889,170

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Filed Dec. 12, 1956 2 Sheets-Sheet 2

Fig. 4

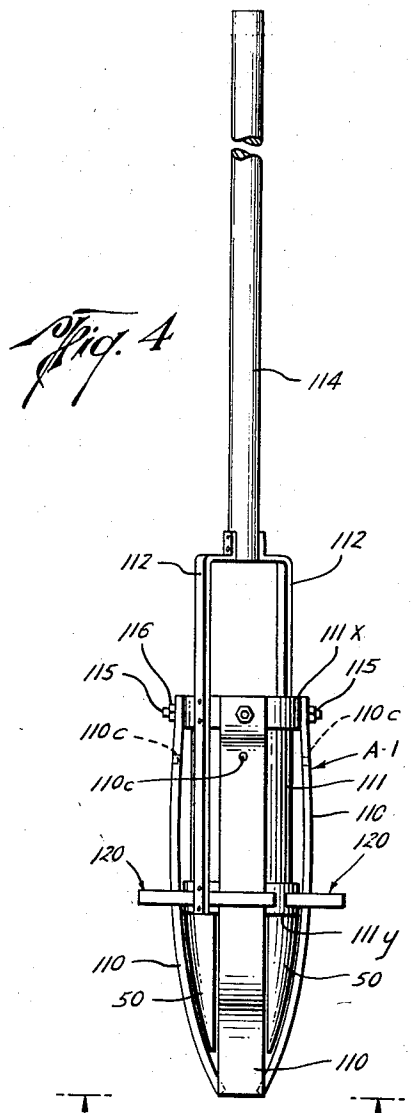


Fig. 5

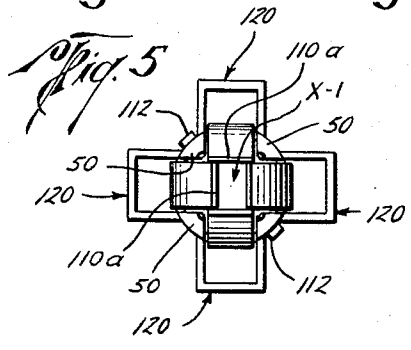


Fig. 6

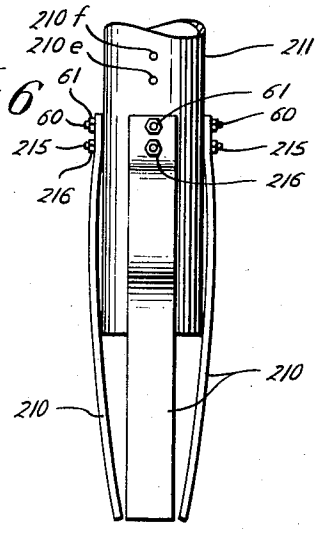
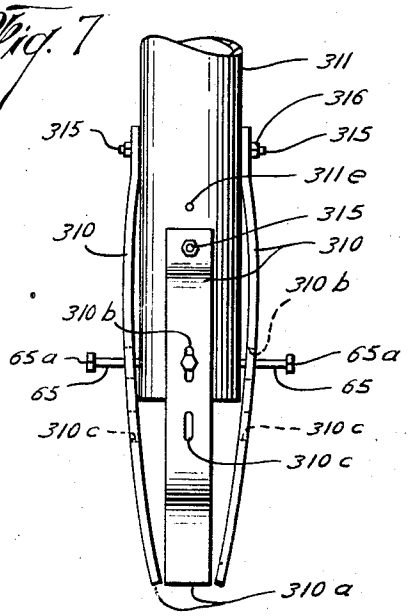


Fig. 7



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United States Patent Office

2,889,170

Patented June 2, 1959

2,889,170

GRAPPLE DEVICE

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Application December 12, 1956, Serial No. 627,774

1 Claim. (Cl. 294—99)

This invention relates to grapple devices, and particularly to grapple devices which are adapted to retrieve rocks and similar articles from well holes, post holes and the like.

An object of this invention is to provide a new and improved grapple device for picking up one or more rocks or similar articles from the bottom of a well hole, post hole, or the like.

An important object of this invention is to provide a new and improved grapple device for retrieving rocks and similar articles from well holes, post holes and the like, wherein the grapple device is adapted to pick up such rocks or similar articles without special manipulation of the device, whereby the device may be lowered into the hole on a flexible cable or on a rigid support.

Another object of this invention is to provide a new and improved grapple device for picking up rocks and similar articles, wherein the grapple device has a means for picking up a rock or similar article as the device is lowered relative thereto, and wherein the device also has means for confining a plurality of rocks or similar articles so that the device may be used repeatedly in a well hole, post hole or the like without removing same therefrom until a relatively large number of the rocks or other similar articles have been picked up.

A further object of this invention is to provide a new and improved grapple device for picking up rocks and other similar articles, wherein resilient grapple arms are provided for resiliently gripping a rock and retrieving same from the ground or the bottom of a hole, and wherein means are provided for limiting the lateral shifting of each of the resilient grapple arms so as to maintain such arms in a position for successive uses.

The construction designed to carry out the invention will be hereinafter described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown, and wherein:

Fig. 1 is a view in elevation illustrating one form of the grapple device of this invention;

Fig. 2 is a vertical sectional view of the lower portion of the grapple device illustrated in Fig. 1, and particularly illustrates the device as it engages or picks up a rock;

Fig. 3 is a view taken on line 3—3 of Fig. 1 to illustrate the construction of the lower end of the grapple device of Fig. 1;

Fig. 4 is a view in elevation illustrating another form of the grapple device of this invention;

Fig. 5 is a view taken on line 5—5 of Fig. 4 to illustrate the lower portion of the device shown in Fig. 4;

Fig. 6 is a modified construction of the grapple device of this invention; and

Fig. 7 is another modified construction of the grapple device of this invention.

In the drawings, the letter A (Fig. 1) designates generally the grapple device of this invention which is adapted to be lowered into a well hole, post hole, or any other similar hole W in the ground in which one or more rocks R or similar articles are located. As will be explained in detail, the grapple device A includes a plurality of spring arms **10** which are formed of a resilient or spring material and which are connected only near their upper ends so that such arms **10** are adapted to open or spread apart from each other when lowered into contact with the rock R or other similar article. The rock R is thus forced upwardly into the enclosure provided by the arms **10** and is, therefore, retained by the device so that it can be removed from the well hole or other opening W. The spring arms **10** are mounted on a body **11** which is elongate and which is preferably cylindrical and tubular so that a plurality of the rocks R may be picked up and accumulated within the bore of the tubular body **11**. With such construction, it is possible to pick up a large number of the rocks R without removing the grapple device A from the hole W. Also, as will be explained, when the grapple device is raised to the surface to remove the rocks R from the bottom of the hole W, the rocks R can then be removed readily from the grapple device A by turning the device A upside down so that the rocks R fall by gravity from the open upper end of the tubular body **11**. Considering the invention in detail, and particularly the embodiment illustrated in Figs. 1–3, the tubular body **11** as shown is cylindrical and has an inner open bore **11***a* (Fig. 2) which extends throughout the length of the body **11** and provides for an open upper end **11***b*. A bracket **12** which is preferably V or U-shaped is welded to the upper end of the tubular body **11** so that a cable or other flexible line **14** may be connected thereto, preferably with a swivel **15** or other similar connecting means. The cable **14** extends to the upper or ground surface of the well hole W so that the operator may lower the grapple device A into such hole W and may thereafter raise the device A from the hole W after one or more of the rocks R have been collected in the device A. It should be noted that the brackets **12** must be constructed so that the opening provided therebelow is at least as great as the diameter of the bore **11***a* of the tubular body **11** so that rocks which are accumulated within the bore **11***a* may be dumped out of the upper opening **11***b* without being caught by the bracket **12**.

The spring arms **10** are formed of a resilient or spring metal, and preferably each of the arms **10** is bowed so that each lower end **10***a* is positioned downwardly and inwardly with respect to the lower end **11***c* of the tubular body **11** so that the opening X (Fig. 3) which is provided by and between the ends **10***a* of the arms **10** is of a reduced size as compared to the bore **11***a* of the tubular body **11** prior to the time that such arms **10** are flexed or moved outwardly to receive a rock or similar article R. As will be explained, the opening X enlarges as a rock or other similar article is picked up by the arms **10**, but such arms are prevented from expanding to such an extent that rocks of a size larger than the bore **11***a* are picked up. It can be appreciated that if the rocks R are of a size larger than the bore **11***a*, they will not pass upwardly into such bore **11***a* as the rocks are accumulated during the use of the grapple device A.

In order to mount the spring arms **10** on the body **11** so that they are in a position for flexing outwardly as a rock R is encountered to thereby pass over such rock and pick it up or confine it within the enclosure provided by the arms **10**, each of the arms **10** is connected to the tubular body **11** near its upper end so that each arm in effect is free to move or flex throughout substantially the full length thereof. Thus, the arms **10** are each preferably connected by a bolt **15** which extends through one

of the openings 11*d* in the body 11 and through an opening 10*b* in each arm 10. Each bolt 15 has a nut 16 threaded thereon to thereby removably secure the upper end of the arms 10 to the body 11.

In the embodiment shown in Figs. 1–3, another set of openings 11*e* (Fig. 1) corresponding to the openings 11*b*, but lying in a lateral plane spaced thereabove, are provided for adjusting the positions of the spring arms 10. Thus, when the bolts 15 are moved to the openings 11*e* and are positioned through the openings 10*b* in each of the arms 10, the arms 10 are raised upwardly with respect to the body 11 so that they do not extend inwardly at their lower ends 10*a* as far as when they were previously positioned with the bolts 15 through the openings 11*b*. Such raising of the arms 10 enlarges the opening X between the ends 10*a* of the arms 10 so that larger sizes of rocks R or similar articles may be accommodated more easily. Also, it should be noted that when the spring arms 10 are positioned with the bolts 15 through the openings 11*d*, the opening X is in the form of a square with the bottom edges 10*a* forming the sides of the square and in substantially close relationship to each other so that the ends 10*a* contact or substantially contact each other. However, when the arms 10 are moved to the upper position with the bolts 15 extending through the openings 11*e*, the opening X is still in the shape of a square, but the bottom edges 10*a* are spaced further from each other. It should be understood, of course, that the shape of the opening X may be other than that of a square, but such shape is preferred in most instances.

Each of the arms 10 is prevented from shifting laterally during the outward and inward movement thereof for picking up a rock R or other similar articles. In the embodiment illustrated in Figs. 1–3, the lateral shifting of the spring arms 10 is prevented by U-shaped retaining members 20 which are welded or otherwise suitably affixed to the external surface of the tubular body 11 at a point below the connection provided by the bolts 15. The legs 20*a* of each retaining member 20 are spaced apart from each other a sufficient distance to permit the arms 10 positioned therebetween to move inwardly and outwardly with respect to the other arms 10 without any binding or dragging contact with such legs 20*a*, but the legs 20*a* are close enough to limit the lateral shifting of each arm 10. The legs 20*a* of each retaining member 20 is perpendicular to the legs 20*a* and serves to rigidify such legs 20*a*, but it may also serve as a stop means for the arm 10 associated therewith so as to limit the extent of the outward flexing of the arm 10 to prevent its breaking, and to also prevent its being expanded to such an extent that the opening X has a larger diameter than the bore 11*a* to thereby prevent the device A from picking up rocks R which are of too large a size for accumulating in the bore 11*a* of the body 11.

In the usual case, the inherent resiliency of the spring arms 10 is sufficient to prevent them from expanding into contact with the base or stop sections 20*b* of the retaining members 20. Such resiliency of the arms 10 tends to urge same inwardly towards each other to maintain the arms 10 in the position shown in Figs. 1 and 3 of the drawings. The extent of the inward movement of the arms 10 is limited by their contact with the lower edge 11*c* of the body 11 due to the fact that the spring arms 10 are preferably made in a bowed construction. It will be noted that the arms 10 thus contact their inward stop surface provided by the lower edge 11*c* at about the mid point of the arms 10, and the retaining members 20 are positioned only a short distance above the lower end 11*c* so that the retaining members 20 are positioned about mid-way of the length of the arms 10. However, it should be specifically pointed out that there is no actual physical connection of the arms 10 except the connection means provided by the bolts 15 and the nuts 16. It is believed evident that except for the adjustment feature above described, the upper ends of the spring arms 10 might be welded to the tubular body 11, instead of using the bolts 15 and the nuts 16.

In the operation or use of the form of the grapple device illustrated in Figs. 1–3, the grapple device A is lowered into the well hole or other hole W on the cable or flexible line 14. The rocks R or similar articles which are to be removed from the hole W are ordinarily positioned at the bottom of the hole W so that the grapple device A is lowered downwardly until the lower ends 10*a* of the arms 10 contact the uppermost rock or rocks R. The weight of the grapple device A is sufficient to cause the arms 10 to spread apart or move outwardly from each other as they pass over the rock R therebelow. The amount of spreading or outward movement of the arms 10 is in accordance with the size of the particular rock R which is encountered. As soon as the lower ends 10*a* of the arms 10 have passed over and below the rock R which is being picked up, the inherent resiliency of the arms 10 returns them inwardly towards each other to confine the rock R in the enclosure or area above the lower ends 10*a* of the arms 10. The rock R is thus prevented from falling downwardly and is retained by the grapple device A. After each successive rock R is picked up and confined between the arms 10, the grapple device A is raised a distance of approximately eight to twelve inches and is then permitted to fall by gravity again to engage the uppermost rock R below the grapple device A. The arms 10 are again expanded as they pass over and around the rock R which is then being picked up. The rock or rocks R which have previously been picked up are forced upwardly as the particular rock which is then engaged by the arms 10 is moved upwardly relative to the arms 10. Ultimately, enough of the rocks R are picked up so that they are accumulated all of the way up into the bore 11*a* of the body 11. The grapple device is thus raised and then lowered for picking up each successive rock R, and the process can be repeated until all of the rocks on the bottom of the hole W which are exposed are picked up, or until the bore 11*a* of the body 11 is full of the rocks.

Thereafter, the entire grapple device A is removed from the hole W by pulling upwardly on the cable or flexible line 14 at the surface of the well or opening. When the grapple device A is positioned at the ground level, the device A may be carried or moved to any desired place and then inverted or turned upside down so that the rocks fall outwardly from the open upper end 11*b* of the body 11. The grapple device A is then in condition for further use.

In Figs. 4 and 5, a modified grapple device A–1 is illustrated. The grapple device A–1 is particularly suitable for use in picking up rocks or similar articles in relatively shallow holes such as post holes. The spring arms 110 are identical with the arms 10 of Fig. 1 except that they are ordinarily of a smaller length and size, and also each arm 110 has an additional opening 110*c* for adjusting the size of the opening provided by the arms 110, as will be explained more fully. The body 111 is similar to the body 11, except that it is preferably formed of a light-weight sheet material, instead of the relatively heavy iron as is used for the body 11 in the usual case. Reinforcing rings 111*x* and 111*y* are also provided at the upper and lower ends of the body 11 to strengthen the otherwise light-weight material of the body 111. Such rings 111*x* and 111*y* are welded or otherwise secured to the central lightweight portion of the body 111. The body 111 is tubular, and preferably cylindrical, so that rocks R and other similar articles may accumulate therein as they are picked up by the spring arms 110.

Bracket members 112 are bolted or otherwise secured to the reinforcing bands or rings 111*x* and 111*y*. The brackets 112 are connected to an operating handle 114 which is ordinarily formed of wood and which is bolted screwed or otherwise connected to brackets 112. Th

handle 114 is preferably of such a length that in relatively shallow holes, such as post holes, the device A–1 may be lowered to the bottom thereof while holding the handle 114 at the surface of the ground. Therefore, a single operator may grasp the handle 114 and thrust the device A–1 downwardly for a distance of eight to twelve inches to pick up a rock or rocks in the bottom of the hole.

The arms 110 are connected to the tubular body 111 with bolts 115 and nuts 116 in the same manner as described above for the nuts 15 and the bolts 16 for the modification of Fig. 1. The arms 110 are thus free to flex or spring outwardly away from each other when a rock R or the like is contacted. The inherent resiliency of the arms 110 causes same to move inwardly to resume the opening prior to the contact with the rock. Such opening is indicated in Fig. 5 by X–1 and it is substantially square in shape, although it is preferably formed by positioning the lower ends 110*a* of one pair of oppositely disposed arms 110 inwardly of the other oppositely disposed arms 110 (Fig. 5), whereby the opening X–1 is more nearly a rectangular shape. In any event, it will be evident that the openings X and X–1 do not have to be square in shape, although such square shape is preferred because it is more adaptable to various shapes of rocks which are encountered. The arms 110 are prevented from shifting laterally by retaining members 120, which correspond with the retaining members 20 of Figs. 1–3. Such retaining members 120 prevent lateral shifting of the arms 110 without interfering with the movement of the arms outwardly and inwardly with respect to each other. However, as explained in connection with the retaining members 20, the members 120 also serve to limit the outward flexing or movement of the arms 110 in some instances.

Since the device A–1 often handles relatively small sizes of rocks R, and even gravel and smaller particles in some cases, enclosure shields or projections 50 are provided on the lower end of the body 111 for closing the areas between adjacent spring arms 110. Such enclosure shields or projections 50 are welded or otherwise secured to the reinforcing band 111*y*, and preferably they are arcuate in shape and extend downwardly almost to the point at which the ends 111*a* of the arms 110 engage or contact each other. Thus, with the enclosures or projections 50, the area inside of the arms 110 is completely, or substantially completely, enclosed so that any rocks or similar articles which are picked up by the arms 110 are prevented from falling or passing through the side areas between the arms 110. Since the modification of Fig. 4 is intended to be used by manual manipulation, it is desirable for the entire device A–1 to be light in weight, and therefore the enclosure shields or projections 50 are preferably made of a light-weight sheet metal similar to the main portion of the tubular body 111. It will also be recognized that the enclosure shields or projections 50 may be used with the modification illustrated in Figs. 1–3, and also with the modifications of Figs. 6 and 7 to be described. Such enclosure shields or projections 50 may be formed separately and welded or otherwise secured to the body of the grapple device, or they may be formed integrally with the body.

The operation or use of the form of the device shown in Figs. 4 and 5 is believed evident from the foregoing description. The device A–1 of Figs. 4 and 5 is particularly suited for manual use, wherein the device A–1 is lowered into a relatively shallow hole such as a post hole for removing rocks and similar articles therefrom. The operator maintains a grip on the rigid handle 114 and applies a downward thrust to the device A–1, or drops the device A–1 a sufficient distance to engage and pass over the rock or rocks to be picked up. As each rock is picked up, the device is again raised and then lowered to pick up the next rock or rocks. After a sufficient number of the rocks are accumulated within the device A–1, or after all the rocks at the bottom of the hole are picked up, the device A–1 is then lifted from the hole and the rocks are emptied from the upper open end of the tubular body 111 in the manner described previously in connection with the device of Figs. 1–3. It should be noted in this connection that the brackets 112 provide an opening which is at least as large as the upper tubular opening of the tubular body 111. The adjustment openings 110*c* provide for the moving of the arms 110 upwardly for receiving the bolts 115 and the nuts 116 so as to enlarge the openings X–1 at the lower end of the arms 110. Thus, the size of the rocks R which can be accommodated is increased in a manner similar to that described previously in connection with Figs. 1–3, except that the additional adjustment openings 110*c* are provided in the arms 110 rather than in the tubular body as in the case of Figs. 1–3.

In Fig. 6, the lower portion of a modified construction is illustrated. The modification illustrated in Fig. 6 more nearly conforms with the structure of Figs. 1–3 than the modification of Figs. 4 and 5, but the modification of Fig. 6 can be readily used with any of the previously described forms of this invention. Thus, the tubular body 211 is identical with, or substantially identical with the body 11 of Figs. 1–3. The spring arms 210 are also identical with the arms 10 of Figs. 1–3. The bolts 215 and 216 of Fig. 6 are identical with the bolts 15 and 16 of Figs. 1–3. The modification of Fig. 6 differs from the form of the invention shown in Figs. 1–3 principally in that the retainer means or brackets 20 are eliminated in Fig. 6, and instead, additional bolts 60 and nuts 61 are provided above the bolts 215 and nuts 216. The additional bolts 60 prevent the arms 210 from moving laterally during their outward and inward movement relative to each other. In that respect they function in the identical manner with the brackets 20, but they do not serve to limit the outward movement of the arms 210 as in the case of the retaining members or brackets 20. The arms 210 are adjustable in substantially the same manner as described in connection with Figs. 1–3, except that two sets of openings 210*e* and 210*f* above each of the arms 210 is preferably provided for receiving each of the bolts 60 and 215. Also, it will be understood that additional holes can be provided in the arms 210 rather than in the tubular body 211, if preferred, and in such case the adjustment holes such as illustrated in Figs. 4 and 5 would be utilized instead of the openings 210*e* and 210*f*. The operation and use of the form of the invention shown in Fig. 6 is, of course, identical with that previously described in connection with Figs. 1–3. It will also be understood that the device of Fig. 6 may be used with a flexible line such as the line 14, or with a rigid handle such as the handle 114 of Fig. 4.

In Fig. 7, another modification of the lower portion of the device of Figs. 1–3 is illustrated. The tubular body 311 corresponds with the tubular body 11 of Figs. 1–3. The spring arms 310 correspond with the arms 10 of Figs. 1–3. In Fig. 7 the oppositely disposed pair of spring arms 310 which are centrally located therein are of a shorter length than the oppositely disposed arms 310 which are on the sides as viewed in Fig. 7. Such construction merely serves to illustrate the fact that the arms 310 do not have to be of the same length. Likewise, in all of the other forms of the invention illustrated herein, the spring arms may be of different lengths if desired in the same manner as shown in Fig. 7. Each of the spring arms 30 is connected at its upper end to the tubular body 311 with bolts 315 and nuts 316 which correspond with the bolts 15 and the nuts 16 of Figs. 1–3. Adjustment openings 311*e* are also provided in the tubular body 311 to position each of the arms 310 upwardly for enlarging the opening provided between the lower ends 310*a*.

The form of the invention shown in Fig. 7 differs pri-

marily from the form illustrated in Figs. 1–3 in that the retaining members or brackets **20** are eliminated, and instead, a guide pin **65** which may be in the form of a bolt with a head **65***a*, is welded or otherwise connected to the body **311** to extend substantially perpendicularly therefrom. Each of the guide pins or bolts **65** extends through a slot **310***b* which is longitudinally elongated, and which preferably has a narrower width than the head **65***a* of the pin or bolt **65**. Thus, the arms **310** are free to move outwardly and inwardly with respect to each other and with respect to the tubular body **311**, with their only fixed connection being the bolts **315**, but the engagement of the pin **65** with the walls of the slots **310***b* prevent lateral shifting of the arms **310** during such outward and inward movement thereof. Also, the extent of the outward movement of the arms **310** is limited by the contact of the arms **310** with the bolt heads **65***a* in the event such heads **65***a* are included. For adjustment purposes, additional slots **310***c* are provided below the slots **310***b* in each of the arms **310** so that when the arms **310** are moved upwardly with the bolts **315** positioned in the openings **311***e*, the retaining pins or bolts **65** extend through the openings **310***c* instead of the openings **310***b*. For adjustment purposes, it is desirable to have the pins **65** formed as bolts which are removably threaded into the tubular body **311** so that they can be removed for raising the arms **310** and then later inserted into the openings **310***c* when the arms **310** are moved to the new position. The operation and use of the modification shown in Fig. 7 is of course the same as described previously in connection with Figs. 1–3.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made within the scope of the appended claim without departing from the spirit of the invention.

What is claimed is:

A grapple device for picking up rocks and similar articles comprising, an elongated body having an open lower end for receiving grappled articles therein, a plurality of bowed spring arms extending downwardly and terminating inwardly with respect to said lower open end of said body, said arms having lower ends which terminate below and in spaced relation to said lower open end of said body, said terminating lower ends of said arms defining an opening normally reduced in size relative to the size of said lower open end of said body and spaced below said lower open end of said body, connection means adjacent the upper end of said bowed spring arms connecting said arms to the exterior of said body at a position above the lower end of said body, said spring arms being unconnected to said body below said connection means whereby said arms are flexible outwardly relative to said body to enlarge said reduced opening defined by said lower arm ends as said arms engage and move over an article, and said lower ends of said arms thereafter returning to their normal position to reduce said opening and retain the article inwardly of said arms and above said lower ends of said arms, and a retaining means on said body below said connection means and having a portion normally spaced outwardly from said arms, but engageable with said bowed spring arms to restrain lateral movement and to limit outward flexing of said spring arm relative to said body.

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