

Oct. 6, 1953

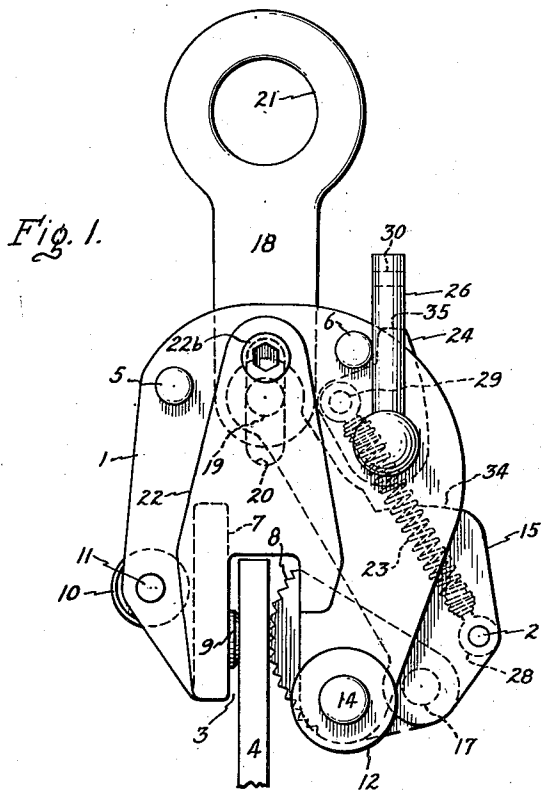
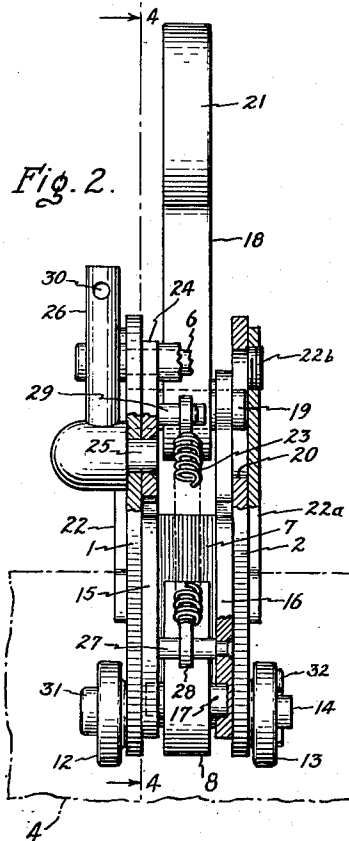
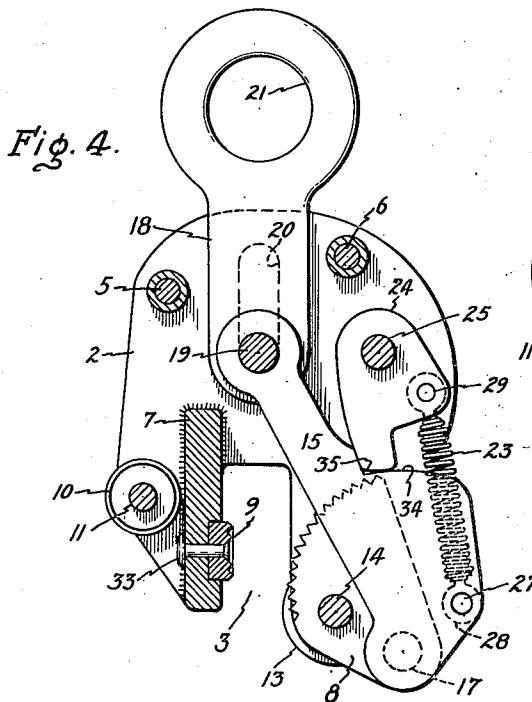
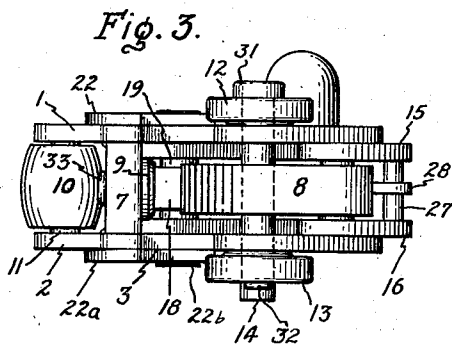
J. C. RENFROE

2,654,630

PLATE LIFTING CLAMP

Filed May 27, 1952

2 Sheets-Sheet 1



Inventor
Joseph C. Renfro,
by George H. Baldwin
His Attorney.

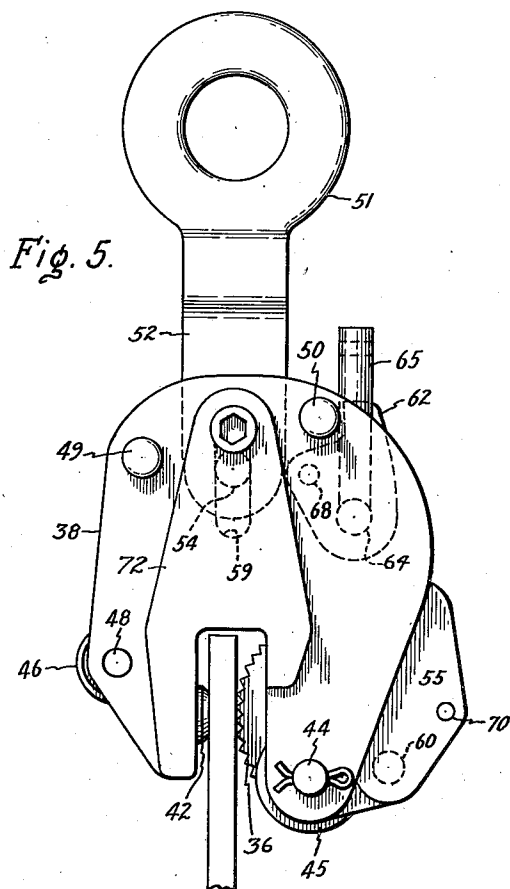
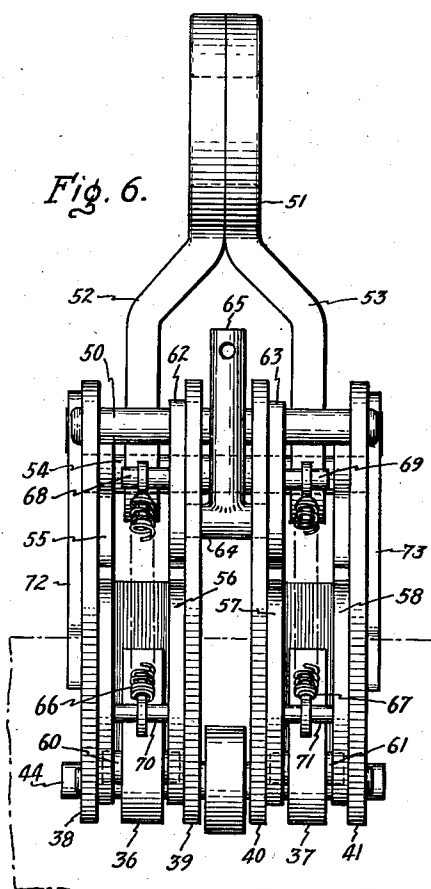
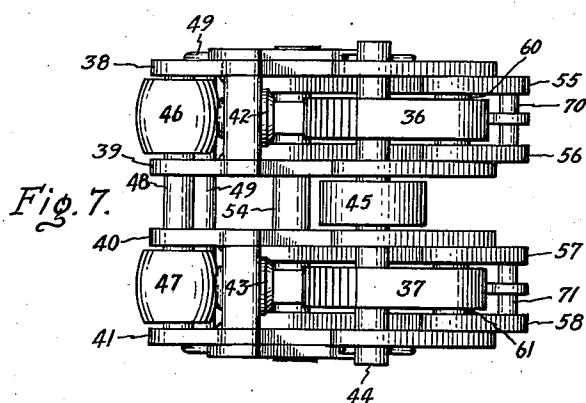
Oct. 6, 1953

J. C. RENFROE
PLATE LIFTING CLAMP

2,654,630

Filed May 27, 1952

2 Sheets-Sheet 2



Inventor
Joseph C. Renfro,
by *George F. Baldwin*
His Attorney.

UNITED STATES PATENT OFFICE

2,654,630

PLATE LIFTING CLAMP

Joseph C. Renfroe, Jacksonville, Fla.

Application May 27, 1952, Serial No. 290,361

10 Claims. (Cl. 294—104)

1

My invention relates to improved steel plate lifting clamps, and more particularly to lifting clamps comprising a clamping jaw eccentrically mounted to engage and grip a steel plate as the clamp is lifted.

An object of my invention is to provide an improved steel plate lifting clamp more easily engageable and disengageable with a lifted plate, less likely to damage the lifted plate; of minimum complexity and cost of construction; requiring fewer manual operations in connection with the moving of plates; and having the operating mechanism covered to prevent injuries and malfunctioning of the mechanism.

A specific object of my invention is to provide a safety locking arrangement in an eccentric jaw steel plate lifting clamp.

In the moving of steel plates, as in the ship-building industry, it is of primary importance that the lifting clamp utilized should be safe. Safety requires that the load be firmly held and that a minimum of personnel occupy hazardous positions in connection with the operation. Clamps in accord with my invention have advantages in each of these respects, in that the safety locking feature makes more secure the grip of the clamp on a plate being lifted and reduces the personnel necessary to follow the clamp. Further features of clamps according to my invention make the placement of the clamp on the plate and removal of the clamp from the plate more easily accomplished.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings, in which Fig. 1 is a side view of a single jaw clamp in accord with my invention, the clamp being in the closed lock condition, Fig. 2 is an end view of the clamp of Fig. 1, Fig. 3 a bottom view of the clamp of Fig. 1, also in its closed lock plate-gripping condition, but with the representation of the lifted plate omitted for the sake of clarity, Fig. 4 is a sectional view taken along line 4—4 of Fig. 2, showing the clamp, however, in open lock condition, Fig. 5 is a side view of a modification of a clamp in accord with my invention which comprises two pairs of jaws, and which is shown in closed lock condition gripping a plate to be lifted, Fig. 6 is an end view of the clamp of Fig. 5,

2

the lifted plate being indicated by broken lines, and Fig. 7 is a bottom view of the clamp of Fig. 5 with the representation of the lifted plate omitted for the sake of clarity.

Referring now to Figs. 1 and 2, the clamp comprises a pair of spaced body walls 1 and 2 cut out at the bottom to form a plate receiving slot 3 adapted to receive a plate 4. The walls 1 and 2 are connected by body rivets 5 and 6, and most of the operative mechanism is disposed between these walls. The walls are further connected by a web 7 at the plate receiving slot, the web being welded to the walls.

In operation, plate 4 is gripped in the slot between a pivotally movable eccentric jaw member 8 and a stationary jaw member 9. The arcuate plate-gripping surface of movable jaw member 8 is toothed, and the plate engaging surface of stationary member 9 has sharp concentric circular ridges to reduce any slipping tendency of the plate.

A crowned roller 10 is mounted between walls 1 and 2 behind web 7, and this roller is free to rotate on a shaft 11. When the plate 4 which is to be gripped or released by the clamp is in vertical position alongside others, roller 10 rolls along the next plate as the clamp is being positioned on or removed from plate 4. When a plate 4 is to be deposited horizontally, or lifted from a horizontal position, roller 10 may roll along the plate or floor under the plate being handled. Rollers 12 and 13, the latter being shown in Fig. 2, are provided for similar purposes and further to prevent the nose portion of the clamp, immediately to the right of the slot 3 as seen in Fig. 1, from digging into plate 4 when the plate is being handled in a horizontal position. Rollers 12 and 13 are carried outside of walls 1 and 2 on a shaft 14 which extends completely through both side walls and carries, between the side walls, the jaw member 8.

As further seen in Figs. 1 and 2, the movable jaw member 8 is operated by a pair of links 15 and 16 arranged on respective sides of the jaw member and connected thereto through pin 17 extending between the links but not beyond. The links extend generally upwardly in parallel, and the upper ends are disposed along opposite sides of the lower end of a clevis 18. A clevis pin 19 is fitted into circular openings in the clevis and links and pivotally connects them. The pin extends beyond the links through elongated apertures 20 in the side walls, and it may travel rectilinearly upwardly and down-

wardly as the clamp is lifted and set down. The upper end of the clevis is provided with a crane-hook-engaging eye 21. Cover plates or pads 22 and 22a are welded to side walls 1 and 2, respectively, and serve to retain clevis pin 19 in position through the round openings in links 15, 16 and in clevis 18 and through the elongated side wall apertures 20. A plug 22b is provided in each side pad in position to permit, when the plugs are removed, the pin 19 to be driven out of the mechanism and a replacement pin 19 to be substituted. The plugs preferably lie flush with both the exposed and inner surfaces of the respective pads when threaded into place and do not interfere internally with free upward and downward sliding of the pin in apertures 20 nor tend externally to catch on external objects. Hexagonal sockets may be provided in the plugs to receive a wrench of the hexagonal bar type. The edges of pads 22 and 22a may be bevelled if desired.

The basic operation of the clamp occurs when weight is taken on the clevis by an external crane. The clevis is moved upwardly as the crane lifts the clevis, and pin 19 slides upwardly in elongated apertures 20. This motion is transferred through links 15 and 16 to shaft 17, and movable jaw member 8 pivots in a counterclockwise direction, as seen in Figures 1 and 4, about shaft 14 into the plate gripping position shown. The weight of the plate 4, as it is lifted, tends to tighten the grip of jaw 8 in two ways. The upward pull of the clevis and links tend to pivot the jaw 8 in the gripping direction by applying an upward force on shaft 17; and the weight of the plate on the teeth of the jaw 8 has the separate effect of aiding pivoting in this direction by the downward force on the teeth. When the plate 4 is set down, both of these effects are, of course, reversed, and the movable jaw 8 pivots clockwise to disengage the plate.

The basic operation of the clamp of my invention, however, is importantly modified by the inclusion of a tension spring 23, a cam locking member 24 and a cam surface on one link 15. Cam member 24 is pivotally mounted on a shaft 25 extending inwardly through a bearing in wall 1. The shaft 25 establishes a pivot axis for cam member 24. A handle 26 is fixed to shaft 25 outside of wall 1 to permit manual rotation of the cam between its closed lock position of Figs. 1 and 2 and its open lock position shown in Fig. 4, later described. As seen in Fig. 1, with handle 26 extending upwardly, the spring 23 is in an expanded or stressed condition and biases links 15 and 16 upwardly through its connection therewith at a stud 27, the stud being fixed at its ends to links 15 and 16 and the spring being connected to the stud by means of a ring 28. The force of the spring in this condition tends to raise links 15 and 16 and to rotate jaw member 8 toward the plate clamping position. The spring further serves to retain handle 26 in its upright position over-center against a stop which comprises a portion of rivet 6. It will be apparent that the force from spring 23 is applied through a stud 29 to cam member 24 over-center of the pivot axis for cam member 24. An aperture 30 is provided in the handle 26 to receive the end of a trip cord, not shown, by which the crane operator may pull the handle 26 over-center in the direction away from body rivet 6 against the resilient spring force. The force of the spring thereafter tends to rotate handle 26 and cam 24 in a clockwise direction. While a plate 4 is being lifted, the jaw

member 8 will remain firmly in plate-gripping or closed position even though handle 26 at this time, is pulled over-center away from stop 6. The force of the spring is sufficient, when the handle 26 is upright and the spring extended, to overcome the weight of the links 15 and 16 and of the clevis 18 and therefore to retain the jaw member 8 in closed or gripping position whether or not a plate is being lifted. For example, if a plate is positioned in slot 3 and the clamp is being supported by the plate, the jaw member 8 being in open position, manual actuation of handle 26 into its upright or closed lock position will so extend the spring that links 15 and 16 will be raised and jaw member 8 will pivot into gripping position. The spring force necessary to accomplish operation of the jaw member 8 under these conditions is reduced by the particular clevis arrangement here provided, since the clevis will pivot on pin 19 and fall against one or the other of body rivets 5 and 6, and thus the full weight of the clevis is not supported on clevis pin 19.

The bottom view of the clamp in Fig. 3 clearly shows the desired crowned shape of roller 10, which permits rolling of the clamp along a plate next to that being moved, this roller being mounted between walls 1 and 2 adjacent the web 7. Jaw member 8 is seen in the position it would occupy with a plate engaged between the jaw member 8 and the stationary jaw member 9, the representation of a plate being omitted for clarity. The shaft or pin 14, on which jaw member 8 and outboard rollers 12 and 13 are rotatably mounted, extends through walls 1 and 2. One end of shaft 14 may be headed, as at 31, or both ends may carry a cotter pin, as at 32, as desired. Stud 27 connects links 15 and 16 and transfers the spring force from ring 28 to the links. It will be understood that links 15 and 16 move together, being held in alignment by stud 27, shaft 17 and clevis pin 20. Although cam member 24 engages the cam surface of link 15 only, its effect is the same as though two cam members 24 were provided, one for each link. Link 16 might be omitted entirely, if desired, without effecting the operability of the clamp except that this omission would slightly unbalance the forces toward one side of the clamp and would cause some additional bending moments on the transverse pins, studs and shafts of the mechanism.

The internal arrangement of the parts of the clamp is seen in Fig. 4. Stationary jaw member 9 is shown in section to have a plate-engaging ridged surface and to be mounted in a cylindrical cavity in web 7. The member 9 is held in place by a rivet 33, and it is free so to rotate about the rivet that a twisting movement of a lifted plate will not cause the jaw ridges to slide on the plate but will permit the ridges to remain in contact with the plate without shifting thereon.

Other portions of the clamp as seen in Fig. 4 are as described hereinabove, and the same reference numerals have been applied.

Cam member 24 is shown in Fig. 4 in open lock position engaging in a discontinuity in the cam surface 34 of link 15. In this position, the cam member 24 prevents raising of link 15, and jaw member 8 cannot be closed until cam member 24 is pivoted a few degrees in the counterclockwise direction. Such pivoting would be accomplished by moving the handle counterclockwise from the downwardly extending open lock position shown in Fig. 4.

As the cam member is pivoted from the open

5

lock position, a lifting force on clevis 18 and link 15 would cause the protruding portion 35 of the cam member to follow outwardly along the cam surface 34 of link 15, toward the right as seen in Fig. 4, and as the link moved upwardly, the cam member 24 would be rotated further in the counterclockwise direction.

If the clamp is being supported from the clevis and the member 24 is moved out of open lock position, the protruding portion 35 of cam member 24 follows outwardly along the surface 34 of link 15. During this period, in the preferred arrangement, the spring 23 is ineffective. The weight of handle 26 and unbalanced weight of cam member 24, which tend to cause clockwise rotation, are overcome by the rising links, and the movable jaw 8 will be pivoted into gripping or closed position. If the links and clevis are later permitted to fall and to pivot the jaw member 8 to open position, gravity will cause the open locked condition of Fig. 4 to be re-established.

In the above operation, it is assumed that spring 23 will not be stressed when portion 35 engages cam surface 34, but that it will be stressed only when handle 26 is above an approximately horizontal position. However, operation of the clamp is not adversely effected even if the spring is designed to be stressed under all conditions. If, while portion 35 engages surface 34, the spring is stressed, its forces on cam member 24 and the links are substantially neutralized because the upward spring force on the links, at pin 27, will be approximately equal to the downward force produced by the spring on portion 35 of the cam member 24.

During the lifting of a clamped plate 4, if portion 35 is bearing on an outer portion of the cam surface 34, the plate may be set down to permit clevis 18 and links 15 and 16 to move downwardly. As this occurs, the weight of the handle 26 and of cam member 24 cause the engagement of portion 35 in the discontinuity of cam surface 34, resulting in the open lock condition seen in Fig. 4.

The handle 26 may be set by a rigger, at the time of picking up a plate, into the upward closed lock position, and the plate may then be repeatedly set down and lifted while the clamp remains continuously gripped to the plate. Only by manual movement of the handle, as by a trip cord or tag line attached at opening 30, over-center away from the closed lock position will the clamp release the plate and fall into the open lock condition.

In lifting a plate from a horizontal position, the roller 10 permits the jaw 8 to be inserted under the plate with greater ease, and as the handle 26 is thrown to the closed lock position, or as a lifting force is applied vertically to the now horizontal clamp to cause clevis 18 to pivot on rivet 5, the links 15, 16 are moved in the direction to close the jaw 8, and the roller 10 may function to make pulling or sliding of the plate in a horizontal direction more easy and less damaging to the plate underneath the one being lifted. If a moved plate is deposited in a horizontal position, roller 10 and rollers 12 and 13 permit the clamp, after the jaw member 8 is retracted, to be pulled horizontally away from the deposited plate, the clamp being normally tilted into an angle at which rollers 12, 13 roll along the upper surface of the deposited plate, while roller 10 rolls along another plate underneath. The cam member 24 in open lock position prevents the jaw from closing on the plate during this operation, even though the pulling is done by the crane hook in clevis eye 21, and

6

rollers 10, 12 and 13 prevent damage to the plate, prevent the pulling of the deposited plate, and reduce the horizontal force necessary to remove the clamp. Crowning of lower roller 10 makes a twisting or pulling from side to side of the clamp easier and assists in removing the clamp in this manner.

A modification of the clamp of my invention is shown in Figs. 5, 6 and 7. According to this modification, the clamp comprises two simultaneously acting pivotal jaw members 36, 37 disposed between respective pairs of walls 38, 39 and 40, 41, and two cooperating rotatable stationary jaw members 42, 43. A shaft 44 extends completely through the clamp to serve as a pivot for jaw members 36, 37 and to support a single freely rotatable upper roller 45 disposed between the inner walls 39 and 40. Crowned rollers 46, 47 are rotatably mounted on a shaft 48 terminating in the outer walls 38 and 41. Body rivets 49 and 50 serve to hold the four walls of the body in parallel spaced relation, as do shaft 48 and shaft 44. Clevis 51 comprises two arms 52, 53 which are apertured to receive a single clevis pin 54. This pin carries two pairs of links 55, 56 and 57, 58 which in turn, transfer the rectilinear movements of pin 54, in elongated apertures 59 of the walls, to the pivotal jaw members, links 55, 56 being coupled to jaw member 36 by a stud or shaft 60 and links 57, 58 being coupled to jaw member 37 by stud 61.

Cam members 62, 63 are disposed against inner walls 39 and 40, respectively, and are rigidly connected to the respective ends of a short shaft 64 for pivoting by means of handle 65 attached to the shaft between walls 39 and 40. Handle 65 serves to pivot both cam members 62, 63 simultaneously over-center against stressed tension springs 66, 67 from a closed lock position, as shown in Fig. 5, toward an open lock position as hereinabove described in connection with Fig. 4. Springs 66, 67 are connected respectively to cam members 62, 63 through studs 68, 69 carried by the respective cam members, and at their opposite ends to respective pairs of links 55, 56 and 57, 58 through a stud 70 attached between the first pair of links and a stud 71 attached between the latter pair of links.

Clevis pin 54 is retained in place by side pads 72, 73 peripherally welded in place to side walls 38 and 41, respectively, and each pad is provided with a plug which may be removed to permit removal of the clevis pin. The pads, as in the embodiment of Figs. 1-4, guard against the entrance of foreign objects into slots 59 which could jam the clamp or otherwise interfere with its normal operation.

The provision of two sets of jaws in the device of Figs. 5-7 results in extreme safety. The tendency of plates to twist out of the clamp is substantially reduced, and it will be apparent that failure of one of the pivotal jaws to grip the plate, if it should occur, would impose additional gripping force on the other pivotal jaw, since the links connected to the gripping jaw would then be supporting the full weight of the plate. The particular arrangement of springs 66 and 67 is such that closed locking of each jaw occurs independently, whether the plate being gripped has portions engaged by both pivotal jaws or only a single portion engaged and gripped by only one pivotal jaw. Other advantages of the dual jaw clamp of Figs. 5-7 are common to both embodiments herein shown and are given above. Operation of the dual jaw modification of my invention is in ac-

cord with the description of operation hereinabove outlined in connection with the embodiment of Figs. 1-4.

While I have shown only certain preferred embodiments of my invention by way of illustration, many modifications will occur to those skilled in the art, and I therefore wish to have it understood that I intend, in the appended claims, to cover all such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A plate lifting clamp comprising two spaced parallel interconnected walls, having an inwardly directed vertical plate receiving slot formed in its lower edge and having outer edges extending upwardly and outwardly from said slot, a clevis, said walls having slot means in which said clevis is adapted to slide, said clevis being disposed at the upper portion of said walls for vertical motion, a fixed jaw in one side of said slot, a pivoted clamping jaw in the opposite side of said slot, linkage connected between said clevis and said pivoted jaw, a cam member, means pivotally mounting said cam member to one of said walls, said cam member being operable in one direction toward a closed locking position in engagement with said pivoted jaw whereby to hold said jaw in locking position, said cam member being operable in the opposite direction to an unlocked position to release said jaw, and spring means for urging said cam member toward its locking position, said spring means having one of its ends connected to said linkage and its other end connected to said cam member, a freely rotatable roller having a rolling surface portion protruding beyond said outer wall edges behind said fixed jaw, and a second roller outside of one said wall adjacent the lower end of said opposite side of said slot and having a rolling surface portion extending sufficiently into the entrance area of said slot to prevent engagement of a plate in said slot with the walls at the lowermost end of said opposite side of said slot, a shaft pivotally mounting said clamping jaw, said second roller being mounted on said shaft.

2. A plate lifting clamp comprising two spaced parallel interconnected walls having an inwardly directed vertical plate receiving slot formed in its lower edge, a clevis, said walls having slot means in which said clevis is adapted to slide, said clevis being disposed at the upper portion of said walls for vertical motion, a fixed jaw in one side of said slot, a pivoted clamping jaw in the opposite side of said slot, linkage connected between said clevis and said pivoted jaw, and an open and closed locking device for said pivoted jaw, said device comprising a cam member and a connected cam member operating handle, said cam member being pivotally mounted to one of said walls adapted to be moved to a position of locking engagement with said linkage to lock said jaw in its open position, or to a position outside the range of movement of said linkage, and a spring connecting an offset portion of said cam member to said linkage, said cam member being operable over-center in one direction toward a closed locking position through said spring to urge said pivoted jaw into clamped position and selectively from said closed locking position over-center in the opposite direction to release said jaw closing force of said spring.

3. A plate lifting clamp comprising two spaced parallel interconnected walls having an inwardly directed vertical plate receiving slot formed in its

lower edge, a clevis, said walls having slot means in which said clevis is adapted to slide, said clevis being disposed at the upper portion of said walls for vertical motion, a fixed jaw in one side of said slot, a pivoted clamping jaw in the opposite side of said slot, linkage connected between said clevis and said pivoted jaw, and an open and closed locking device for said pivoted jaw, said device comprising a cam member and a connected cam member operating handle, said cam member being pivotally mounted to one of said walls, and a spring connecting an offset portion of said cam member to said linkage, said cam member being operable over-center in one direction toward a closed locking position through said spring to urge said pivoted jaw into clamped position and selectively from said closed locking position over-center in the opposite direction to release said jaw closing force of said spring, said linkage and cam member having interfitting surface portions arranged for engagement upon the falling open of said clamping jaw to lock said clamping jaw in unclamped position.

4. A plate lifting clamp comprising two spaced parallel interconnected walls, having an inwardly directed vertical plate receiving slot formed in its lower edge and having outer edges extending upwardly and outwardly from said slot, a clevis, said walls having slot means in which said clevis is adapted to slide, said clevis being disposed at the upper portion of said walls for vertical motion, a fixed jaw in one side of said slot, a pivoted clamping jaw in the opposite side of said slot, linkage connected between said clevis and said pivoted jaw, a freely rotatable roller mounted on said walls having a rolling surface portion protruding beyond said outer wall edges behind said fixed jaw, a second roller outside of one said wall adjacent the lower end of said opposite side of said slot and having a rolling surface portion extending sufficiently into the entrance area of said slot to prevent engagement of a plate in said slot with the walls at the lowermost end of said opposite side of said slot, said rollers being mounted on said clamp, and an open and closed locking device for said pivoted jaw, a cam member having manual means for operating the same handle, said cam member being pivotally mounted to one of said walls, whereby said cam may be manually moved to a position into locking engagement with said linkage to retain said jaw in open position, a spring connecting an offset portion of said cam member to said linkage, said cam member being operable over-center in one direction toward a closed locking position through said spring to urge said pivoted jaw into clamped position in engagement with said pivoted jaw whereby to hold said jaw in locking position and selectively from said closed locking position over-center in the opposite direction to release said jaw closing force of said spring.

5. A plate lifting clamp comprising two spaced parallel interconnected walls, having an inwardly directed vertical plate receiving slot formed in its lower edge and having outer edges extending upwardly and outwardly from said slot, a clevis, said walls having slot means in which said clevis is adapted to slide, said clevis being disposed at the upper portion of said walls for vertical motion, a fixed jaw in one side of said slot, a pivoted clamping jaw in the opposite side of said slot, linkage connected between said clevis and said pivoted jaw, a freely rotatable roller having a rolling surface portion protruding beyond said outer wall edges behind said fixed jaw, a second

roller outside of one said wall adjacent the lower end of said opposite side of said slot and having a rolling surface portion extending sufficiently into the entrance area of said slot to prevent engagement of a plate in said slot with the walls at the lowermost end of said opposite side of said slot, and an open and closed locking device for said pivoted jaw, said device comprising a cam member and connected operating handle, said cam member being pivotally mounted to one said wall, a spring connecting an offset portion of said cam member to said linkage, said cam member being operable over-center in one direction toward a closed locking position through said spring to urge said pivoted jaw into clamped position and selectively from said closed locking position over-center in the opposite direction to release said jaw closing force of said spring, said linkage and cam member having interfitted surface portions arranged for engagement upon the falling open of said clamping jaw to lock said clamping jaw in unclamped position, a shaft pivotally mounting said clamping jaw, said second roller being mounted on said shaft.

6. A plate clamp comprising a frame, a stop on said frame, a fixed jaw on said frame having a plate-gripping surface, a jaw pivotally mounted on said frame opposite said fixed jaw and having a plate-gripping surface, said frame having slot means, lifting means including a clevis movable in said slot means and having means pivotally connecting the same to said clamp including a link pivotally connected to said clevis and pivoted jaw and effective to actuate said pivoted jaw into gripping relation with a plate between said jaws upon elevation of said clamp by said lifting means, a cam surface on said link, a cam member pivotally mounted on said frame and having an active position in engagement with said link and an inactive position in engagement with said stop, a spring attached at one end off center to said cam member and at the other end to said link and providing over-center actuation of said cam member between said positions, manually operated means selectively to move said cam member through dead center from one toward the other of said positions, said link cam surface having a protruding portion engageable by a portion of said cam member in said active position to lock said link against closing of said pivotal jaw, said spring urging said link to close said pivotal jaw when said cam member is in said inactive position.

7. A plate lifting clamp comprising a wall, a movable jaw member pivotally attached to said wall for pivoting about a predetermined axis, a lifting clevis, said wall having slot means and said clevis having means for guiding said clevis in said slot means to permit limited sliding motion with respect to said wall in two opposite rectilinear directions, a link connecting said clevis and a point on said jaw member spaced from said axis, said link being effective to pivot said jaw member toward a jaw closing position in response to said motion of said clevis in one of said directions and toward a jaw opening position in response to motion in the opposite of said directions, a cam member pivotally attached to said wall, a stop for said cam member to limit pivoting thereof in one rotative direction, said link having a cam surface engaged by said cam member when said cam member is pivoted in the other rotative direction, resilient member attached to said cam member at a point offset from the pivot axis of said cam member to provide over-center pivoting movement between the limits imposed by said stop

and said engagement of said cam member with said cam surface, said stressed resilient member having an attachment with said link and normally urging said link to pivot said jaw member into a plate gripping position, manually operated means to pivot said cam member over-center selectively toward said respective limits, a portion of said cam surface comprising a notch, said cam member being engageable in said notch upon motion of said clevis in said opposite one of said rectilinear directions and concurrent pivoting of said cam member in said other rotative direction.

8. A plate lifting clamp having spaced parallel interconnected walls, a connecting web between said walls, said clamp being formed with a vertical plate receiving slot extending upwardly from its lower edge, a fixed jaw supported by said web at one side of said slot, a pivoted camming jaw mounted at the opposite side of said slot, said walls having opposed vertical slots formed adjacent their upper ends in alignment with said plate receiving slot, a transversely extending clevis pin slidably mounted in said slots, a clevis connected to said pin and having a crane hook receiving eye in its upper end, a connecting link pivotally connected with said pin and with the outer end of said pivoted jaw, a jaw locking and releasing cam member pivoted between said walls, a stressed spring connected between an offset point of said cam member and a point on said link, means to pivot said cam member over-center against the force of said spring from an inactive position to an active position, said spring yieldably locking said jaw member in gripping position when said cam member is in inactive position, and said link having a cam-member-engageable portion contacted by said cam member in said active position to lock said link when said jaw is in open position.

9. A plate lifting clamp having spaced parallel interconnected walls, a connecting web between said walls, said clamp being formed with a vertical plate receiving slot extending upwardly from its lower edge, a fixed jaw supported by said web at one side of said slot, a pivoted camming jaw mounted at the opposite side of said slot, said walls having opposed vertical pin-receiving slots therethrough adjacent their upper ends, a transversely extending clevis pin slidably mounted in said slots, a clevis connected to said pin and having a crane hook receiving eye in its upper end, a connecting link pivotally connected with said pin and with said pivoted jaw, and a cover plate at each side of said clamp against the respective outer faces of said plates covering said pin-receiving slots and retaining said clevis pin, and a manually operated locking means pivotally mounted on said clamp and having a portion adapted to engage said connecting link for locking said jaw in open position.

10. A plate lifting clamp having spaced parallel interconnected walls, a connecting web between said walls, said clamp being formed with a vertical plate receiving slot extending upwardly from its lower edge, a fixed jaw supported by said web at one side of said slot, a pivoted camming jaw mounted at the opposite side of said slot, said walls having opposed vertical pin-receiving slots therethrough adjacent their upper ends, a transversely extending clevis pin slidably mounted in said slots, a clevis connected to said pin and having a crane hook receiving eye in its upper end, a connecting link pivotally connected with said pin and with said pivoted jaw, and a

11

cover plate at each side of said clamp against the respective outer faces of said plates covering said pin-receiving slots and retaining said clevis pin, each said cover plate being provided with a round aperture closed by a removable plug 5 aligned with a portion of said pin-receiving slots and adapted and arranged to permit removal of said clevis pin upon removal of said plugs, and a manually operated locking means pivotally mounted on said clamp and having a portion 10 adapted to engage said connecting link for locking said jaw in open position.

JOSEPH C. RENFROE.

12

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,360,365	Renfroe -----	Oct. 17, 1944
2,360,601	Waldrup -----	Oct. 17, 1944
2,360,602	Waldrup -----	Oct. 17, 1944
2,446,610	Renfroe -----	Aug. 10, 1948
2,543,017	Hagan -----	Feb. 27, 1951

FOREIGN PATENTS

Number	Country	Date
255,744	Germany -----	Jan. 18, 1913
8,780	Great Britain -----	Apr. 14, 1913