Feb. 12, 1935. E. J. SHAUGHNESSY 1,990,673

GRAPPLE

Filed Jan. 8, 1934 2 Sheets-Sheet 1

Fig. 1

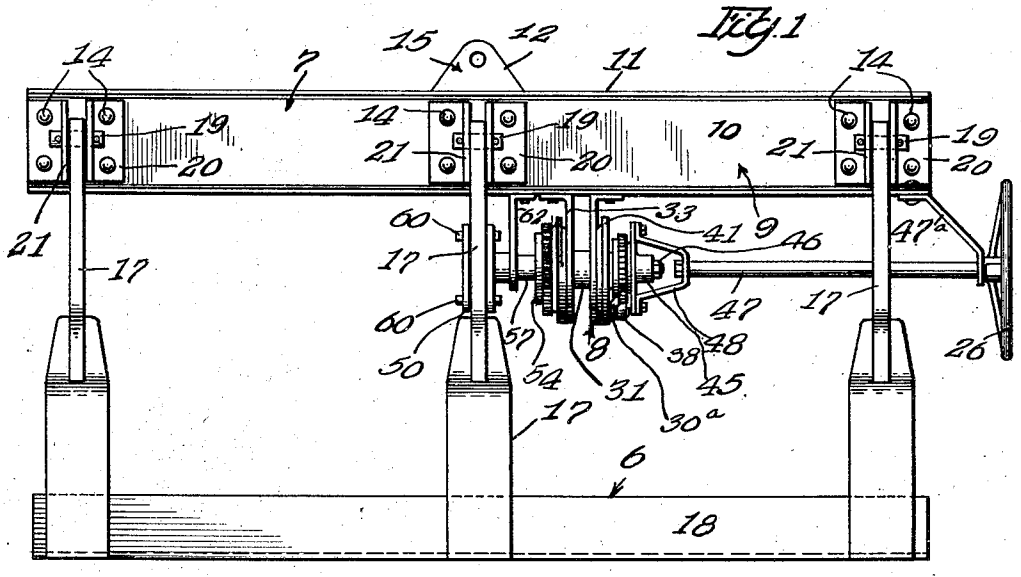
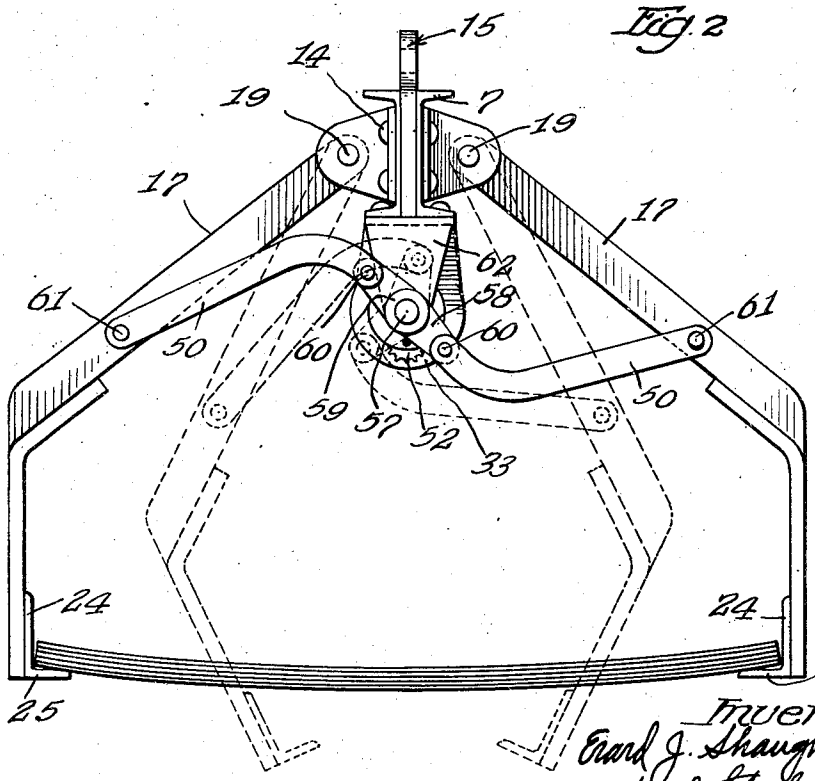


Fig. 2



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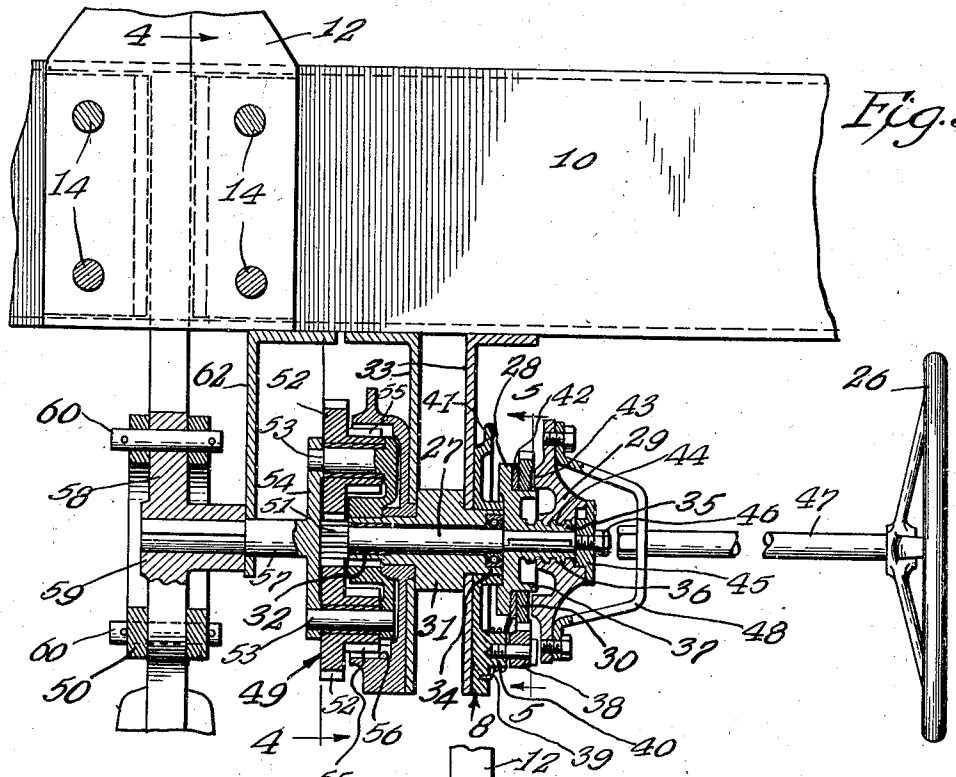


Fig. 3.

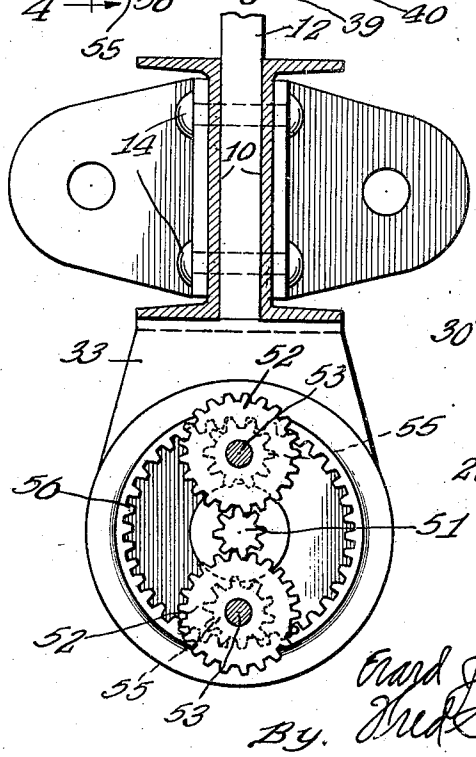


Fig. 4.

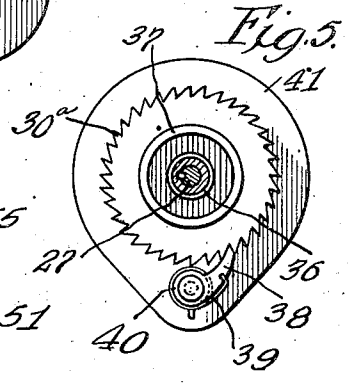


Fig. 5.

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UNITED STATES PATENT OFFICE

1,990,673

GRAPPLE

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Application January 8, 1934, Serial No. 705,796

3 Claims. (Cl. 294—106)

The present invention relates generally to grapples for use in handling sheets and plates of metal or other materials. More particularly, the invention relates to that type of grapple which is adapted to be hoisted and moved from place to place by a crane or overhead hoist and comprises (1) a pair of oppositely facing, horizontally elongated, complemental jaws which depend from an elongated, horizontally extending, supporting element and are pivotally connected to the latter so that they may be swung to and from one another into and out of engagement with the side margins of the sheets or plates, and (2) mechanism which is associated with the horizontally extending supporting element and operates to swing the jaws to and from one another and to lock or hold them in place.

One object of the invention is to provide a grapple of this type which is generally an improvement upon, and is more efficient and positive in operation than, previously designed grapples for the same purpose by reason of the fact that the mechanism for operating the jaws is so designed and is of such construction that the jaws, after being swung or adjusted into hoisting relation with respect to a stack of sheets or plates, are permitted automatically to swing towards one another to a limited extent in order to compensate for the sag in the sheets or plates when the latter are hoisted or lifted by the grapple.

Another object of the invention is to provide a grapple of the type under consideration in which the actuating means for the jaw-operating mechanism is in the form of a hand wheel which is located at one end of the grapple so that it is possible when the grapple is used in stacking sheets or plates in row or pile form to place the stacks closer together than is possible with grapples wherein the jaw-operating mechanism is controlled or actuated from one side of the grapple by way of a man or operator who must stand between the stacks.

A still further object of the invention is to provide a grapple of the aforementioned type which is generally of new and improved construction and may be manufactured at a low and reasonable cost.

Other objects of the invention and the various advantages and characteristics of the present grapple construction will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which ar hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a side view of a grapple embodying the invention;

Figure 2 is an end view illustrating the construction and arrangement of the oppositely facing, complemental jaws;

Figure 3 is an enlarged, longitudinal, vertical section of the mechanism for swinging the jaws to and from one another;

Figure 4 is a transverse, vertical section on the line 4—4 of Figure 3; and

Figure 5 is a detailed view of the ratchet wheel which forms part of the jaw-operating mechanism.

The grapple which forms the subject matter of the invention is designed expressly for use in handling sheets or plates of metal or other material. It is adapted to be hoisted and moved from place to place by a crane or overhead hoist and comprises a pair of oppositely facing, horizontally elongated, complemental jaws 6, a supporting element 7 for the jaws and mechanism 8 for operating or actuating the jaws.

The supporting element 7 extends horizontally and consists of a pair of laterally spaced, channel iron bars 9. These bars are coextensive and consist of vertically extending webs 10 and side flanges 11. The flanges are formed integrally with, and project outwardly from, the webs 10. The two bars 9 are spaced apart by means of a center plate 12 and end plates. These plates are disposed between the webs of the bars and carry rivets 14 which extend through the webs and operate to secure the bars rigidly together. The center plate 12 is located midway between the two end plates and is provided with an integral, upwardly extending, apertured ear 15. This ear projects above the uppermost side flanges 11 of the bars 9 and serves as the medium whereby the grapple may be attached to a hook or other connecting device on the operating end of the crane or hoist with which the grapple is used.

The oppositely facing, complemental jaws 6 are supported by the element 7 and consist of a plurality of pivot members 17 and a pair of angle iron bars 18. The members 17 depend from the supporting element 7 and have the upper ends thereof pivotally mounted on pins 19 which are carried by pairs of brackets 20. These brackets

embody outwardly extending lugs 21 through which extend transversely the pivot pins 19, and are fastened fixedly to the outer faces of the webs 10 of the channel bars 9 by the rivets 14 which serve to secure the bars rigidly together. The upper ends of the pivot members 17 extend between the lugs 20 and have holes for the pins 19. By reason of the pivotal connection between the brackets 20 and the upper ends of the members 17, the jaws 6 are supported from the element 7 so that they may be swung to and from one another as indicated by dotted lines in Figure 2 of the drawings. The angle iron bars 18 are applied to the lower ends of the pivot members 17 and consist of substantially vertical legs 24 and substantially horizontal legs 25. The legs 24 are welded or otherwise secured to the inner faces of the lower ends of the pivot members 17 and are adapted when the arms are brought into hoisting relation with respect to a stack of sheets, to abut against the side edges of the sheets. The legs 25 are formed integrally with and project inwardly from the bottom portions of the legs 24 and are adapted to underlie the side margins of the sheets, as shown in Figure 2. Preferably, each of the jaws 6 embodies three pivot members 17.

The mechanism for swinging the jaws 6 to and from one another is carried by the supporting element 7 and is located between the upper ends of the pivot members 17. It is controlled by means of a hand wheel 26 at one end of the grapple and comprises a horizontally extending shaft 27, a brake plate 28, a disk 29, and a ratchet wheel 30. The shaft 27 extends longitudinally through an elongated block 31 and is journaled in a pair of bearings 32. The block 31 is suspended from the channel bars 9 of the element 7 by means of a pair of brackets 33. The latter are welded or otherwise secured to the lowermost side flanges of the bars 9 and are arranged in spaced relation and so that they support the ends of the block 31. The bearings 32 are mounted in annular grooves 34 in the ends of the block 31. The brake plate 28 is mounted on, and keyed to, one end of the shaft 27 and is provided with a hub 35 which extends longitudinally of the grapple and in the direction of the hand wheel 26. This hub is preferably formed as an integral part of the brake plate and embodies an external screw thread 36. In addition to the hub 35, the brake plate embodies an annular flange 37. The latter, as shown in Figure 3 of the drawings, surrounds and projects in the same direction as the hub 35 and has mounted thereon the ratchet wheel 30. The latter is provided on the periphery thereof with ratchet teeth 30^a and is confined to rotation in one direction on the flange 37 by means of a pawl 38. This pawl is pressed into engagement with the ratchet teeth 30^a by means of a spring 39 and is mounted on a lug 40 which is attached to a plate 41 on one end of the shaft-supporting block 31. A flat, ring-shaped brake strip 42 surrounds the annular flange 37 and is mounted between the ratchet wheel 30 and the peripheral portion of the brake plate so that when the ratchet wheel is moved towards the plate it is locked for rotation with the plate. The disk 29 is mounted on the outer end of the hub 35 of the brake plate and is provided with an annular portion 43 for engaging the outer face of the ratchet wheel 30. In addition to the ratchet wheel-engaging portion 43, the disk 29 is provided with an internal screw thread 44 which coacts with the external screw thread 36 on the hub 35 of the brake plate 28 so that when the disk 29 is rotated in one direction relatively to the brake plate, it is moved towards the brake plate and clamps the ratchet wheel 30 against the brake strip 42. When the disk 29 is rotated in the opposite direction, it is moved away from the brake plate 28 and releases the ratchet wheel so that the brake plate is rotatable relatively thereto. Reverse rotation of the disk 29, that is rotation tending to move the disk away from the brake plate, is limited by means of a trust washer 45. This washer is mounted on a threaded stem on the hand wheel end of the shaft 27 and is clamped adjacent the outer end of the hub 35 of the brake plate by means of a nut 46 on the stem. Rotation of the disk 29 is effected by the hand wheel 26 which is located in front of the disk 29 and is provided with a shaft 47. This shaft is aligned with the shaft 27 and is connected at its inner end to the disk 29 by means of a bracket or yoke 48 which straddles with thrust washer 45 and is bolted to diametrically opposite parts of the disk. The outer end of the shaft 47 is supported by means of a bracket 47^a which is connected to and depends from the side flanges of the bars 9 at one end of the supporting element 7. When the hand wheel 26 is rotated in one direction, the disk 29 turns on the threaded hub of the brake plate until the ratchet wheel is clamped against the brake strip for rotation with the brake plate and then transmits rotative movement of the wheel to the shaft 27 via the ratchet wheel and the brake plate. When the hand wheel 26 is rotated in the opposite direction, the disk 29, because of its screw thread connection with the hub of the brake plate, is moved away from the brake plate and releases the ratchet wheel so that the brake plate is free to move independently thereof.

In addition to the parts previously described, the mechanism for operating the jaws comprises planetary gearing 49 and two pairs of links 50. The planetary gearing, as hereinafter described, operates in response to rotation of the shaft 27 by the hand wheel 26 and through the medium of the links 50 to open the jaws 6, and comprises the following parts: a pinion 51 which is keyed or otherwise fixedly secured to the end of the shaft 27 opposite the brake plate 28 and abuts against one end of the block 31; a pair of diametrically opposite gears 52 which mesh with and are driven by the pinion 51 and are mounted rotatably on stub shafts 53 on a spider 54; and a pair of pinions 55 which are formed integrally with the gears 52 respectively and mesh with a stationary internal gear 56 in order to cause the gears 52 to revolve around the pinion 51 and thus to rotate the spider 54 in response to rotation of the pinion 51 by the hand wheel 26. The internal gear 56 is mounted on one end of the block 31 and abuts against, and is attached to, one of the brackets 33 which serve to support the block and the various operating parts of the jaw-operating mechanism. The spider 54 is provided with a shaft 57 which is longitudinally aligned with the shaft 27 and embodies at one end thereof a pair of oppositely extending arms 58. The arms are joined to one another by means of a hub 59 which is keyed or otherwise fixedly secured to the shaft 57 of the spider 54 and operates to rotate the arms in response to rotation of the shaft 57. The two pairs of links 50 are applied to the jaws 6 respectively and have the inner ends thereof pivotally connected by pins 60 to the outer or distal ends of the arms 58 and have their outer ends pivotally connected by pins 61 to the central portions of the intermediate pivot

members 17 of the jaws 6. A bracket 62 is secured to and depends from the lowermost side flanges 11 of the channel iron bars 9 and is applied to the shaft 57 so as to support the latter.

The operation of the grapple is as follows:

When it is desired to hoist or move a stack of sheets, the jaws 6 are swung apart so that the angle iron bars 18 are spaced apart a distance slightly greater than the width of the sheets. This outward swinging of the jaws of the grapple is accomplished by turning the hand wheel 26 in the proper direction to effect rotation of the shaft 27 through the medium of the disk 29, the ratchet wheel 28 and the brake plate 27. In response to rotation of the shaft 27 by the hand wheel 26, the planetary gearing 49 is driven and this gearing in turn rotates the shaft 57 and swings or rotates the arms 58 so as to force outwardly the jaws of the grapple through the medium of the link 50. The extent of the jaw opening is controlled by the number of revolutions of the hand wheel 26. After the jaws have been adjusted or swung outwardly the proper amount, the grapple is lowered by the crane or hoist with which it is associated until the angle iron bars 18 at the lower ends of the pivot members 17 of the jaws are properly positioned with respect to the side edges of the sheets. In order to swing the jaws inwardly into hoisting relation with the sheets, the operator turns the hand wheel 26 in the opposite direction. This movement of the hand wheel causes the disk 29 to back away from the brake plate 28 because of its threaded engagement with the hub of the brake plate and releases the ratchet wheel 29 so that the brake plate is free to rotate relatively thereto. Upon freeing or release of the brake plate from the ratchet wheel, the jaws 6 swing inwardly by gravity until the vertical legs 24 of the angle iron bars 18 abut against the side edges of the sheet and the horizontal legs 25 of the angle iron bars underlie the side margins of the sheets. Inward swinging of the jaws results in reverse rotation of the planetary gearing 49 and a reverse drive of the shaft 27. Such drive of the shaft is in turn imparted to the brake plate 28 and through the medium of the screw thread connection between the disk 29 and the hub of the brake plate, causes the disk 29 to move towards the brake plate and to jamb the ratchet wheel into locked relation with the latter. As soon as the ratchet wheel is jambed against the brake plate, it brakes or stops the jaws against further inward movement because it is restricted to rotation in but one direction by its teeth 30^a and the pawl 38. After the angle iron bars 18 which form a part of the jaws 6 are swung into place, the disk 29 is again backed away from the brake plate 28 by manipulation of the hand wheel 26. As a result of this operation, the jaws are again released so that they may swing inwardly to a limited extent in order to compensate for any sag in the sheets when the latter are hoisted or lifted by the grapple. Further inward movement of the jaws, if necessary, can be obtained by further manipulation of the hand wheel. By virtue of the fact that the hand wheel 26 for actuating the jaw-operating mechanism is located at one end of the grapple, it is possible, when the grapple is used in stacking sheets, to place the stacks extremely close together inasmuch as the sides of the grapple are free and it is not necessary for the operator of the grapple to stand between the stacks in connection with the manipulation of the grapple. An advantage and characteristic of employing the specific jaw-operating mechanism herein shown and described is that the jaws may be set so that they automatically move inwardly to compensate for the sag in the sheets during raising of the grapple. Furthermore, it is possible to make the horizontal legs 25 of the angle iron bars 18 extremely narrow with the result that the grapple may be used effectively in the handling of sheets in stacks which are disposed closely together.

The herein described grapple is positive and exceedingly efficient in operation and because it consists of but a small number of parts may be manufactured at a low and reasonable cost.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent, is:

1. A grapple adapted for use in handling sheets and like articles and to be attached to a crane or hoist and comprising in combination a pair of oppositely facing, horizontally elongated, complemental jaws pivoted at the upper portions thereof so that they tend to swing together by gravity and provided at their bottom portions with inwardly extending means for underlying the side margins of the sheets, a rotatable, jaw-controlling member, and gear mechanism between the member and the jaws operative in response to rotation of the member in one direction positively to swing the jaws apart and in response to rotation of the member in the other direction to permit the jaws to swing inwardly, said mechanism including a lost motion brake control for the gear portion thereof whereby when the jaws are brought into contact with the side margins of the sheets, the jaw-controlling member may be rotated to a limited extent in said other direction so as to release the jaws so that they are free to swing inwardly by gravity to a limited extent and thus automatically close in to compensate for sag in the sheets during hoist thereof by the grapple.

2. A grapple adapted for use in handling sheets and like articles and comprising in combination a horizontal supporting element having means for attachment to a crane or hoist, a pair of oppositely facing, horizontally elongated, complemental jaws pivoted to the element so that they depend therefrom and tend to swing together by gravity and provided at the bottom portions thereof with inwardly extending means for underlying the side margins of the sheets, a rotatable, jaw-controlling member supported from the supporting element, and mechanism between the controlling member and the jaws operative in response to rotation of said member in one direction positively to swing the jaws apart and in response to rotation of the member in the other direction to effect inward swinging of the jaws, said mechanism including a lost motion brake control whereby when the jaws are brought into contact with the side margins of the sheets the member may be rotated to a limited extent in said other direction to release the jaws so that they are free to swing inwardly by gravity to a limited extent and thus automatically close in to compensate for sag in the sheets during hoist thereof by the grapple.

3. A manually operated grapple of the character described, adapted for use in handling sheets

and like articles and comprising in combination a horizontal supporting element having means for attachment to a crane or hoist, a pair of oppositely facing, horizontally elongated, complemental jaws pivoted to the element so that they depend therefrom and tend to swing together by gravity and provided at the bottom portions thereof with inwardly extending means for underlying the side margins of the sheets, a hand wheel at one end of the grapple, and gear mechanism between the hand wheel and the jaws operative in response to rotation of the hand wheel in one direction positively to swing the jaws apart and in response to rotation of the wheel in the other direction to permit the jaws to swing inwardly, said mechanism including a lost motion brake control for the gear portion thereof, whereby when the jaws are brought into contact with the side margins of the sheets the wheel may be rotated to a limited extent in said other direction so as to release the jaws so that they are free to swing inwardly to a limited extent by gravity and thus automatically close in to compensate for sag in the sheets during hoist thereof by the grapple.

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