

April 28, 1953

F. T. HANSEN

2,636,768

BRICK STACK HANDLING FORK

Filed Oct. 17, 1949

5 Sheets-Sheet 1

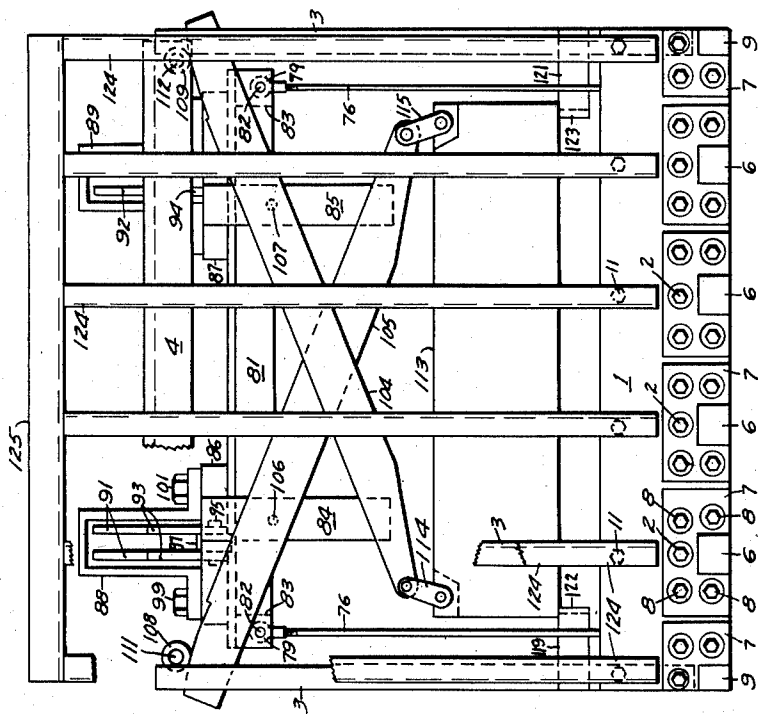


FIG. 1

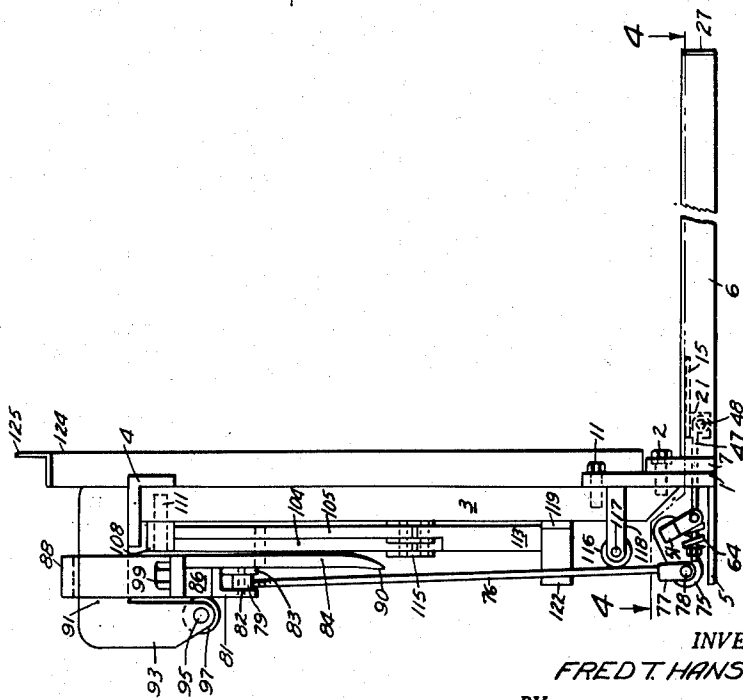


FIG. 2

INVENTOR.
FRED T. HANSEN
BY
S. C. BIRNICK
ATTORNEY

April 28, 1953

F. T. HANSEN

2,636,768

BRICK STACK HANDLING FORK

Filed Oct. 17, 1949

5 Sheets-Sheet 2

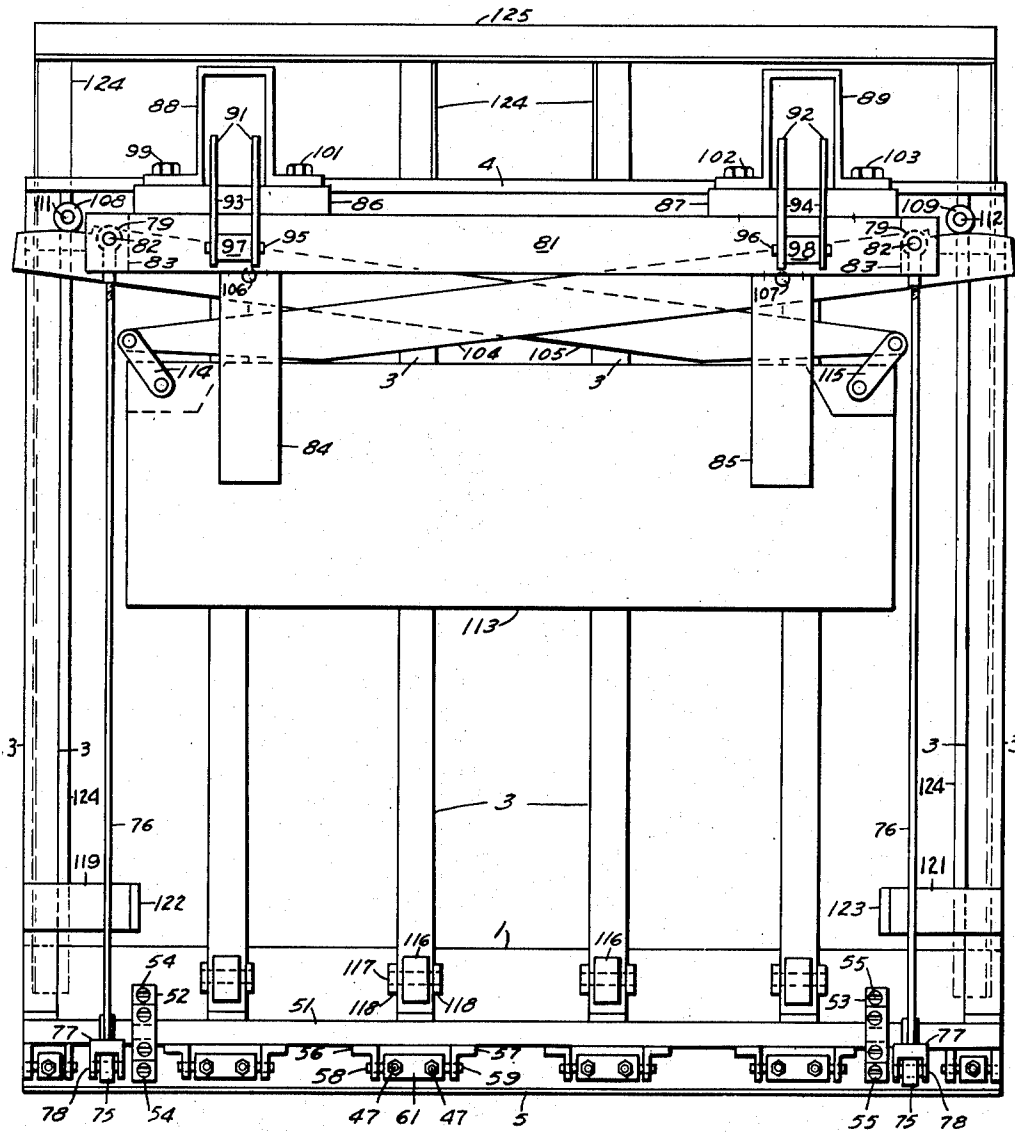


FIG. 3

INVENTOR.
FRED T. HANSEN
BY
S. B. BIRNISH
ATTORNEY

April 28, 1953

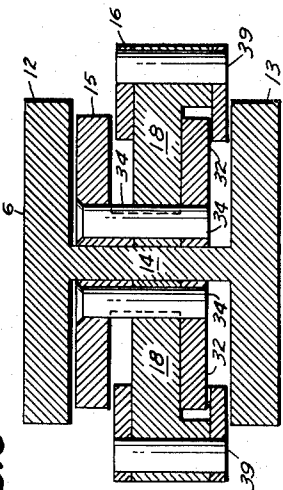
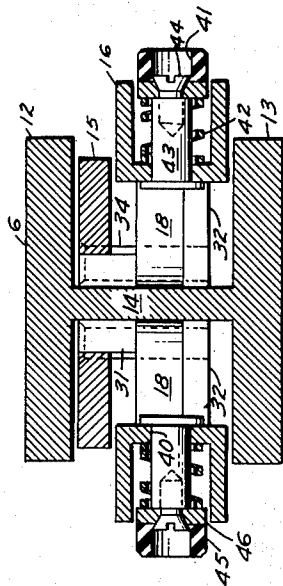
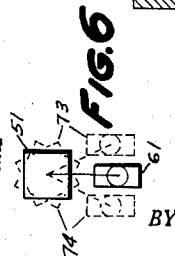
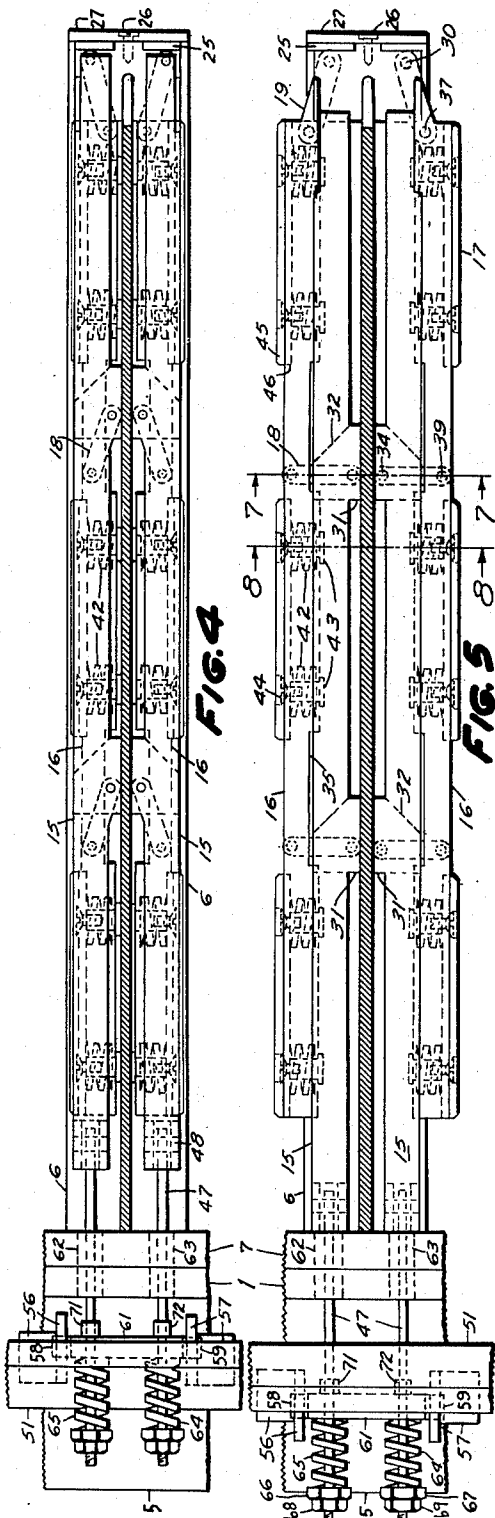
F. T. HANSEN

2,636,768

BRICK STACK HANDLING FORK

Filed Oct. 17, 1949

5 Sheets-Sheet 3



INVENTOR.
FRED T. HANSEN

BY

Edwinish
ATTORNEY

April 28, 1953

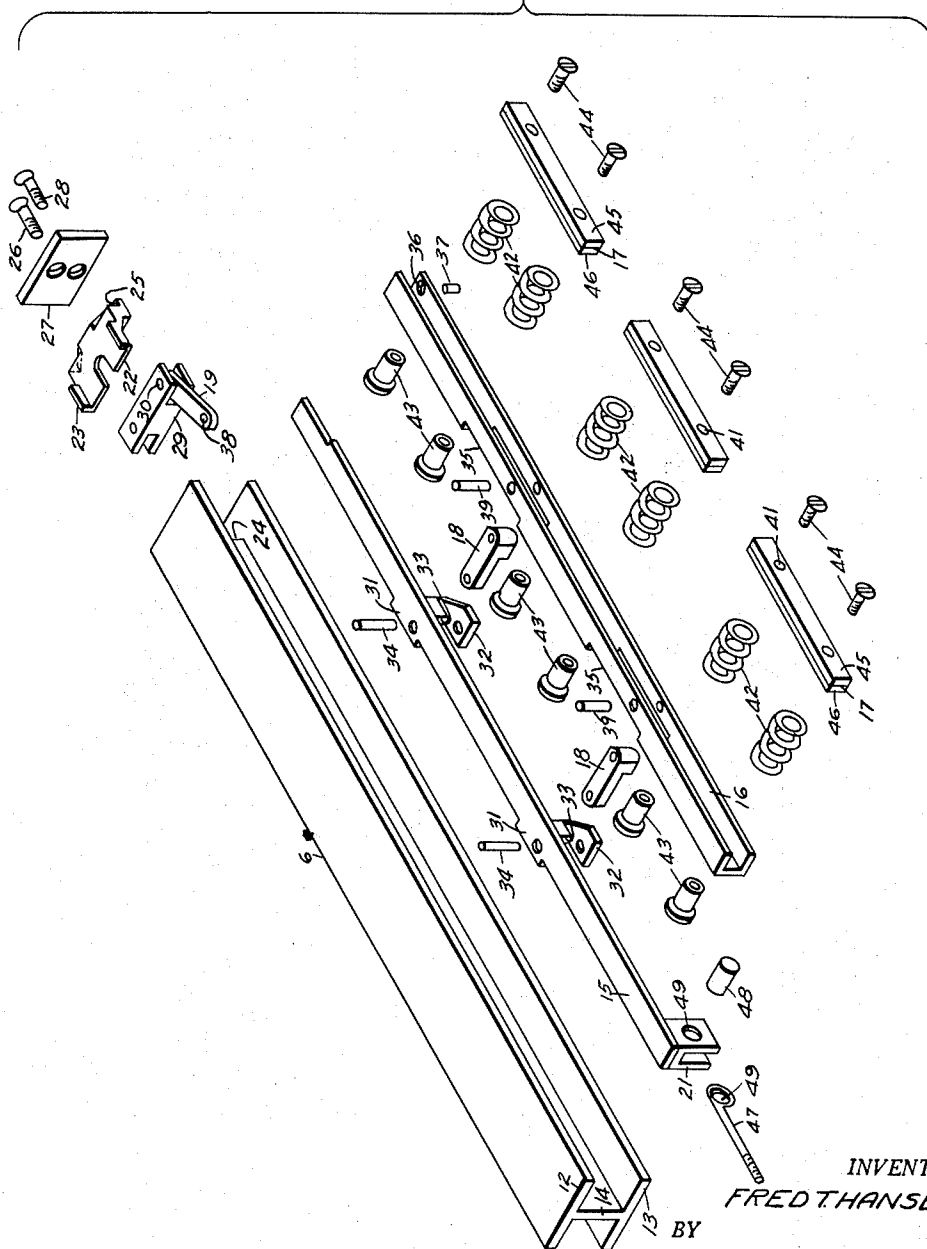
F. T. HANSEN
BRICK STACK HANDLING FORK

2,636,768

Filed Oct. 17, 1949

5 Sheets-Sheet 4

FIG. 9



INVENTOR.
FRED T. HANSEN

BY
S. C. BISHOP
ATTORNEY

April 28, 1953

F. T. HANSEN
BRICK STACK HANDLING FORK

2,636,768

Filed Oct. 17, 1949

5 Sheets-Sheet 5

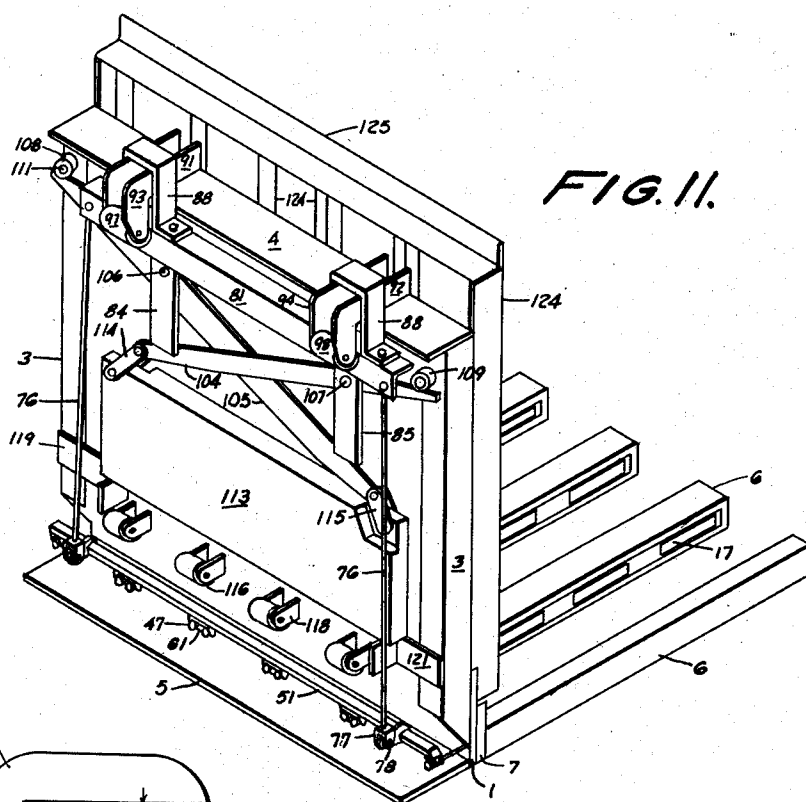


FIG. 11.

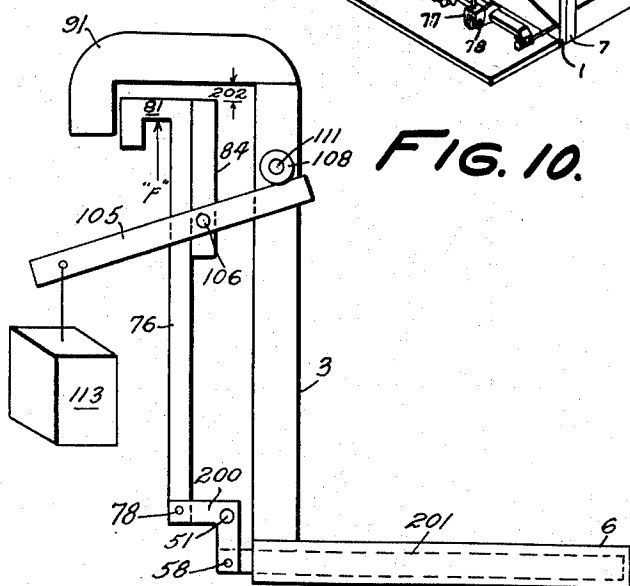


FIG. 10.

INVENTOR.
FRED T. HANSEN

UNITED STATES PATENT OFFICE

2,636,768

BRICK STACK HANDLING FORK

Fred T. Hansen, Green Bay, Wis.

Application October 17, 1949, Serial No. 121,656

23 Claims. (Cl. 294—63)

1.

My invention relates to improvements in brick handling forks, and particularly to improvements in a brick handling fork of a type that is adapted to handle a pile of bricks stacked up in conformity with a prearranged plan and with uniform spaces between the base courses into which tines, including clamping devices automatically actuated by the weight of the load, may be projected into said spaces to carry the superposed load, and also to pick up and carry along with the superincumbent bricks the base courses by means of a horizontal gripping action caused by the clamping devices, so that the stack may be handled and lowered into position and the tines withdrawn without disturbing the arrangement thereof.

Prior art brick stack handling forks embody a tension or compression spring for balancing the weight of the fork. Said spring constructions necessarily require a stiff spring, a spring with a high spring constant, to balance the dead weight of the heavy steel fork construction required by the work to be done. As a result thereof only large superposed loads are capable of stretching the stiff spring sufficiently to furnish the measure of initial lateral displacement of the clamping devices necessary to contact the base courses. This condition rules out the handling of fractional capacity loads. The inherent nature, character, and operation of a spring balancing construction prevents its successful application to fractional loads, because it requires a considerable parasite load to expand and extend the clamping devices into contact with the base rows of brick before gripping pressure can be applied. The spring constructions expand the grippers step by step as parasite load is progressively applied to stretch the spring until contact is finally made with the brick, and the device is only then ready to apply pressure to the brick.

It should be noted that the parasite load of the spring constructions continues to be augmented as the spring is further tensioned during the pressure delivery stage, or until the fork reaches a pressure stop element or other operational adjustment.

My invention on the other hand provides a gravity force (counterweight) that is capable of nicely counterbalancing the fork proper, which is over-balanced by the application of a very small load. The over-balancing results in the forthwith expansion of the grippers into contact with the brick, and is therefore immediately ready to apply pressure thereto, thereby eliminating parasite load.

2.

Moreover, when the spring elements contract, as when the live load is removed, the unloaded, relaxed condition of the spring cannot forcibly urge the gripper mechanism into a full and complete restriction—to the very end of the inward displacement of the grippers. As a result, the grippers are not fully seated, they often protrude slightly beyond the tine structure, and prevent the tine from being freely and unobstructedly inserted into close quarters, such as between base courses. Again it is the inherent nature, character, and operation of a spring element that restricts successful operation. While the balancing spring could be tightened and tensioned to accomplish a more positive and full retraction of the grippers, this would necessarily increase an already burdensome parasite load.

My counterweight on the other hand can be made to slightly over-balance the fork, thereby providing an excess force applicable to forcefully and positively retract the gripping mechanism to its fullest.

I further claim novelty in an improved gripper mechanism that for all practical purposes has only one degree of freedom, that is, lateral thrust only, as distinguished from the prior art which discloses mechanisms that have a damaging longitudinal thrust component along with the lateral thrust.

My toggle action gripping mechanism is designed to operate at its maximum thrust capacity.

It is an object of my invention to provide a brick stack handling fork that will handle fractional capacity loads.

It is another object of my invention to provide novel means for balancing a brick stack handling fork that makes it capable of handling fractional capacity loads.

It is still another object of my invention to provide means for balancing a brick stack handling fork that allows the gripping mechanism to be forthwith extended into contact with the base course of bricks upon the application of an incremental over-balancing load.

It is yet another object of my invention to provide means for balancing a brick stack handling fork that allows the working load to be wholly and completely devoted to the generation of lateral pressure for the grippers.

It is a further object of my invention to provide means for balancing a brick stack handling fork that eliminates the parasite load required to bring the grippers into operable position against the base brick, or until the fork reaches a pressure stop element.

3

It is a still further object of my invention to provide gravity balancing means for a brick stack handling fork.

It yet is a further object of my invention to provide gravity balancing means and lever linkage means associated therewith, having a movable fulcrum, for balancing a brick stack handling fork.

It is another object of my invention to provide a gripping mechanism for a brick stack handling fork that for all practical purposes has one degree of freedom, that is, lateral thrust only.

It is still another object of my invention to provide a gripping mechanism for a brick stack handling fork that eliminates damaging longitudinal thrust which results in the rapid wearing of the gripper shoes, and possible displacement of the base brick which is cumulative.

It is yet another object of my invention to provide a gripping mechanism for a brick stack handling fork that is designed to operate at its maximum thrust capacity.

It is a further object of my invention to provide a gripping mechanism for a brick stack handling fork that reduces to a minimum the possibility of inoperability due to jamming of the parts one against the other, or to the accumulation therebetween of foreign matter.

It is a still further object of my invention to provide a gripping mechanism for a brick stack handling fork that is self cleaning.

It is yet a further object of my invention to provide a gripping mechanism for a brick stack handling fork that allows the use of a highly frictional shoe facing, such as rubber, for better gripping effect.

It is a final object of my invention to provide a gripping mechanism that contains a minimum number of movable parts, that requires a minimum of machining, and is easy to fabricate and assemble.

Other objects and many of the attendant advantages of my invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designate like parts throughout the figures thereof and wherein:

Fig. 1 is a front elevational view of a brick fork embodying my invention,

Fig. 2 is a side elevational view,

Fig. 3 is a rear elevational view,

Fig. 4 is an enlarged plan view of one of the inner tines taken along broken line 4—4 of Fig. 2, showing the top flange removed and showing the brick gripping mechanism in retracted position,

Fig. 5 shows the tine of Fig. 4 in expanded position,

Fig. 6 is an end view of the rocker shaft and an associated spring abutment element in various positional phases,

Fig. 7 is a cross-sectional view of one of the tines taken along line 7—7 of Fig. 5,

Fig. 8 is a cross-sectional view of one of the tines taken along line 8—8 of Fig. 5, and

Fig. 9 is an exploded isometric view of one of the tines showing the gripping mechanism in detail.

Fig. 10 is a schematic representation illustrating the general principles of the invention. The weight is shown out of its normal position for clearness of representation.

Fig. 11 is an isometric view showing in partic-

4

ular the lever system in its relation to the frame, saddle, and weight.

Referring now to the drawings, wherein for the purpose of illustration, is shown a preferred embodiment of my invention, the reference numeral 1 designates an elongated base bar to which is secured, as by means of bolts 2 and 11, a plurality of equally spaced upright bars 3 tied together at their tops by means of an angle iron 4 welded thereto, forming there together an upstanding rectangular gridiron frame, which is mounted on a base plate 5 and is secured thereto as by welding.

The inner tines 6 consists of an H-beam having a face plate 7 welded transversely of the tines to one end of each of said tines. These tine assemblies are secured to the bottom portion of the base plate 1 as by bolts 8, Fig. 1, the H-beam being disposed so that its web is vertical. It is to be noted that bolts 2 also act to secure the face plates 7 to the upright bars 3. The two outer tines 9, Fig. 1, are of modified H-beam construction in that each has the outside portions of their flanges removed, resulting in only one gripper mechanism being accommodated along the inside of said tines, as distinguished from each of the inner tines which have a gripper mechanism along both sides thereof. As the gripping mechanisms along the sides of all the tines are constructed alike, a description of one gripping mechanism or the corresponding components thereof will apply to all.

Arranged in the beam recess or space bounded by the top flange 12, bottom flange 13, and web 14 of H-beam 6 is the gripper mechanism comprising a pull bar 15, an elongated channel shoe retaining member 16, gripper shoes 17, toggle links 18 for engaging the shoe retainer to the pull bar, and an oscillatable link guide 19 for controlling the movement of the shoe retainer for reciprocation transversely of the tine. See Figs. 9, 8 and 7.

The pull bar 15 is disposed adjacent to the underside of top flange 12 and the web 14, and is supported in that position by a channel section 21 at its rear end, and a plate guide 22 at its front end.

The channel section 21 has its web portion welded or otherwise secured to the underside of said pull bar, and its leg-like flanges in sliding engagement with the top surface of tine flange 13.

The plate guide 22 is provided with side flanges 23 which abuttingly engage with the underside of tine flange 12 to receive the front end of pull bar 15 in sliding engagement therebetween. The web 14 of tine 6 is cut away at its front end, as at 24, to accommodate the insertion and placement of plate guide 22. The plate guide is provided with an inclined slot 25 for the reception and removal of sand, grit, or other foreign matter that may foul the plate guideway. Such foreign material as might find its way into the plate guideway would be delivered to said slot for removal by the normal reciprocating operations of the pull bar head. This results in a self cleaning construction. Longitudinally, the plate guide is of a length that will support the pull bar throughout its travel. The plate guide 22 is held in its operative position by means of a cap screw 26 supported by the closure plate 27 welded across the front or head end of tines 6.

Disposed beneath said plate guide 22, and secured to said closure plate 27 by means of cap

screw 28, is a pin block 29 having its ends slotted to receive therein one end of link guide 19 in pivotal arrangement accomplished through means of pin 30.

Dependent from the inner edge of the pull bar 15 are two spaced brackets 31 having inturned seat lugs 32, said brackets being in-cut or slotted as at 33 to snugly receive one end of toggle links 18 in pivotal arrangement through means of pins 34. See Fig. 9.

The shoe retaining member 16 is a channel iron disposed on its side, beneath the pull bar, with its web toward the web of the tine 6. Portions of its web and upper flange are removed as at 35 to receive the remaining end of toggle links 18, to accommodate the bracket 31 when the shoe retaining member is in its full retracted position, and to accommodate the link when the member is expanded. The outer end of the lower flange of said shoe member 16 is provided with an aperture 36 to receive pin 37 for pin-connecting link guide 19 thereto through means of aperture 38 in said link guide. Said link guide 19 restrains any longitudinal movement of the shoe retaining member 16 resulting from the reciprocating movements of the pull bar 15, and guides the shoe member outwardly and inwardly of the tine 6 in response to the toggle action of toggle link 18. A portion of the web is removed to accommodate the link. The brackets 31 and their associated seat lugs 32 are constructed and arranged, particularly as to their pendant length, to be accommodated and received by the openings 35 in the shoe retaining member. In furtherance thereof, the lugs 32 pass through said opening and into the channel member 16, and take a position superimposed over the bottom flange of said channel member 16 when said channel member is in its retracted position. The outwardly projecting dimension of the lug 32 is of a measure that slightly overlaps and overlays said bottom flange of the channel member 16 when said member 16 is in its most expanded position. This overlapping assures an operable disposition of said movable parts, and provides a maximum of bearing surface for the support of the toggle link in its expanded position thereby contributing greatly to the strength of the arrangement.

It is to be noted that one end of the toggle link has a small depth dimension relative to the other end which has a larger depth dimension. The small end fits snugly into the slot 33 and is limited in dimension by the pendant length of bracket 31 and its associated lug 32. The dimension of the large end is dictated by the distance between the channel member flanges within which said larger end is snugly fit and pivoted as by means of pin 39.

Within the shoe retainer 16 are secured elongated gripper shoes 17, spring loaded to be urged outwardly by a pair of spaced springs 42. The shoes are received between the flanges of the shoe retaining member 16, and retained thereon by means of flanged guide pins 43 in abutting engagement with the rims of apertures 40, Fig. 8, in the web of said shoe retaining member and by means of screws 44 passing through countersunk bores 41 in said shoes and threadedly engaging with said guide pins 43. Springs 42 are inserted between said web and said shoes, and around said guide pins and screws, to spring load said shoes. This yielding arrangement results in gripping means automatically adjustable

to irregularities in the surface, the thickness, or other dimensions of the bricks.

Shoes 17 comprise a frictional, resilient facing 45 such as rubber bonded to a stiff backing plate 46 such as steel. While it is obvious that many types of shoe forms can be used such as saw-tooth, hob-nailed, wood, or steel, I prefer to use a flat shoe, faced with a yieldable material such as rubber, and of a broad and optimum area, for allowing their use in picking up green brick or otherwise and for greater frictional gripping effect. By green brick I mean brick immediately after they are cut by the wire cutting process. Said process allows a much greater consistency of the raw clay mixture than does the sand mold brick method, and lends itself to green brick handling with my type of gripper shoe.

The eye of eye-bolt 47 is inserted between the legs of pull bar support 21 and is pin-connected thereto by means of pin 48 passing through apertures 49 and said eye. The free end of said eye-bolt is connected to rocker shaft as hereinafter described.

Square rocker shaft 51, Fig. 3, extending entirely across the lower portion of the rear of the gridiron frame, at an elevation slightly above the tines, is journaled in split bearing blocks 52 and 53 which are bolted to said base bar by means of bolts 54 and 55, respectively.

A pair of spaced angle iron brackets 56 and 57 are secured as by welding to the under face of said square rocker shaft 51, and are provided with apertures in the extending legs to receive the trunnions 58 and 59 of spring abutment block 61.

The threaded free ends of eye-bolts 47 pass substantially horizontally, Fig. 5, through bores 62 and 63 through the base bar 1 and continuing through the face plate 7, and through axially aligned bores in the spring abutment block 61, and receive compression springs 64 and 65 secured thereon by means of nuts 66 and 67 and lock nuts 68 and 69, Figs. 4 and 5. Fixed collars 71 and 72 are secured to said eye-bolts 47 by set screws (not shown) or otherwise, and are disposed in abutting relation against the front face of the abutment block 61 when the gripping mechanism is fully retracted.

The above said nuts are drawn-up to initially strain said springs for the normal gripper expansion operation through said springs, without any lost motion therethrough. The springs should yield, however, to prevent the building-up of damaging stresses as when any one of the shoe springs 42 goes solid. This spring arrangement also contributes as means automatically adjustable to the irregularities in the thickness of the bricks being gripped.

The fixed collars 71 and 72 function as positive drive elements through which the gripping mechanism is positively driven to its full retracted position.

It is to be noted that the maximum rearward travel of the pull bar 15 is limited by its abutment with the face plate 7. This occurs when the gripping mechanism is in its most maximum expanded position, that is when the toggle links 18 are at right angles to the tine web and capable of delivering the maximum of lateral pressure. The maximum of forward travel of the pull bar 15 is limited by the seating of the flanged heads of guide pins 43 against the web 14 of the tine. This occurs when the gripping mechanism is fully retracted against the web 14.

7

Fig. 6 shows an end view of the rocker shaft 51 and its associated spring abutment block 61 in the retracted position 73, and the expanded position 74.

To each end of the square rocker shaft 51 is secured a crank arm 75 which is connected to a pull-rod 76 through means of a clevis 77 which is welded to the lower end thereof, and which is pin connected to said crank arm by means of pin 78. The upper end of said pull rod 76 is provided with an eye 79 threadedly engaged with said pull-rod for adjustment, and pin connected to saddle bar 81 through means of pin 82. See Fig. 2.

Said saddle bar 81 consists of an angle iron horizontally disposed near the upper end of the gridiron frame. One leg of the angle iron is horizontally positioned; the other leg, disposed outwardly of the frame, extends downwardly. The function of the saddle 81 is to engage with the lifting plate of a lifting truck (not shown) and be carried thereby. To each end of the saddle are secured additional leg plates 83 to support the pins 82 in a simple beam manner.

Pending plate guides 84 and 85 are secured to the horizontal portion of the saddle as by welding, and serve to guide the lifting plate of the lifting truck (not shown) into the saddle for engagement therewith. The lower ends of said guides 84 and 85 are curved rearwardly as at 90, Fig. 2, to stabilize the saddle in erect position when the lifting plate (not shown) engages therewith. The distance between the outer legs of the saddle and the guide plates is of a measure providing sufficient clearance to allow a tilted lifting plate to enter therebetween and engage with the saddle.

Mounted on said saddle, near the ends thereof, are base blocks 86 and 87 secured thereto as by welding or otherwise. The plate guides 84 and 85 have their upper ends extended so as to abut the side faces of said blocks, and are welded thereto so as to provide greater strength of securement.

Yokes 88 and 89 are mounted on said blocks to receive therethrough the head ends of paired shoulder lugs 91 and 92 that are secured to the top of tie bar 4 as by welding. The head ends of said lugs have downwardly projecting portions 93 and 94 that have journaled therein pins 95 and 96 rotatably supporting rollers 97 and 98, respectively. Said roller laterally supports the saddle, and guides it in its up and down movements. The spaced relation between the follower shoulder lugs 91 and 92 and the base blocks 86 and 87 on the saddle defines an initial take-up distance to permit movement of the saddle relative to the fork frame during which the gripping mechanism is actuated and the gripper shoes are thrust against the brick to be gripped, and after contact therewith the required pressure of the shoes against the bricks is slowly generated and later controlled. Said take-up distance may be varied by adjustable means such as shims. After the base blocks have engaged the shoulder lugs, the gripper pressure against the bricks ceases to increase, remains constant, and the assembly of the gridiron frame with its attached tines is bodily lifted along with the saddle structure, by a lifting plate (not shown). It is obvious that a small load of bricks upon the tines functions to resist the initial lifting force exerted by the lifting plate, thereby holding the fork frame immobile while the saddle structure, driven by the lifting plate, negotiates the take-up dis-

8

tance, resulting in an automatic actuation of the gripper mechanism and the generation of the lateral pressure required to grip the bricks as a consequence of the restraining load.

The yokes 88 and 89 are fixed to the base blocks 86 and 87 as by paired bolts 99, 101, 102 and 103.

A pair of crossed lever arms 104 and 105 are pivotally mounted on pins 106 and 107 which are fixed in guide plates 84 and 85, respectively.

The upper end portions of said lever arms 104 and 105 are rollingly engaged with rollers 108 and 109 rotatably mounted on pins 111 and 112 which are fixed to the outer upright bars 3, respectively.

The lower ends of said lever arms 104 and 105 are link connected to a counterweight 113 through means of links 114 and 115, respectively, the link connections being off-set one in relation to the other to allow the lever arms to move in separate planes.

The weight of the gravity mass 113 on one end of the lever system shown is approximately one-third of the weight of the fork so as to decidedly over-balance the weight of the fork structure acting on the other end of said lever arms through rollers 108 and 109, the fulcrums being pins 106 and 107. The pivots 106 and 107 are disposed in the lever bars so that the effort arm portions of the bars are approximately three times the length of the resistance arm portions of the bars.

It is obvious that means other than a lever system can be used between the weight and the fork, such as a wheel and axle system, or pulley system, or a train of gears.

Bearing rollers 116, rotatably mounted on pins 117 journaled in arms 118 secured to the upright members 3 as by welding, are provided for lateral bearing support against the engaged lifting plate (not shown).

Side sway lugs 119 and 121 having rearwardly extending flanges 122 and 123 are fixed to the outer upright bars 3 to receive the lifting plate therebetween and restrain the sidesway thereof. Said flanges also serve as stop members with which the downwardly moving counterweight engages when the gripping mechanism is completely retracted thereby relieving said mechanism of damaging stresses.

The front face of the gridiron frame is provided with guard members consisting of vertically disposed angle irons 124 having the edges of one of their legs welded to the adjacent upright bars 3 and presenting the flat face of the other leg, forward. The bottom portions of said guard members overlay the base bar 1 and cover the bolts 11; the upper portions of said guard members are tied together with an angle iron 125 as by welding or otherwise.

Fig. 10 discloses a schematic representation of the invention wherein the reference numerals of the preceding figures are used to denote equivalent parts in Fig. 10. This simplified version of the invention discloses the fork proper comprising tines 6, back frame 3, and shoulder lug 91, secured rigidly together. Rotatably mounted on said frame is a shaft 51 that receives bell-crank means 200 mounted rotatively-rigid thereon. Carried between the flanges of the tines 6 is a gripper assembly 201 that is connected to the bell-crank by means of pivot 58. Saddle means 81, adapted to receive the lifting plate of a lifting truck (not shown), is connected to the other end of the bell-crank through means of pull-rod

76. A plate 84, rigidly fixed to said saddle, supports a lever arm 105 through means of fulcrum pivot 106. This fulcrum pivot is movable up and down with the saddle and its associated pull rod 76. A counterweight 113 is attached to one end of the lever arm 105, while the other end reacts against a roller 103 pivotally mounted on the fork member 3 through means of pivot 111. The magnitude of the counterweight 113 is preferably of a measure to slightly overbalance the weight of the fork proper supported on the other end of the lever arm 105. This overbalancing provides a take-up spaced relation 202 between the saddle 31 and the shoulder member 91. It is obvious from this simplified illustration that when a lifting force F is applied under the saddle the overbalancing effect of the counterweight maintains the take-up spaced relation 202 between the saddle and fork proper, and said saddle and associated fork are pick-up as a unit. When the tines 6 are slipped under a prearranged brick stack, the load thereof resists upward movement of the fork proper, and a further lifting movement applied under the saddle 31, results in the saddle assembly being moved upwardly relative to the loaded and "held-fast" fork, until the saddle 31 solidly contacts the shoulder member 91 after which both the fork and saddle assemblies are lifted in union. During the take-up movement, that is when the saddle assembly is being moved relative to the fork proper, the gripper assemblies 201 are being actuated into extended gripping position against the base course of brick. When the load of brick is to be set down, the lifting plate acting through force F is slowly lowered until the base of brick touch the ground and the fork is relieved of the load stresses. The lifting plate is continued to be slightly lowered, resulting in saddle moving downwardly relative to the fork, thereby restoring the take-up spaced relation 202. During this downward movement, the gravity force of the counterweight 113 and the dead weight of the saddle assembly provide the force necessary to positively retract the gripper assemblies 201. The tines are now withdrawn from under the brick stack by a rearward movement of the truck, and the lifting truck and the fork are now ready to repeat the operation on another pile of bricks.

Operation. When the fork is to be used, a lifting truck having a lifting plate (not shown) approaches the fork, tilts the plate slightly forward and engages the saddle 81 to support it. As the lifting plate is raised, the complete fork assembly comprising the fork frame and tines structure, the saddle structure, and the intervening counterweight structure is bodily lifted from the ground. Said subassemblies maintain their operable relative positions one to the other as shown in Figs. 1 and 2 because of the acting forces thereon provided by the counterweight. The counterweight tends to maintain the take-up distance, and when not acted upon by some external force such as a brick load, the fork does maintain that normal spaced relation between the frame and the saddle. Stop members 122 and 123 control that relative position. Stop members 122 and 123 also function to absorb shock and relieve the gripper assembly of wear and tear resulting from the gripper mechanism being fully and violently retracted against the web 14.

The pile of brick to be raised and transported is supported on ground rows or base courses of bricks. Each of said rows or courses consists of tandem arranged paired bricks resting on their

side edges, and between said rows are provided openings.

When the pile is to be moved, the fork on the lifting truck is to be raised, lowered or side-shifted until it aligns with the openings, and is then slid into the openings by a forward movement of the truck.

As the lifting truck through its lifting plate commences to apply a raising force to the bottom of the brick pile, the load on the tines resists the initial lifting forces; however, the movable saddle is slowly moved upwardly by the lifting plate relative to the fork frame, within the limits of the take-up distance between the initial resting position of the saddle and the frame shoulder lugs 91 and 92. As a result thereof the pull rod 76 attached to the saddle, actuates the rocker shaft 51 through means of crank arm 75. Consequently the gripping mechanism is immediately expanded and thrust laterally against the ground rows of bricks. Thereafter as the load continues to resist displacement of the fork frame, the continuing movement of the saddle results in gripper pressure being generated against the ground rows of bricks until the required pressure is reached, at which time the blocks 86 and 87 solidly contact the underside of the shoulder lugs 91 and 92, and upon the further application of a sufficient lifting force the fork with its brick load superimposed on the tines, as well as the ground rows of bricks, are raised bodily for transportation.

During the take-up movement, the counterweight 113 is raised from its lowermost position to its uppermost position through means of its lever connection to the movable saddle and its lever engagement with reaction roller 103 and 109 fixed to the immobile fork frame. The raising of the weight to its uppermost position gives to it the potential gravity energy necessary to retract the gripping mechanism, as hereinafter described.

The gripper mechanism is actuated through means of the pull bar 15 linked to the rocker shaft 51 by means of eye-bolt 47, compression springs 64 and 65, abutment 61, and brackets 56 and 57. As the saddle is moved through the take-up distance to contact the fork frame the attached pull rod 76 actuates the rocker shaft clockwise through means of crank arm 75. This clockwise motion of the rocker shaft is communicated to the pull bar 15 through the above said intervening linkage, and results in a rearward movement of the pull bar 15.

As the pull bar 15 is pulled rearwardly, the attached toggle link is urged to assume a position at right angles to the bar. As a result thereof the shoe retaining member 16, attached to the other end of the toggle link, is thrust laterally outward against the bricks and generates an endwise pressure thereagainst which increases indefinitely as the toggle link approaches a position at right angles to the pull bar. It is to be noted that for all practical purposes the shoe retaining member has only one degree of motion, namely, outwardly, guided by oscillatable link guide 19. Its longitudinal motion is restrained by said same link guide 19.

When the load is about to be deposited at its destination, the lifting plate and the complete fork assembly is slowly lowered until the base course of brick touch the ground or other resting place.

At this point the lifting fork is relieved of the greater portion of the load, however, the saddle

11

is still at its upper limit of the take-up distance, and a lifting force necessary to generate the required lateral pressure on the bricks is still being applied by the lifting plate and resisted by the load. To complete the act of deposition, the lifting plate is continued to be lowered, and the associated saddle lowers with it, while the fork proper remains immobile, being urged against the bottom of the brick pile by forces resulting from the counterweight. As the saddle retracts from its upper limit of the take-up distance there results a diminishing lateral pressure against the bricks until the pressure is reduced to zero.

As the lifting plate and its supported saddle is lowered still further, the gravity force of the counterweight bearing on the saddle, through means of the lever linkage and pins 106 and 107, forcefully urges the saddle downwardly relative to the fork resulting in a positive retraction of the gripping mechanism communicated through the pull rod 76 and appurtenant linkage.

When the counterweight reaches stop lugs 122 and 123 the retraction is complete. Thereafter the complete fork assembly comprising the fork frame structure, the saddle structure, and the intervening counterweight structure is bodily lowered from engagement with the bottom of the brick pile, by a further lowering of the lifting plate, and the tines withdrawn by a rearward movement of the truck. The lifting truck and the attached fork are now ready to repeat the operation on another pile of bricks.

It is the function of my invention to provide a brick stack handling fork, of the type that has the grippers actuated by the weight of the load, that will handle fractional capacity loads, that eliminate parasite load, that actuates the grippers against the bricks forthwith, that embodies gravity balancing means, that provides a gripping mechanism with one degree of freedom (lateral thrust only), that provides a gripping mechanism that will not jam and is self cleaning, and that allows the use of highly frictional shoe facing.

It should be understood of course, that the foregoing disclosure relates to only a preferred embodiment of the invention and that numerous modifications or alterations may be made therein without departing from the spirit and the scope of the invention as set forth in the appended claims.

What is claimed is:

1. A brick stack handling fork, comprising: a frame having a plurality of tines, projecting shoulder means, and roller means rotatably mounted on said frame; projectable mechanism carried by said tines for gripping and holding bricks therebetween, said mechanism being normally in a retracted position; a movable saddle structure adapted for engagement with said shoulder means, and adapted to receive a lifting member; means connecting said saddle and said projectable mechanism for actuating said projectable mechanism responsive to movement of said saddle; a counterweight; a pair of lever arms disposed cross-wise of each other, pivotly connected to said saddle, rollingly engaged with said roller means, and link-connected to said counterweight, operative to slightly overbalance said frame and dispose said shoulder and saddle in a take-up spaced relation, whereby, under load conditions, the initial lifting movement applied to the saddle by a lifting member automatically expands the gripping mechanism into immediate

12

engagement with the brick, generates lateral pressure for gripping and holding the brick, and thereafter engaging the saddle with the shoulder means for bodily lifting the fork and its superposed load and during which interval the counterweight having been raised in readiness to retract the gripping mechanism when the fork is unloaded.

2. A brick stack handling fork, comprising: a frame having a plurality of tines; an extendable structure carried by said tines for gripping brick therebetween; a movable saddle structure adapted for engagement with said frame and adapted to receive lifting means; means connecting said saddle and said gripping structure operative to actuate said gripping structure responsive to movement of said saddle; a gravity mass; lever means connecting said frame, said saddle structure and said mass, operable to overbalance said frame and dispose said frame and saddle in a take-up spaced relation; and stop means to limit said spaced relation.

3. A brick stack handling fork, comprising: a frame having a plurality of tines rigidly fixed thereto for lifting; an expandable mechanism carried by said tines coactable with corresponding mechanism on adjacent tines for gripping and holding brick therebetween; movable saddle means for actuating said gripping mechanism, adapted for engagement with said frame; a counterweight; and lever means connecting said frame, said saddle means, and said counterweight, operable to overbalance said frame and establish a take-up spaced relation between said saddle means and said frame.

4. A brick stack handling fork, comprising: a frame having a plurality of tines rigidly connected thereto for lifting; gripping mechanism carried by said tines coactable with corresponding mechanism on adjacent tines for gripping and holding bricks therebetween; movable saddle means for actuating said gripping mechanism; a counterweight; and lever means with reactions on said frame, on said saddle means, and on said counterweight, operable to overbalance said frame.

5. The apparatus of claim 4 wherein the lever means comprise a pair of levers disposed cross-wise of each other.

6. The apparatus of claim 4 wherein the lever means is pivotly mounted on said movable saddle means.

7. The apparatus of claim 4 wherein the lever means is pivotly connected to said mass.

8. The apparatus of claim 4 and a roller rotatably mounted on said frame, and wherein the lever means is rollingly engaged with said roller.

9. The apparatus of claim 4 and a stop secured to said frame to arrest the downward travel of said mass.

10. A brick stack handling fork, comprising: a frame having a plurality of tines rigidly fixed thereto for lifting; extendable mechanism carried by said tines coactable with corresponding mechanism on adjacent tines for gripping bricks; movable means for actuating said extendable mechanism; a gravity mass; and mechanical means connecting said frame, said actuating means, and said mass, operable to balance said frame.

11. A brick stack handling fork, comprising: a frame having a plurality of tines rigidly connected thereto for lifting; extendable means carried by said tines coactable with corresponding extendable means on adjacent tines for gripping

bricks; movable means for actuating said extendable means; a gravity mass; and means connecting said frame, said actuating means, and said mass, operable to balance said frame.

12. A brick stack handling fork, comprising: 5
a frame having a plurality of tines rigidly fixed thereto for lifting; brick gripping structure carried by said tines coactable with corresponding gripping structure on adjacent tines; movable means for actuating said brick gripping structure; a gravity mass; and means connecting said frame, said actuating means, and said mass, operable to balance said frame. 10

13. In a brick stack handling fork having a frame and a plurality of load supporting tines rigidly fixed thereto, retractile brick gripping means on said tines coactable with corresponding gripping means on adjacent tines, a gravity mass associated with said frame and said gripping means operative to actuate said gripping means. 20

14. In a brick stack handling fork: spaced tines, each tine having thereon an axially reciprocable pull bar; a shoe carrying member; linkage means having its ends pivotally connected to said bar and said member, respectively, in toggle joint arrangement; and guide means engaging said time and said member, operative to guide the member outwardly of said time. 25

15. In a brick stack handling fork: spaced tines, each tine having thereon an axially movable pull bar; a shoe mounting member; link means having one end pivotally connected to said bar and the other end pivotally connected to said member, in toggle joint arrangement; and mechanical guide means connecting with said time and said member, operative to guide the member laterally of said time. 30

16. In a brick stack handling fork: spaced tines, each tine having thereon an axially movable pull bar; guide means for said bar; a shoe supporting member; a link having its ends pivotally connected to said bar and said member, respectively, in toggle joint arrangement; and a link having its ends pivotally connected to said time and said member, operative to guide the member transversely of the time. 40

17. In a brick stack handling fork: spaced tines, each tine having thereon an axially reciprocable pull bar; guide means for said bar; a shoe carrying member disposed under said bar; a link having its ends pivotally connected to said bar and said member, respectively, in toggle joint arrangement; and an oscillatable link having its ends pivotally connected to said time and said member, respectively, operative to guide the member laterally of the time. 50

18. In a brick stack handling fork: spaced H-beam tines, each tine having an axially reciprocable pull bar in each beam recess thereof, disposed adjacent the beam web and the upper flange; at least one bracket depending from said bar; a toggle link having one end pivotally mounted on said bracket; a channel beam disposed under said pull bar with its web adjacent 60

the web of the H-beam, the other end of said link being pivotally connected across the channel flanges in toggle joint arrangement with said bar, said channel web having openings therein to accommodate the bracket and toggle link; and an oscillatable link at one end of the time, having its ends pivotally connected to said time and said channel beam, operative to guide the channel beam transversely of the time.

19. In a brick stack handling fork: spaced H-beam tines, each tine having an axially reciprocable pull bar in each beam recess thereof, disposed adjacent the beam web and the upper flange; means for guiding said bar; brackets depending from said bar; a toggle link for each bracket, having one end pivotally supported on said bracket; a channel beam disposed under said pull bar with its web adjacent the web of the H-beam, the other end of said link being pivotally connected across the channel flanges in toggle joint arrangement with said bar and operative to expand responsive to a rearward force applied to said bar, said channel web having openings therein to accommodate the bracket and the link; and an oscillatable link at the head end of the time, having one end pivotally connected to said time, and the other end pivotally connected to said channel beam, operative to guide the channel beam transversely of the time.

20. The apparatus described in claim 14; and gripper shoes; means slidably supporting said shoes on said shoe carrying member; and a compression spring between said shoe and said member, operative to urge the shoe away from the member. 35

21. The apparatus described in claim 16; and gripper shoes; means slidably supporting said shoes on said shoe carrying member; and a compression spring between said shoe and said member, operative to urge the shoe away from the member. 45

22. The apparatus described in claim 18 and an elongated shoe receivable between the channel flanges, said shoe having a frictional resilient facing; means slidably supporting said shoe on said channel web; and compression spring means between said shoe and said web operative to urge the shoe outwardly of the web.

23. The apparatus described in claim 19 and elongated stiff shoes receivable between the channel flanges, said shoes having rubber faces bonded thereon; means slidably supporting said shoes on said channel web; and spring means between said shoes and said web operative to urge the shoes outwardly of said web. 55

FRED T. HANSEN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
679,440	Tempest	July 30, 1901
956,330	Fritsch	Apr. 26, 1910
1,051,001	Penfield	Jan. 21, 1913
2,311,084	Redler	Feb. 16, 1943