Sept. 16, 1952 G. JAEGER 2,610,890

LIFTING DEVICE

Filed June 2, 1950 3 Sheets-Sheet 1

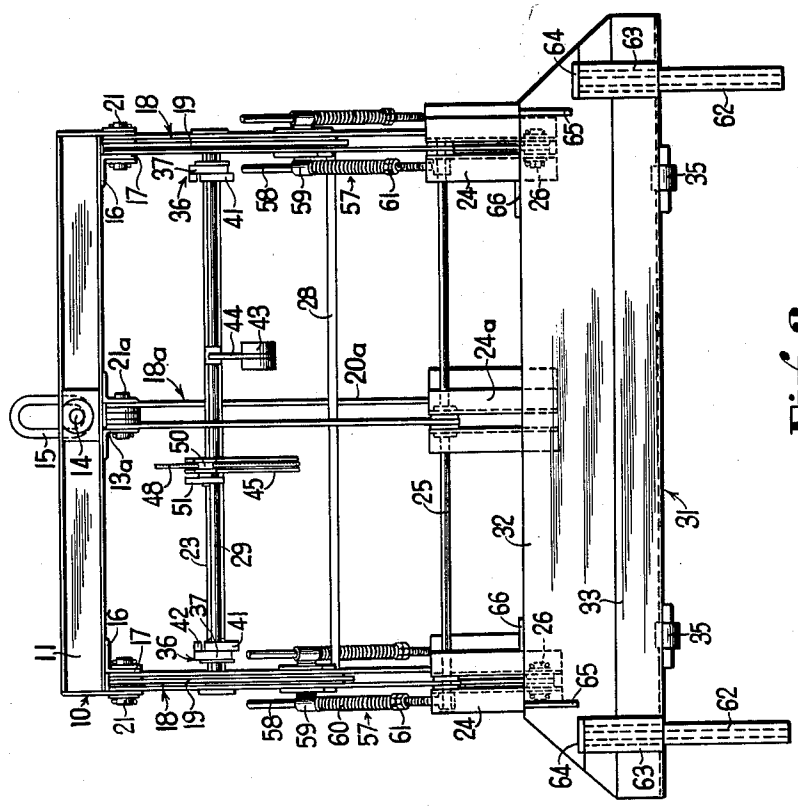


Fig. 2

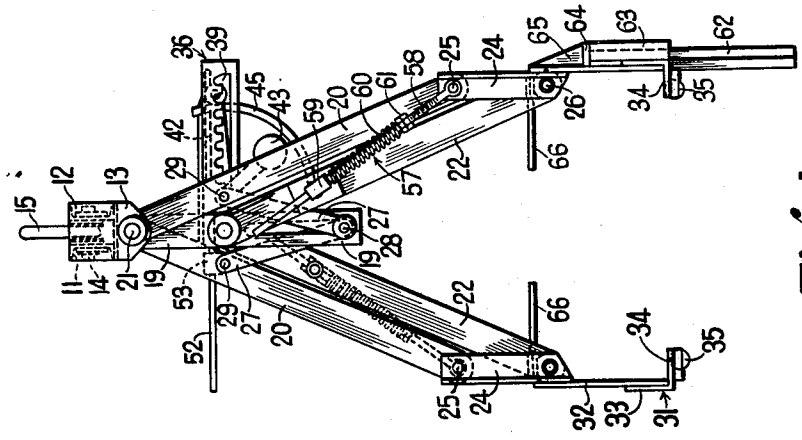


Fig. 1

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LIFTING DEVICE

Filed June 2, 1950 3 Sheets-Sheet 2

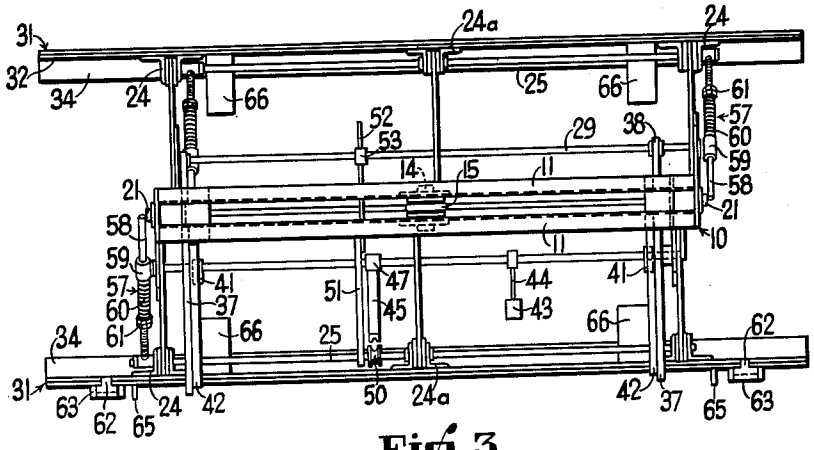


Fig. 3

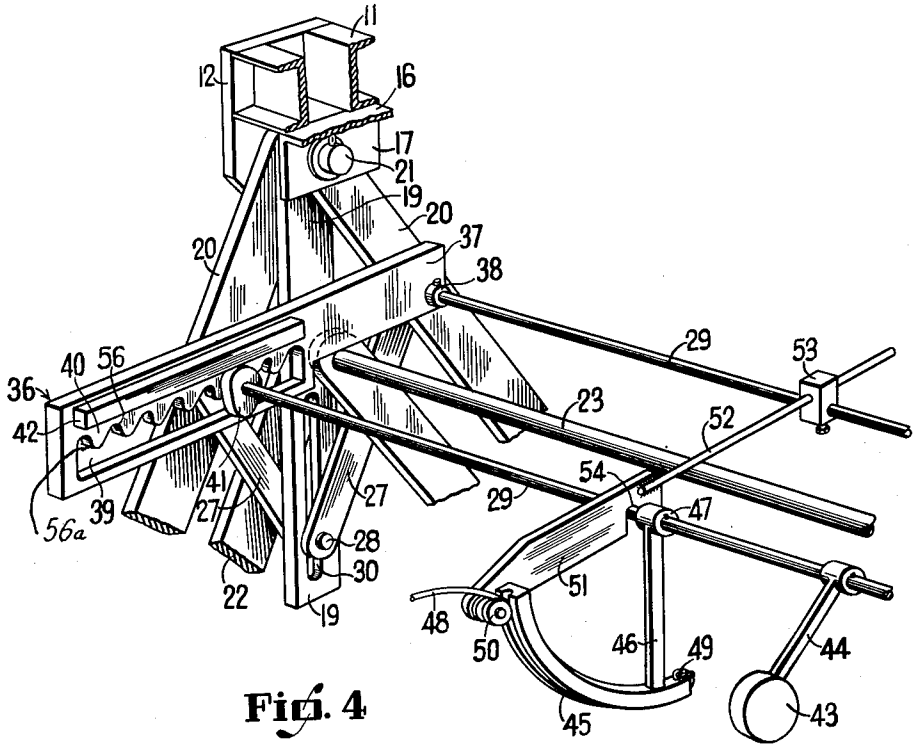


Fig. 4

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Sept. 16, 1952 G. JAEGER 2,610,890

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Filed June 2, 1950 3 Sheets-Sheet 3

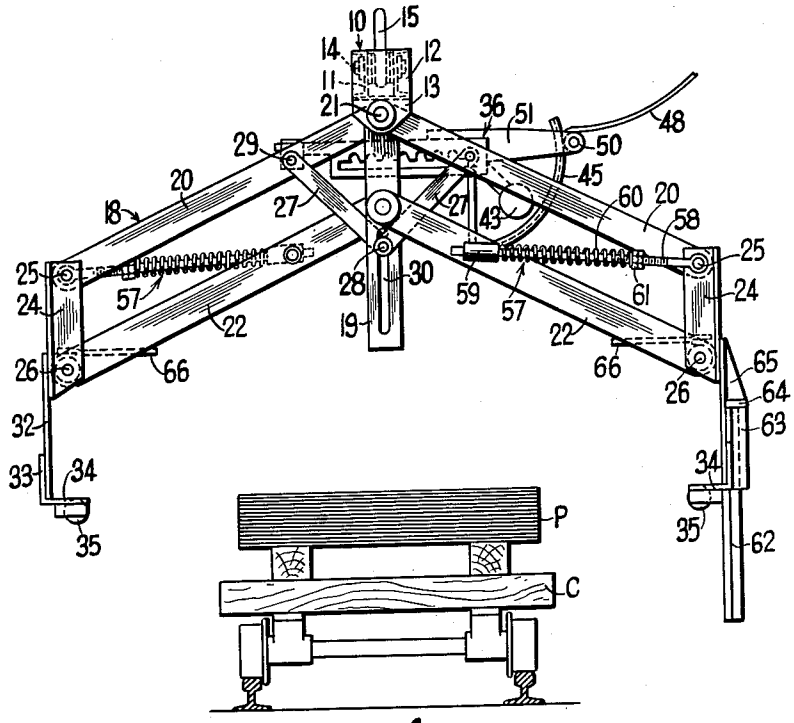


Fig. 5

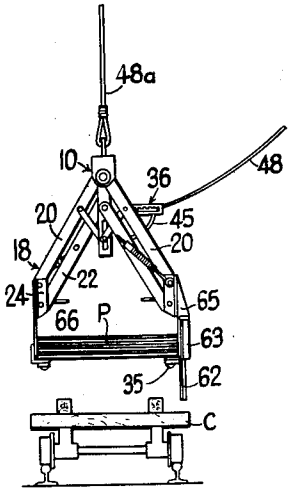


Fig. 6

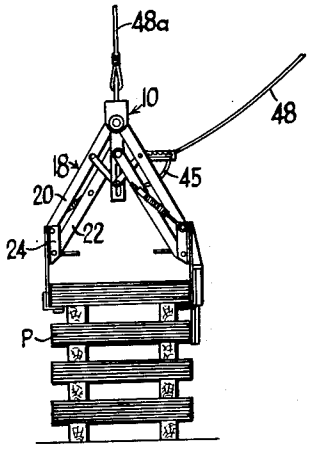


Fig. 7

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UNITED STATES PATENT OFFICE

2,610,890

LIFTING DEVICE

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Application June 2, 1950, Serial No. 165,656

13 Claims. (Cl. 294—110)

1

My invention relates to a lifting device. It has to do, more particularly, with a lifting device of the tong-type which is adapted to be supported by the conventional crane hook and which is particularly useful for handling a pile of sheet metal or plate that is supported on skids or stringers so that portions of the tongs may engage the pile underneath the bottom sheet or plate.

With this tong-type of lifting device, the pile of sheet or plate is engaged by lowering the device in straddling relationship to the pile by means of the crane which carries it. Lowering the lifting device and relieving the tension on the tongs, causes the tongs to spread and straddle the pile. Then, when the crane is operated to exert an upward pull on the lifting device, the tongs are caused to contract and to engage the lower surface of the pile as well as to grip the sides of the pile.

It is the main object of my invention to provide a lifting device of the tong-type which is particularly suitable for handling piles of sheet material and which can be operated from a remote point, such as by the crane operator when it is carried by the hook of the crane, to effectively engage and positively grip the pile of material in order to move the pile as desired and to release the pile whenever desired.

Another object of my invention is to provide a lifting device of the type indicated wherein a locking means is provided which functions automatically as the tongs are spread to keep the tongs in spread condition, to permit straddling of another pile, until released to permit engagement with the pile.

Still another object of my invention is to provide a lifting device of the tong-type which is provided with means that operate to aid in spreading the tongs when the lifting force on the device is released as the device is lowered into contact with a suitable surface especially after the tongs have been so contracted that the angle between the tongs is small.

Still another object of my invention is to provide a lifting device of the tong-type which has guide means associated therewith that will aid in obtaining a straight stack of material when one pile or group of sheet material is stacked on another.

A further object of my invention is to provide a lifting device of the type indicated which is of simple and inexpensive construction and is of a rugged nature.

Various other objects will be apparent.

2

The lifting device of my invention comprises a supporting frame which is adapted to be suspended from a suitable movable supporting structure, such as the hook of the conventional crane. This frame is provided with pivoted tong arms which carry the material-engaging lifts at their lower ends. These lifts are adapted to engage the sides of the pile and are provided with inwardly extending portions for extending beneath the pile and engaging the lower surface thereof. An upward pull on the supporting frame causes the tong arms to swing inwardly towards each other and the material-engaging lifts to engage the pile of material provided the lifting device is disposed in a straddling relationship thereto. To disengage the lifting device from the pile, it is necessary to relieve it of the lifting force and allow the tong arms to settle against the pile and expand. I provide means in association with the tong arms for aiding spreading thereof when the lifting force is slackened sufficiently as the lower ends of the tong arms are lowered into contact with the pile. This means is especially helpful after a time when the tong arms have been swung very close together, for example, in gripping a narrow pile. Locking means is connected to the tongs which functions automatically to hold the tong arms in spread position until released so that the lifting device will be spread sufficiently to again engage a pile of material. When positioned again over the pile of material in straddling relationship thereto, the locking means may be released from a remote control point to permit the engagement of the tongs with the pile when a lifting force is again supplied thereto. At one side of the lifting device, the tongs are provided with a depending guide member which will engage a lower pile of material at the time another pile is being stacked thereon by means of the lifting device. This will ensure the formation of a straight stack when several bunches of material are stacked together.

The preferred embodiment of my invention is illustrated in the accompanying drawings wherein similar character of reference designate corresponding parts and wherein:

Figure 1 is an end view of a lifting device according to my invention.

Figure 2 is a side view of the lifting device.

Figure 3 is a plan view of the device.

Figure 4 is an enlarged view, mainly in perspective, showing one end of the device including the tong arms and associated locking structure.

Figure 5 is an end view of the device showing it in expanded condition over a pile of material with which it is to be engaged.

Figure 6 is a digrammatic view showing the device engaging and lifting a pile of material.

Figure 7 is a similar view showing how several piles or groups of material may be stacked one upon the other.

With reference to the drawings, my lifting device includes a suitable supporting beam structure 10 which may be fabricated from a pair of longitudinally extending channels 11 (Figure 4) which are disposed in parallel relationship and have their ends welded to pivot plates 12 that have pivot-supporting portions 13 depending therefrom. Intermediate the ends of the channels 11, a transverse pin 14 is provided which carries a loop 15 that is adapted to receive the hook of a crane or other suitable moving means. Welded to the lower surfaces of the channels 11 at each end thereof and to the plates 12 are the transversely disposed angle members 16 which provide the depending pivot-supporting flanges 17 that are parallel to the portions 13. The pivot-supporting portions 13 and 17 serve to support a tong structure, indicated generally by numeral 18, at each end of the supporting beam structure 10.

Each of the tong structures includes a central bar 19 and upper diverging arms 20 (Figures 4 and 5) which have their upper ends pivoted together and to the beam support 10 by means of a pin 21 passing through the supporting portions 13 and 17. It will be noted that bar 19 is located between the arms 20. Each of the tong structures also includes lower diverging arms 22 which are disposed in parallel relationship to the arms 20 in the planes thereof and which are pivoted together and to the bar 19 by means of a rod 23 extending through the bar and the upper ends of the arms 22. The outer end of each arm 20 is connected to its parallel arm 22 by means of a vertically disposed link 24 which is pivoted at its upper end by a pivot rod 25 to the outer end of arm 20 and at its lower end by a pivot pin 26 to the outer end of arm 22. The arms 20 and 22 in combination with the cooperating link 24 and the portion of the bar 19 between pivots 21 and 23 form a parallelogram.

In order to keep the parallelograms at each side of the bar 19 in the same angular relationship thereto and to keep bar 19 vertical, an equalizing arrangement is provided. This equalizing arrangement comprises the links 27 which are pivoted together at their lower ends on opposite sides of bar 19 by a pin 28 and each of which has its upper end pivoted by a rod 29 to one of the upper arms 20. The pivot points 29 are located equal distances from the pivot 21. The pin 28 operates within a vertical slot 30 formed in the portion of bar 19 which depends below the pivot point 23 for the arms 22. Upward swinging of the arms 20 will be to the same extent and will cause upward sliding movement of pin 28 in slot 30. Downward swinging movement of these arms will be to the same extent and will cause downward sliding movement of pin 28 in slot 30, the bar 19 always remaining vertical. The pin 28 operating in slot 30 will serve as stop means for limiting upward and downward swinging of the parallelogram arm structures.

At each side of the lifting device, a material gripping and lifting member 31 (Figures 1, 2 and 5) is provided. Each member 31 is in the form of an elongated vertically disposed plate 32 which extends from one tong structure 18 to the other and which is welded or otherwise secured to the outer surfaces of the vertical links 24 at the lower ends thereof. The lower edge of each plate 32 carries an angle member 33 which provides an inwardly extending lifting lip 34. At points near the ends of this lip, rollers 35 are mounted therein. The members 31 will connect the two tong structures 18 together so that they will operate as a unit. It will be noted that the rods 23, 25 and 29 extend longitudinally from one tong structure 19 to the other.

Midway between the tong structures 18, an auxiliary tong structure 18*a* (Figures 2 and 3) is provided. This tong structure consists merely of the arms 20*a* which are equivalent to the arms 20 of the tong structures 18. These arms 20*a* are pivoted by a pin 21*a* to a bracket 13*a* provided on the lower side of the beam structure 10. Their lower ends are pivotally carried on the longitudinally extending rods 25. Pivoted to each rod 25 at each side of the cooperating arm 20*a* is an angle member 24*a*. These members 24*a* have their lower ends welded at 35 to the inner surfaces of the vertically disposed plates 32 of the material gripping and lifting members 31. This auxiliary tong structure 18*a* will serve to increase the rigidity of the device.

As previously indicated, I provide locking means in association with the tong structures. A locking means is provided at each end of the device in association with one of the tong structures 18 and this means is indicated generally by numeral 36 (Figures 1, 2 and 4). It comprises a ratchet bar 37 which has one end pivoted at 38 to one of the rods 29 (Figure 4). The ratchet bar 37 is provided at its opposite end with a slot 39 which is notched at its upper side to provide the ratchet teeth 40. It will be noted that the other rod 29 extends through this slot 39. This rod is adapted to be engaged by the ratchet teeth. This rod 29 carries an elongated cam member 41 which engages a ledge 42 on the side surface of bar 37 above slot 39. Normally this cam is rotated downwardly due to the fact that the rod 29 to which it is keyed is rotated in a counterclockwise direction by means of a counterweight 43 which is carried by an arm 44 that is keyed to the rod 29. Thus, normally the cam 41 permits the ratchet teeth 40 to engage the rod 29 since the bar 37 is permitted to swing downwardly around pivot point 38. However, if the rod 29 which carries the cam 41 is rotated in a clockwise direction, the elongated cam will be swung upwardly into engagement with ledge 42 and will swing the bar 37 upwardly about pivot 38 thereby releasing the ratchet teeth from the rod 29.

In order to release the ratchet when desired, from a remote point, I provide the release arrangement shown best in Figure 4. This arrangement includes a segmental cable guide 45 which is carried by the cam 41, being located intermediate the ends of the rod close to the auxiliary tong structure 18*a*, as shown best in Figure 2. An operating cable 48 passes through the channel in the outer surface of this guide and is anchored at the point 49 at the lower end of the guide. The cable 48 passes upwardly over a guide roller 50 which is carried on the outer end of a rigid arm 51 at a level corresponding to the upper end of guide 45 in its normal position. This arm 51 has its inner end welded to a rod 52 that is slidably mounted in a guide block 63 that is carried

by the other rod 29. The arm 51 is provided with a notch 54 that straddles the rod 29 which carries the cam 41. It will be apparent that a pull on the cable 48 will rotate the rod 29 and, in turn, rotate the cam 41 that is associated with the ratchet lock at each end of the device. This will lift the ratchet bars 37 and release them from the rod 29 which carries the cams 41. It will be apparent that expansion and contraction of the tong structures will move the two rods 29 towards and away from each other. The ratchet releasing structure will not interfere with this movement since rod 52 will slide in block 53, the notch 54 causing arm 51 to move along with the rod 29 with which it engages.

The ratchet teeth are so formed as to provide notches 56 at intervals which have angular outer edges 56*a*. This will permit automatic expansion of the tongs 18 and 18*a* whenever the lifting force on look 15 is released.

In order to aid in expansion of the tong structures 18, upon release of the lifting force on my device by lowering the tong structures into contact with the ground or floor or other suitable surface, assuming they have been contracted, I provide plungers 57 associated with each pair of arms 20 and 22, as shown best in Figures 1, 2 and 5. Each unit 57 comprises a rod 58 which has its outer end pivoted to rod 25 and its inner end slidably disposed in a sleeve 59 carried by the arm 22. A compression spring 60 is disposed on rod 58 between sleeve 59 and nuts 61 which are threaded on the outer portion of the rod. Thus, the resistance of the spring 60 can be adjusted.

As the tong structures are contracted, the springs 60 tend to resist this contraction since the arms 20 move closer to the arms 22 but the springs are not of sufficient resistance to prevent the contraction which is caused by the weight of the tong structures. Therefore, as soon as the lifting force is relieved by contact of the lower ends of the tong arms with the ground or floor or other suitable surface and the tongs are permitted to collapse, the springs 60 tend to move the arms 20 upwardly away from the arms 22 and, therefore, will aid in expanding the tong structures and move the material gripping and lifting members 31 away from each other. This compression spring arrangement is especially desirable after the tong arms have been contracted close together, as in Figure 1, and the angle therebetween is slight. The inclined outer edges 56*a* of the notches 56 of the ratchet will permit outward movement of rods 29, the ratchet bar 37 pivoting upwardly.

One of the members 31 carries stacking guide members 62, as shown best in Figures 1, 2 and 5. Each member 62 is in the form of a T-shaped bar which has its flat side disposed inwardly. The upper end of this bar is slidably mounted for vertical movement in a guide housing 63 secured on the outer side of the vertical plate 32 of member 31. The upper end of member 62 is provided with a cap 64 which prevents such member from dropping through the guide housing 63. Normally, the guide members 62, which are preferably disposed adjacent the ends of member 31, depend from member 31, as shown in Figure 2. However, they may move vertically in case their lower ends contact with an obstruction. To protect the upper ends of the housing 63, deflector lugs 65 are carried by the plate 32 on its outer surface and are inclined downwardly and outwardly to prevent contact of an obstruction with the upper ends of the housings and members 62 adjacent which the lugs are disposed.

To prevent the lifting device from moving downwardly over the pile of material to an undesirable extent and thereby possibly damaging parts of the device which are disposed within the two end tong structures 18, I provide the stop arrangement shown best in Figures 1, 3 and 5. This arrangement comprises the stop arms 66 which are rigidly carried on the upper edges of plates 32 of members 31 at each end thereof. These four stop arms 66 will extend inwardly and will be positioned over the pile of material as the lifting device straddles the pile. They will contact with the top of the pile to limit downward movement of the lifting device relative thereto.

In using my lifting device, for example, in removing a pile P of sheets from a car C, as shown in Figure 5, assuming that the tongs are in expanded conditions as shown in this figure, the crane operator positions the device over the car and lowers it into straddling relationship to the pile P. Downward movement of the lifting device will be limited by contact of stop arms 66 with the top of the pile . The locking means 36 serve to keep the tong structures expanded with the members 31 spaced sufficiently from each other to pass downwardly over the pile. If an upward pull on the lifting device is now exerted by the lifting cable 48 and the locking devices are released by means of the cable 48, the tong structures will be contracted against the force exerted by the springs 60 and the members 31 will be moved towards each other until they grip the sides of the pile P, as shown in Figure 6, the lips 34 of members 31 moving beneath the lower surface of the pile. The rollers 35 prevent undue friction as lips 34 engage the lower surface of the pile and move inwardly thereof. Furthermore, if in position my device over the pile it is not centered relative thereto, the rollers 35 at one side may contact the upper surface of the pile. In positioning the lifting device over the pile on the car, the lower ends of stacking guides 62 will engage the upper surface of the car but they are free to move vertically.

If several piles of material are to be superimposed in the stack, as shown in Figure 7, the members 62 will function to insure straight stacking of the piles of material. In positioning the one pile on the other, the members 62 engage one side surface of the lower pile, as shown in Figure 7. When the pile is positioned as desired, the lifting device may be released by slackening of the cable 48*a* to allow the tongs to settle on the pile and expand. This expansion will be aided by the springs 60. The lips 34 will thus be moved outwardly from beneath the pile. The members 31 will be locked in this spaced position by means of the locking means 36, it being understood that the one rod 29 will at this time be in one of the notches 56 of each bar 37. If further expansion of the lifting device, that is, further spacing of members 31 is desired, the lifting device may be lowered into contact with a suitable surface, permitting further collapse and expansion of the tong structures, the rod 29 moving into different notches 56 located farther outwardly on the bar 37. This further expansion can be accomplished without releasing the locking means by means of cable 48, due to the inclined outer edges 57 of the notches 56.

It will be apparent from the above description that I have provided a lifting device which is particularly suitable for handling piles of

sheet material and which can be operated by a single man from a remote point. The locking mean serves to lock the device in expanded condition so that it will be in condition to straddle a pile of the material. Also, the compression spring structures aid in expansion of the tongs at the proper time. The stop means provided on the lower portion of the device will prevent the device from moving downwardly over the pile to an undesirable extent which might injure parts of the device. Furthermore, the stacking guides will provide effective means for aiding in obtaining a straight stack.

Various other advantages will be apparent.

Having thus described my invention, what I claim is:

1. A lifting device for handling a stack of material or other articles comprising a supporting structure having means for suspending it from a crane or other moving device, tong structures suspended from said supporting structure and being spaced from each other in parallel planes, each of said tong structures including pivoted arms, elongated material-engaging members extending between the arms of said tong structures and being connected thereto at the lower ends thereof, a ratchet lock comprising a ratchet member pivotally connected to one arm of each of said tong structures and having a ratchet portion engaging a retaining member carried by the other arm of each of said tong structures, a ratchet-releasing member carried by each of the tong arms which carries said ratchet arm and engaging said ratchet arm, and an operating member connected to said ratchet-releasing members and being operable to move said releasing members for pivoting each ratchet arm to release said ratchet portion from said retaining member so that a lifting force on said supporting structure will cause said tongs to contract.

2. A lifting device according to claim 1 wherein said ratchet member includes a portion which cooperates with said retaining member to prevent relative movement of the arms of the tong structures towards each other but permits movement away from each other.

3. A lifting device according to claim 2 including resilient units connected to and tending to expand the arms of said tong structures when the lifting force is eliminated.

4. A lifting device for handling a stack of material or other article comprising a beam-like supporting structure having means for suspending it from a crane or other moving device, tong structures suspended from said beam-like supporting structure at longitudinally spaced intervals thereof, each of said tong structures comprising a central bar suspended from and pivoted to the beam structure, a pair of upper arm pivoted to said bar and a pair of lower arms pivoted to said bar in parallel relationship to the upper arms, connecting links pivoted to the outer end of each upper arm and to the outer end of each lower arm, a pair of equalizing links having their upper ends pivoted to one of said arms at each side of said bar and having their lower ends pivoted together by a pivot pin mounted for vertical movement in a slot in the lower portion of said bar, and means tending to expand said tong structures, said means comprising spring plungers disposed between each pair of upper and lower arms and connected thereto so as to tend to move said arms apart.

5. A lifting device for handling a stack of material or other article comprising a beam-like supporting structure having means for suspending it from a crane or other moving device, tong structures suspended from said beam-like supporting structure at longitudinally spaced intervals thereof, each of said tong structures comprising a central bar suspended from and pivoted to the beam structure, a pair of upper arms pivoted to said bar and a pair of lower arms pivoted to said bar in parallel relationship to the upper arms, connecting links pivoted to the outer end of each upper arm and to the outer end of each lower arm, material gripping members extending between said tong structures and being carried by said links, a pair of equalizing links having their upper ends pivoted to one of said arms at each side of said bar and having their lower ends pivoted together by a pivot pin mounted for vertical movement in a slot in the lower portion of said bar, locking means connected to each of said tong structures, said locking means comprising a ratchet bar pivoted to a rod which extends from one of the upper arms of one of said tong structures to the corresponding upper arm of the other tong structure, said ratchet bar having a ratchet portion which cooperates with a rod extending from the other upper arm of said first-named tong structure to the corresponding upper arm of the other tong structure, and ratchet releasing cams carried by the last-named rod and engageable with said ratchet bar upon rotation of the rod to release the ratchet portion from the bar.

6. A lifting device according to claim 5 wherein the last-named rod extends through a slot in the ratchet bar, wherein each of the ratchet bars has a ledge formed thereon, said cams on the rod being disposed for engagement with said ledge upon rotation of said rod.

7. A lifting device according to claim 6 wherein a segmental cable guide is carried by said rod which carries said cams for rotation of the rod, an additional guide being carried by an arm extending from the other rod to a point adjacent the upper end of said segmental guide, said arm engaging the cam-carrying rod and being slidably carried by the other rod to permit movement of said rods towards and away from each other.

8. A lifting device according to claim 6 wherein each of said ratchet bars is provided with rod-receiving notches which permit relative movement of said two rods outwardly but prevents movement of said rods towards each other.

9. A lifting device according to claim 5 wherein said gripping members are provided with inwardly extending lips having rollers mounted thereon.

10. A lifting device according to claim 5 wherein said gripping members are provided with depending stacking guide arms which are free to move upwardly.

11. A lifting device according to claim 5 wherein said gripping members comprise elongated vertically disposed plates having inwardly extending material-engaging lips at their lower edges, and stop arms extending inwardly from each of said plates adjacent the upper edges thereof.

12. A lifting device according to claim 5 including an auxiliary tong structure between said tong structures, said auxiliary tong structure comprising a pair of arms pivoted together at their upper ends and to said beam-like supporting structure, the lower ends of said arms being pivoted to said gripping members.

13. A lifting device comprising a pivoted tong structure for gripping material which tends to

contract into gripping position upon the application of a lifting force thereto, a locking unit carried by and connected to the tong structure for automatically locking said tong structure in expanded condition whenever it is expanded, a yieldable unit carried by and connected to said tong structure for aiding in expanding said tong structure upon release of the lifting force thereon, and a releasing unit carried by said tong structure and operatively connected to said locking unit for releasing said locking unit.

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