

March 3, 1931.

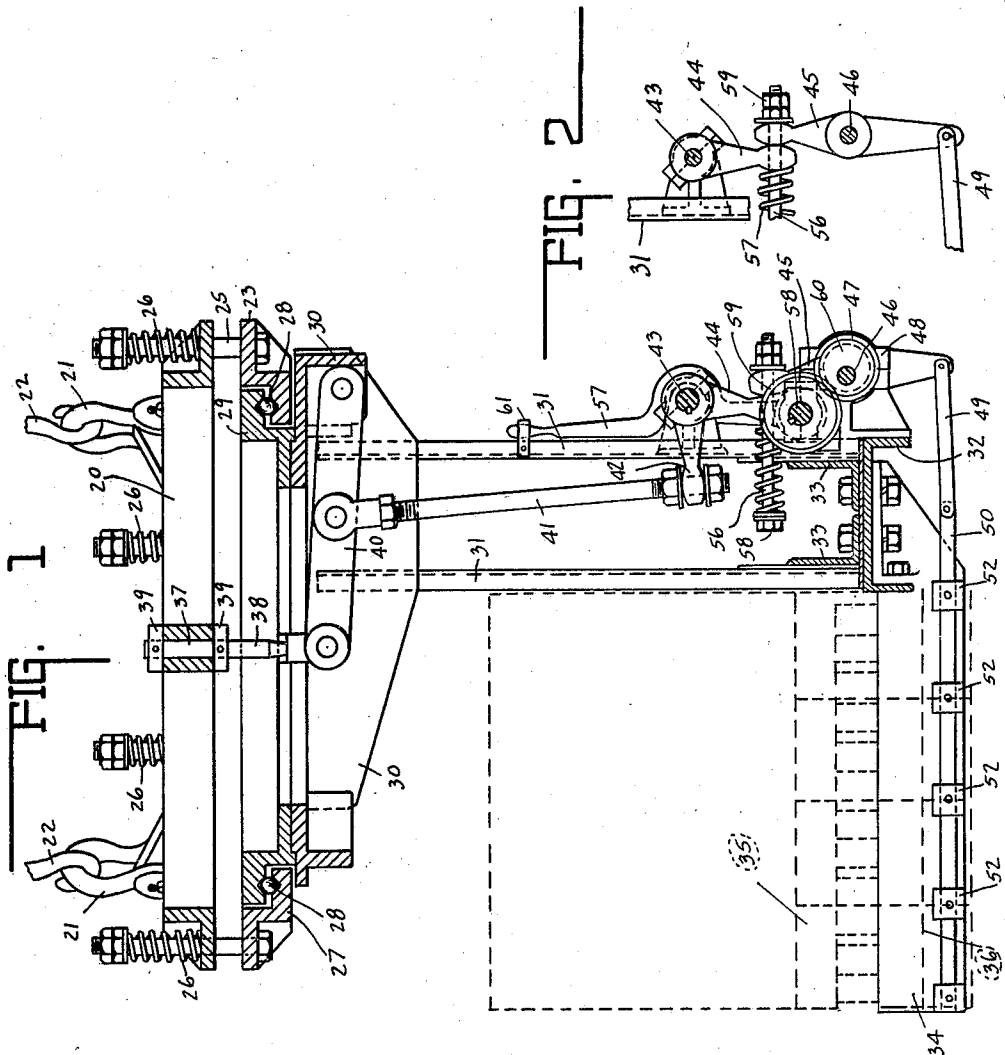
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1,794,698

BRICK SETTER

Filed Oct. 5, 1929

5 Sheets-Sheet 1



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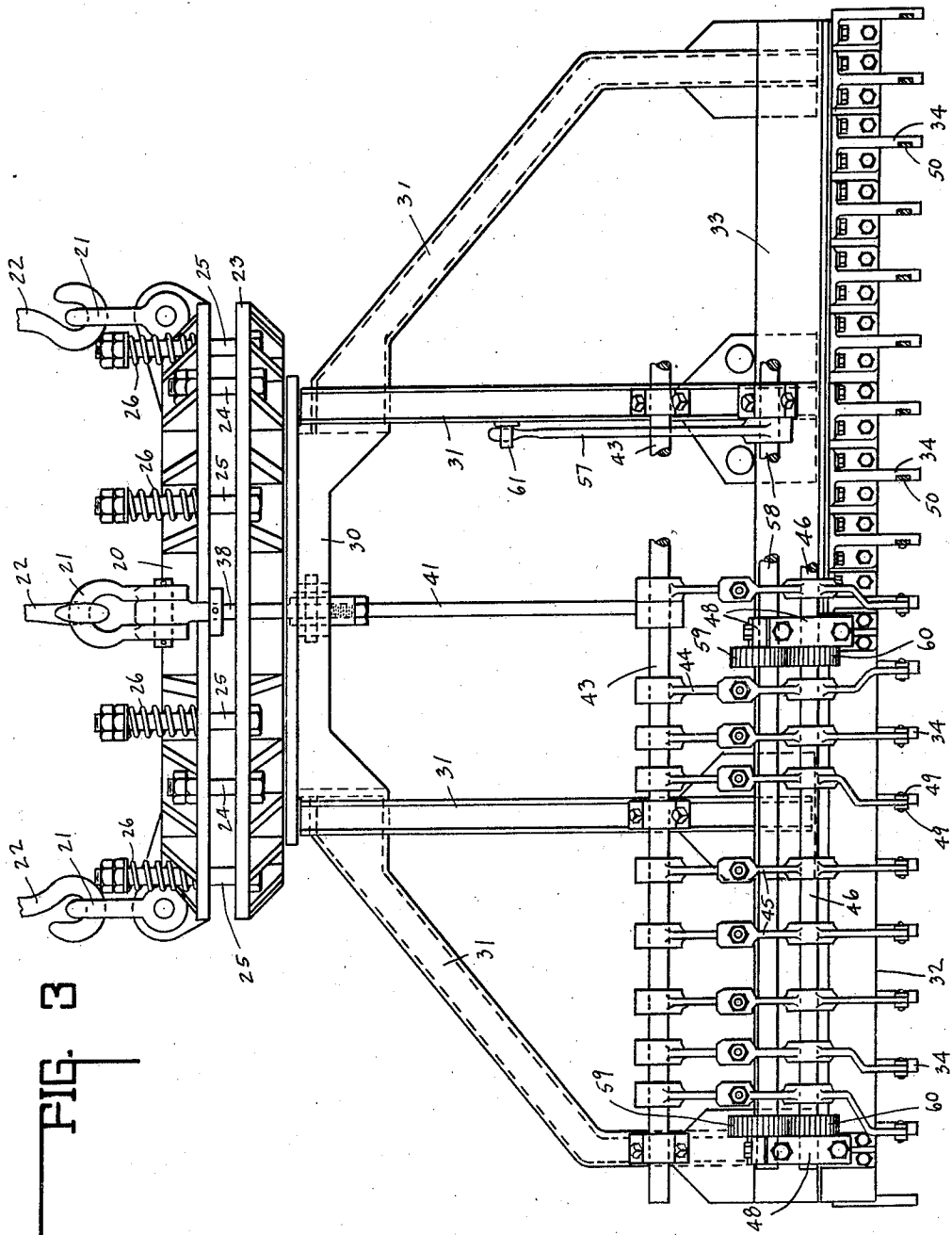
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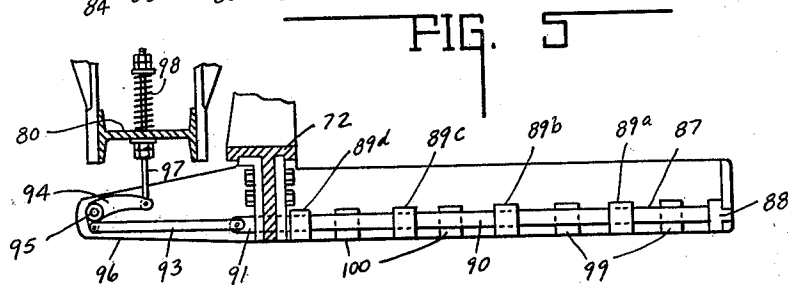
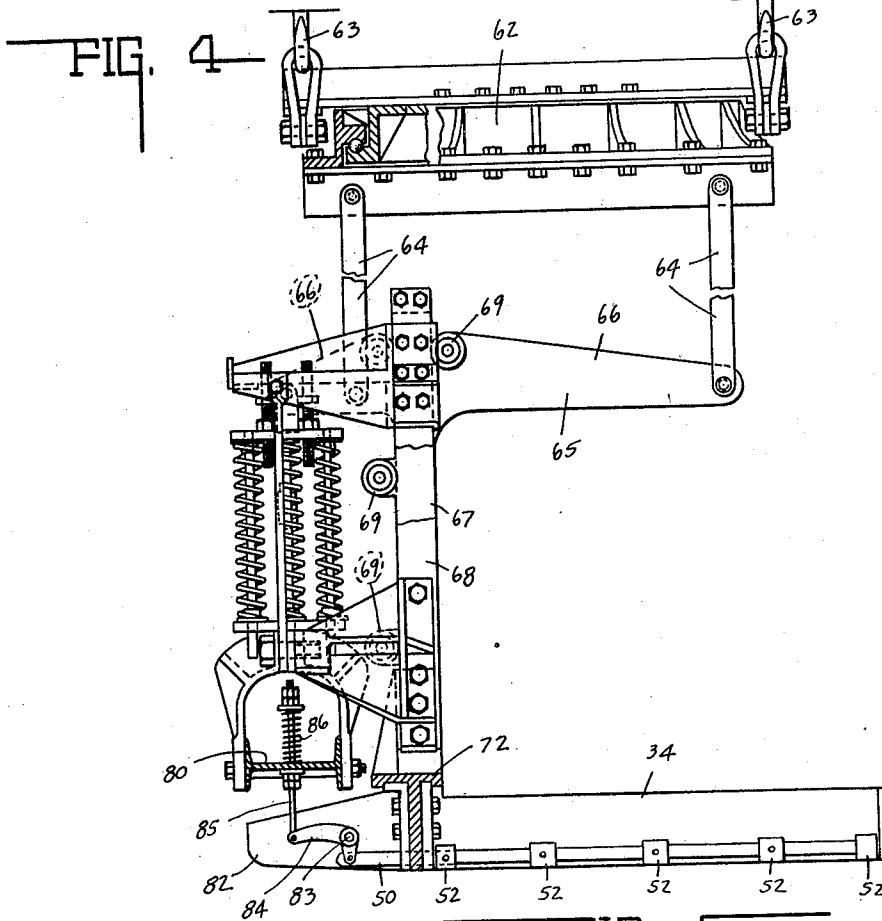
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5 Sheets-Sheet 3



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BRICK SETTER

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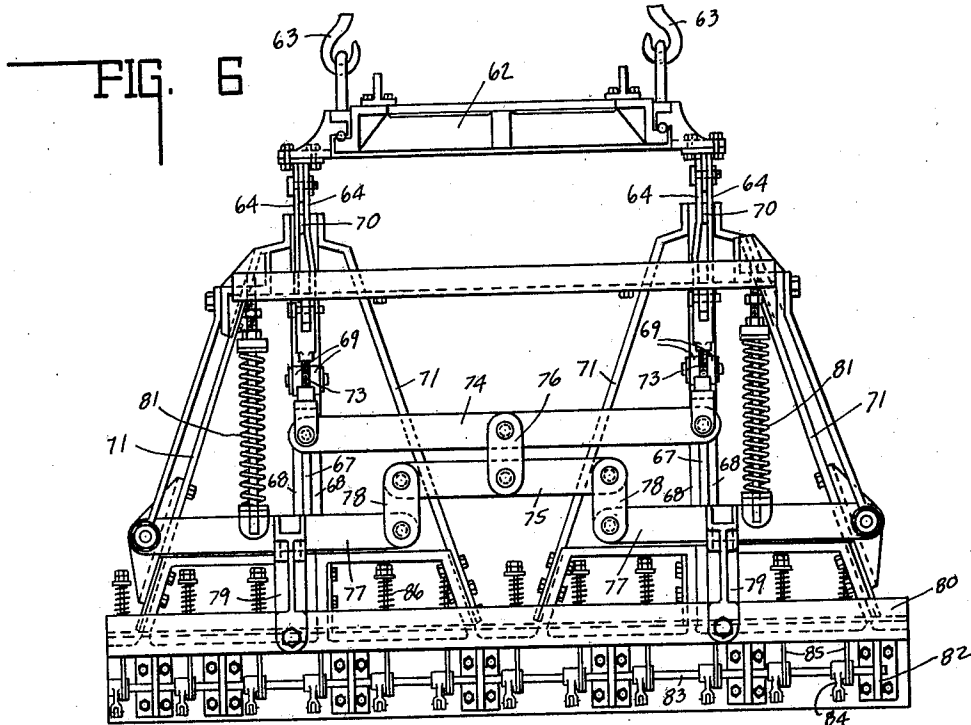
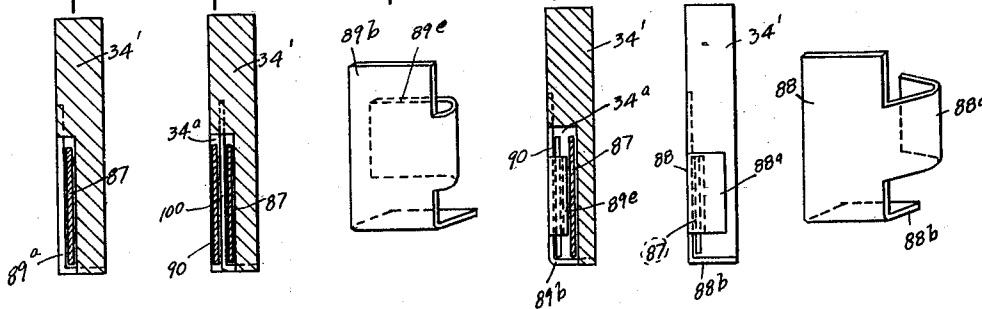


FIG. 12 FIG. 13 FIG. 14 FIG. 15 FIG. 16 FIG. 17



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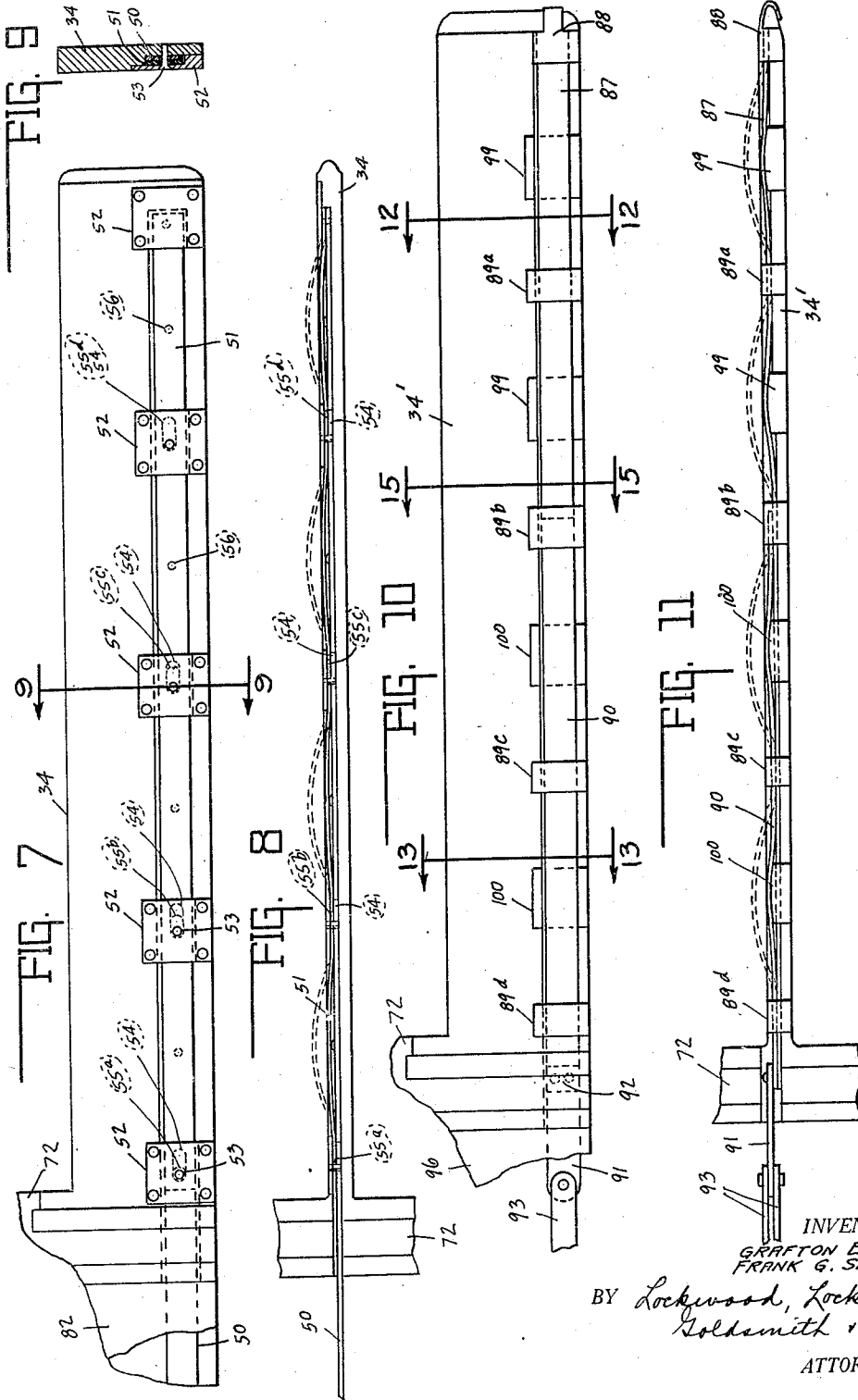
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5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

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BRICK SETTER

Application filed October 5, 1929. Serial No. 397,607.

This invention relates to an article handling machine. More particularly it relates to a machine of the general type disclosed in prior patents to R. C. Penfield, No. 1,205,562, issued November 21, 1916, and Grafton E. Luce, No. 1,712,773, issued May 14, 1929, adapted to transport a pile of brick or similar articles in stacked relation. In the brick industry this type of brick handling machine is known as a brick setter and is adapted to transport a unit stack of brick having a basic course arranged in parallel rows with openings therebetween. The setter is provided with a plurality of horizontally extending finger members which may be inserted in the said openings and which are provided with grasping means for grasping and transporting the basic course of brick while the upper courses are supported upon said finger members.

The principal object of the present invention is to provide a novel form of grasping mechanism for the fingers which overcomes certain difficulties which have heretofore been experienced with other types of grasping mechanism.

The principal feature of the invention resides in the provision of an elongated flexible member of spring steel or similar material associated with each of the finger members with the exception of one of the outer finger members. The flexible member abuts at one end against an abutment fastened to its associated finger member so that longitudinal movement of the end of the flexible member with respect to the finger member is prevented. In certain cases the end of the flexible member may be rigidly fastened to its finger member. Confining means are provided at a plurality of other points to maintain the flexible member in contact with the finger member. For grasping the brick placed between the finger members, longitudinal force is applied to the flexible member causing it to spring away from the finger member in the space between the confining points, thereby pressing the brick against the adjacent finger members and grasping the same. The flexible member, when in non-grasping position, is normally positioned

within a recess in the finger member. The said recess communicates with the lower side of the finger and thus prevents brick dust, chips and other foreign matter from accumulating between the flexible member and the finger member. The flexible member is relatively thin in section and the recess provided therefor may be much shallower than that provided for other forms of grasping mechanism. A stronger finger member is, therefore, provided with no increase of width or a narrower finger may be provided with no decrease in strength. Even when projecting partly from the recess, the flexible member provides less resistance to the insertion of the fingers into the openings in the basic course of the brick stack than previous types of grasping mechanism. Since the flexible member is formed of a resilient material, it tends naturally to return to the non-grasping position within the recess when the pressure acting thereon has been released.

In the brick setters in common use the finger members are four brick lengths long. A separate grasping mechanism is provided for each of the four sets of brick placed between these fingers. A separate adjusting mechanism is provided for each grasping mechanism. In the present invention a single flexible member confined at the points adjacent the ends of the brick provides a grasping means for all four sets of brick. A single adjusting means provides adjustment for each finger. A much simpler form is, therefore, obtained than has heretofore been possible.

The present invention provides a grasping member contacting with a greater percentage of the surface of the brick than with previous grasping means and also provides that the area of grasping contact increases as the pressure applied to the flexible member increases. By covering a greater area of the brick, less pressure is applied to the brick at any given point and less damage, therefore, results. This is particularly important in handling brick in the dry state before burning.

While the invention is hereinafter described in connection with a brick setter, it

is to be understood that it is equally applicable to brick loading forks and many other types of article handling machines.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

Fig. 1 represents a side view partly in section illustrating one form of the invention applied to the type of setter illustrated in the before-mentioned Luce patent. Fig. 2 is a fragmentary detail of a portion of the actuating mechanism of Fig. 1. Fig. 3 is a rear elevational view of the machine illustrated in Fig. 1. Fig. 4 is a side elevational view partly in section illustrating one form of the invention as applied to the type of setter illustrated in the before-mentioned Penfield patent. Fig. 5 is a similar view of a portion of Fig. 4 illustrating a second form of the invention similarly applied. Fig. 6 is a rear elevational view of the machine illustrated in Fig. 4. Fig. 7 is an elevational view of an individual finger member with one form of the invention applied thereto. Fig. 8 is a bottom view of the finger member illustrated in Fig. 7. Fig. 9 is a sectional view taken on the line 9—9 of Fig. 7. Fig. 10 is an elevational view of an individual finger member with an alternative form of the invention applied thereto. Fig. 11 is a bottom view of the finger member illustrated in Fig. 10. Fig. 12 is a sectional view taken on the line 12—12 of Fig. 10. Fig. 13 is a sectional view taken on the line 13—13 of Fig. 10. Fig. 14 is a perspective view of a combined confining plate and abutment used with one form of the invention. Fig. 15 is a sectional view taken on the line 15—15 of Fig. 10. Fig. 16 is an end view of the finger member illustrated in Fig. 10 showing the form of confining plate used at that point. Fig. 17 is a perspective view of a combined confining plate and abutment used at the end of the finger member of Fig. 10.

Referring particularly to Figs. 1 and 3, a frame casting 20 is supported by clevises 21 in turn supported by hooks 22 depending from a traveling crane or other lifting and transporting mechanism not shown in the drawings. A turn table casting 23 is positioned beneath the frame casting 20 and a plurality of travel limit bolts 24 pass through corresponding holes in the said castings and permit a limited movement of the frame casting 20 away from the turn table casting 23 in the lifting of the device. Spring stems 25 are provided, likewise passing through both castings and are fitted with compression springs 26 normally tending to resist the movement of the casting 20 away from the casting 23.

The casting 23 has an inturned annular flange 27 carrying a plurality of ball bearings 28 in turn supporting an annular casting 29.

As illustrated in Fig. 1, the casting 29 is confined within portions of casting 23 and is free for rotation upon the ball bearings 28. A frame casting 30 is suitably fastened to the casting 29 and supports a plurality of downwardly extending frame members 31. The members 31 support at their lower ends a horizontally extending channel member 32 fastened thereto by angle members 33. A plurality of horizontally extending parallel finger members 34 are suitably supported from the channel member 32. The finger members 34 are adapted to be inserted in openings in the basic course in the stack of brick and are spaced at the proper distance apart to support the upper courses of brick thereon. In Fig. 1 the upper courses of such a stack of brick are shown in dotted lines and indicated by the numeral 35. The basic courses are similarly shown and indicated by the numeral 36. In this drawing a basic course two brick high is illustrated. However, the invention is equally applicable to a stack of brick having a single basic course when a shallower finger member is used.

The frame casting 20 is provided with an opening 37 coaxial with the rotation of the casting 29 and adapted to receive a stem 38. The stem 38 is free to rotate in the opening 37 but is prevented from longitudinal movement relative thereto by collars 39. The lower end of the stem 38 is pivotally fastened to one end of a lever 40 in turn pivotally fastened at the other end to a portion of the casting 30. Intermediate the ends of the lever 40 is pivotally fastened one end of a rod 41 having an operating connection at its opposite end with a lever 42. The lever 42 is fixedly connected to a shaft 43 rotatably mounted upon suitable bearings carried upon the frame members 31. A plurality of levers 44 are likewise fixedly mounted upon the shaft 43 and are one less in number than the number of finger members 34. Each of the levers 44 has an operating connection at its lower end with the upper end of a lever 45. All of the levers 45 are freely mounted upon a shaft 46 in turn carried in a plurality of eccentric bushings 47 mounted in bearings 48 carried upon the channel member 32. A stem 56 extends through openings provided therefor in the lower end of each of the levers 44 and the upper end of each of the levers 45. A compression spring 57 surrounds each of said stems and abuts at one end against an abutment 58 carried by said stem and at the other end against the lower end of lever 44. The opposite end of stem 56 carries nuts 59 which are adjustable to adjust the tension of the spring 57. The spring 57 normally tends, therefore, to yieldingly maintain the operating contact between levers 44 and 45.

The lower end of each of the levers 45 is connected to a pair of links 49 in turn connected to one end of a rigid bar 50. The bar

50, as illustrated particularly in Figs. 7, 8 and 9, is positioned within a recess in finger members 34 and extends substantially the full length thereof. The outer end of the bar 50 is fixedly connected to a flexible member 51 preferably of spring steel or other resilient material. The member 51 is arranged within the recess in the finger member 34 and substantially parallels the bar member 50. At a plurality of points along the finger member 34, an inset plate 52 is provided and is adapted to confine the bar member 50 and the flexible member 51 and to permit longitudinal movement only of said members with respect to said finger members. The confining plates 52 are located adjacent the ends of the brick when the same are placed between the fingers 34. A central pin or screw 53 is provided in each of the plates 52 with the exception of the plate at the outer end of the finger member. The pins 53 extend through openings 54 provided in the bar member 50 and openings 55^a, 55^b, 55^c and 55^d provided in the flexible member 51 and preferably extend into the finger members 34 and are threadedly engaged therewith.

It will be observed that the opening 55^a in the flexible member 51 is associated with the innermost of the confining plates 52 and is substantially the same size as the pin 53. No longitudinal movement of the flexible member is, therefore, possible at this point. By means of this construction the withdrawal of the bar 50 to the left as illustrated in Figs. 7 and 8 exerts a longitudinal pressure upon the flexible member 51 which causes the portions thereof between the confining plates 52 to spring outwardly into the position indicated by dotted lines in Fig. 8. These portions, therefore, exert a pressure upon the brick between the finger members and cause them to be firmly grasped for lifting and transportation. Since the confining plates are located adjacent the ends of the brick, the initial contact of the flexible member with the brick takes place at the center of the brick. It is also evident that the greater the pressure applied to the bar 50, the greater is the area of the surface of the flexible member brought into contact with the brick. The openings 55^b, 55^c and 55^d are elongated in form and of sufficient length so that the longitudinal movement of the flexible member is not limited thereby in the normal operation of the apparatus with a full complement of brick. Therefore, the pressure exerted by the flexible member upon the brick is substantially equally divided between the four brick units. To provide an initial curvature of the flexible member and thereby insure its proper action, a plurality of protuberances 56 are provided on the finger member 34 intermediate the confining plates 52.

It is often desirable to use a brick setter designed for a four-brick unit to lift a unit

less than four brick in width. To accomplish this purpose the openings 55^b, 55^c and 55^d are made of increasing lengths in the order mentioned. In picking up a unit only three brick in width the fingers 34 are inserted far enough in the unit to bring the three brick in position adjacent the three outer grasping portions of the flexible member. If the longitudinal travel of the flexible member were unlimited the inner grasping portion thereof would then be free to expand sufficiently to absorb all of the said movement. No pressure would then be exerted upon the brick adjacent the three outer portions. By limiting the size of the opening 55^b the longitudinal movement of the flexible member is limited at that point and the travel of the inner grasping portion away from the finger member is accordingly limited. A normal pressure is thereby secured upon each of the three brick units in the three outer positions. By similarly choosing the length of the openings 55^c and 55^d a stack of brick two brick in width or one brick in width may similarly be grasped.

In the operation of the setter the springs 26 are adjusted to overcome the weight of the setter mechanism depending from the bolts 25. Therefore, they normally maintain the castings 23 and 20 in contact with each other so long as no brick are carried by the setter. With the said castings in contact, the stem 38 positions the lever 40, stem 41 and lever 42 in their lowermost positions. The levers 44 are, therefore, outwardly pressed against the upper end of levers 45 which in turn position the bar members 50 at the outer end of their longitudinal movement. In this position the flexible members 51 are free to assume their positions within the recesses in the finger members 34. The finger members may, therefore, be inserted within the openings in the basic course of brick. When so inserted the setter is lifted by means of the hooks 22 and the weight of the upper courses of brick upon the setter fingers prevents upward movement of the said fingers until the springs 26 have been compressed and the castings 20 and 23 have been moved apart to the limit of their travel as determined by the length of bolts 24. The relative movement of the castings 20 and 23 causes the stem 38 to elevate the lever 40, rod 41 and lever 42 and to move the levers 44 inward. This movement causes a pressure upon the springs 57 which in turn operates the levers 45 to withdraw the bar members 50. The said withdrawal of the bar member 50 exerts the necessary force upon the flexible member 51 to force the portions thereof between the confining plates 52 against the brick in the basic course. The brick are, therefore, tightly grasped and further lifting of the hooks 22 elevates the entire unit. The provision of the springs 57 insures against an excess of pressure upon the

brick and the adjustment of the said springs provides a method of equalizing the pressures on the individual grasping mechanisms.

From the above description it is evident that the entire force necessary to grasp the basic course of brick is provided by the weight of the brick supported upon the grasping fingers. In releasing a unit of brick when the same has been transported to the desired position it is only necessary to lower the unit into place and to lower the finger members sufficiently to remove the weight of the upper courses of brick therefrom. The flexible grasping members then assume their normal non-grasping position and the finger members may then be withdrawn from beneath the unit.

For manual operation of the grasping members when a single course of brick is to be lifted, a hand lever 57 is provided. The said lever is fixedly mounted upon a shaft 58 suitably supported upon bearings carried upon the frame members 31. A plurality of spur gears 59 are carried upon the said shaft and engage spur gears 60 which are formed integral with the eccentric bushings 47 heretofore mentioned. The lever 57 is normally maintained in a non-active position by a keeper 61. For manual operation of the grasping fingers the lever 56 is pulled outwardly and downwardly rotating the shaft 58, the gears 59 and 60 and the eccentric bushings 47. The rotation of the said bushings throws the shaft 46 outwardly and since the upper ends of levers 45 are fixedly maintained by their contact with levers 44 the lower ends of the levers 45 are outwardly moved. This movement of levers 45 actuates the grasping mechanism in the same manner as previously described.

In Figs. 4 and 6 the type of grasping mechanism previously described is illustrated applied to the type of brick setter illustrated in the before-mentioned Penfield patent. In these drawings a turn table mechanism generally indicated by the numeral 62 is supported by means of hooks 63 upon a common type of overhead crane or other lifting and transporting mechanism. Depending from the turn table 62 there is a plurality of link members 64. The said link members 64 are attached at their lower ends to a pair of substantially T-shaped members 65 each having a horizontal portion 66 to which the said link members are attached and a vertical portion 67. Each of the vertical portions 67 is adapted to slide between a pair of vertical frame members 68. Rollers 69 are supported upon the members 65 and engage the members 68 for maintaining the relative position of the said members and for permitting vertical relative motion only therebetween. The upward travel of the T-members 65 with relation to the frame members 68 is limited by a block

70 interposed between the members 68 at their upper ends.

The frame members 68 form a part of a rigid frame work which also includes a plurality of frame members 71 and a horizontally extending member 72 to which finger members 34 of the same type as heretofore described are fastened. Pivotally attached to one end of the horizontal portion 66 of each of the T-members 65 there is a downwardly extending adjustable link 73. A bar member 74 is pivotally attached at each end to the lower ends of the links 70. Substantially parallel with the bar 74 is a bar 75 and a link 76 is pivotally fastened at each end to the mid-points of said bars. A pair of levers 77 are pivotally mounted at one end to a portion of the frame members 71 and each of said levers is connected by a link 78 with one end of the bar 75. A yoke 79 is attached to each of the levers 77 and a horizontally extending channel member 80 is supported by the said yokes. A plurality of compression springs 81 are interposed between the levers 77 and a portion of the frame 71.

In the operation of this mechanism the initial lifting of the turn table member tends to elevate the T-members 65. The elevation of the T-members 65, by means of the series of linkages described, elevates the channel member 80 and tends to elevate the rigid frame work and the finger members attached thereto by compression of the springs 81. The springs 81 are adjusted so that the rigid frame work and the said finger members will be elevated simultaneously with the channel members 80 so long as no brick are in position upon the fingers. When a stack of brick is supported upon the fingers the springs 81 will be compressed and relative motion will occur between the channel 80 and the finger members 34 until the T-members 65 reach the blocks 70. This relative movement of the fingers 34 and the channel 80 is utilized to operate the grasping mechanism as will now be described.

A plurality of rearwardly extending members 82 are attached to the member 72 and form a bearing for a horizontal shaft 83. The shaft 83 in turn forms a pivot for a plurality of bell crank members 84, one arm of each of which is attached to one of the bar members 50 heretofore mentioned. The opposite arm of each of the bell cranks is attached to a spring stem 85 extending upwardly through the channel member 80 and being fitted with an adjustable compression spring 86. By this means the elevation of the channel member 80, when a load of brick is present upon the finger members 34, operates the bar 50 to grasp the brick. The provision of the springs 86 insures that there will be no excess pressure upon the brick and the adjustable feature of the said springs provides a method of maintaining substantially equal pressures

upon the brick grasped by each of the grasping mechanisms.

In Figs. 5, 10, 11, 12, 13, 14, 15 and 16 there is illustrated an alternative form of the invention which may be applied to either of the foregoing types of brick setters. In this form finger members 34' are provided with recesses 34^a similar to those in finger members 34 and may be similarly supported upon the brick setter frame work. A combined confining plate and abutment 88 is fastened at the outer end of each finger member as illustrated in Figs. 16 and 17. Each plate 88 has a portion 88^a bent about the end of the finger member 34' and a portion 88^b bent about the lower surface of the finger. The end of the recess 34^a extends behind the plate 88 and forms a pocket for the reception of the end of a flexible member 87. The flexible member 87 is substantially the same length as the finger member and is normally positioned within the recess 34^a. A plurality of confining plates 89^a, 89^b, 89^c and 89^d are provided having the same function as the plates 52 in the previous illustrations. The confining plate 89^b, located at substantially the mid-point of the finger member, is provided with an inturned portion 89^c which serves to confine the flexible member 87 and also serves as an abutment for a second flexible member 90. The flexible member 90 is substantially half the length of the flexible member 87 and is likewise contained in the recess 34^a and extends substantially parallel with the flexible member 87. The two flexible members are joined to a short rigid bar 91 by suitable rivets or screws 92. The bar 91 is pivotally connected to a link 93 in turn connected to the lower arm of a bell crank 94. The bell crank 93 is mounted on a shaft 95 journaled in rearwardly-extending members 96 in turn supported upon the frame member 72. The opposite arm of the bell crank 94 is attached to a spring stem 97 extending through channel member 80 and fitted with adjustable compression springs 98.

A pair of plates 99 are inset in the finger member and have a curved surface in contact with the inner surface of the flexible member 87. The plates 99 serve to give the desired initial curvature to the said flexible member. A pair of plates 100 are likewise inset in the finger member but are spaced therefrom as illustrated in Figs. 11 and 13 to allow the flexible member 87 to pass therebetween. These plates, therefore, act as additional confining plates for the flexible member 87. The outer surface of the plates 100 are curved to contact with the inner surface of flexible member 90 and provide the desired initial curvature thereof.

By this construction the relative motion of the channel member 80 and the finger member 34' in the lifting of a load of brick exerts a thrust upon the bar 91 and the two

flexible members 87 and 90. This outward thrust causes the said flexible members to assume the positions illustrated in dotted lines in Fig. 11 and thereby grasp the brick. It will be noted that the confining plates 100 prevent the flexible member 87 from being forced away from the finger member 34' in the inner pair of grasping spaces. It will also be noticed that the motion of the bar 91 need be only half as great as the corresponding motion of the bar 50 in the preceding embodiment of the invention in order to provide the same gripping force upon the brick. The force applied to bar 91, however, must be twice as great as that applied to bar 50. By the use of four flexible members in place of the two here illustrated, one of which being associated with each grasping space, the motion of the bar 91 may be made only one-fourth as great as the bar 50 with a corresponding increase in the pressure required. By a suitable reversal of the leverages in the Luce type of setter to provide a thrust on the bar 91 instead of a pull, this form of the invention may be conveniently applied thereto. Other variations in the details of the invention are possible without departing from the broader features thereof.

The invention claimed is:

1. In an article moving device, the combination of a pair of spaced apart finger members adapted to receive an article therebetween, a flexible member associated with one of said finger members, means for maintaining said flexible member in contact with its associated finger member at a plurality of points and mechanism for forcing the portion of said flexible member between said points away from said finger member to press said article against the second of said finger members for grasping and moving the same.

2. In an article moving device, the combination of a pair of spaced apart finger members adapted to receive an article therebetween, a flexible member associated with one of said finger members, means for maintaining said flexible member in contact with its associated finger member at a plurality of points, and mechanism for applying a longitudinal force to said flexible member whereby the portion of the same between said points is forced away from the associated finger member to press said article against the second of said finger members for grasping and moving the same.

3. In an article moving device, the combination of a pair of spaced apart finger members adapted to receive an article therebetween, a flexible member associated with one of said finger members, means for preventing longitudinal motion of said flexible member with respect to its associated finger member at one point, means for maintaining said flexible member in contact with said finger member at another point, and mechanism

for forcing said flexible member away from said finger member between said points to press said article against the second of said finger members for grasping and moving the same.

4. In an article moving device, the combination of a pair of spaced apart finger members adapted to receive an article therebetween, a flexible member associated with one of said finger members, means for preventing longitudinal motion of said flexible member with respect to its associated finger member at one point, means for maintaining said flexible member in contact with said finger member at another point, and mechanism for applying a longitudinal force to said flexible member, whereby the portion of the same between said points is forced away from the associated finger member to press said article against the second of said finger members for grasping and moving the same.

5. In an article moving device, the combination of a pair of spaced apart finger members adapted to receive an article therebetween, a flexible member disposed longitudinally of one of said finger members, means for preventing longitudinal motion of said flexible member with respect to its associated finger member at one point, and mechanism for applying a longitudinal force to said flexible member whereby a portion of said member is forced away from its associated finger member to press said article against the other of said finger members for grasping and moving the same.

6. In an article moving device, the combination of a pair of spaced apart finger members adapted to receive an article therebetween, a flexible member associated with one of said finger members, means for maintaining said flexible member in contact with its associated finger member at a plurality of points, protuberances upon said finger member between said points for imparting an initial curvature to said flexible member, and mechanism for applying a longitudinal force to said flexible member, whereby the portion of the same between said points is forced away from the associated finger member to press said article against the second of said finger members for grasping and moving the same.

7. In an article moving device, the combination of a pair of spaced apart finger members adapted to receive an article therebetween, a flexible member associated with one of said finger members, means for preventing longitudinal motion of said flexible member with respect to its associated finger member at one point, means for maintaining said flexible member in contact with said finger member at another point, a protuberance upon said finger member between said points for imparting an initial curvature to said flexible member, and mechanism for ap-

plying a longitudinal force to said flexible member, whereby the portion of the same between said points is forced away from the associated finger member to press said article against the second of said finger members for grasping and moving the same.

8. In an article handling device the combination of a pair of spaced apart finger members adapted to receive articles therebetween and to support other articles thereon, a flexible member associated with one of said finger members, means for maintaining said flexible member in contact with its associated finger member at a plurality of points, means for lifting said finger members, and an operating connection between said finger members and said flexible member operable by the weight of the articles supported upon said finger members in the lifting thereof to force the portion of said flexible member between said contact points away from the associated finger member to press the articles between said finger members against the second of said finger members for grasping and lifting the same.

9. In an article handling device, the combination of a pair of spaced apart finger members adapted to receive articles therebetween and to support other articles thereon, a flexible member associated with one of said finger members, means for maintaining said flexible member in contact with its associated finger member at a plurality of points, means for lifting said finger members, and an operating connection between said finger members and said flexible member operable by the weight of the articles supported upon said finger members in the lifting thereof to apply a longitudinal force to said flexible member, whereby the portion of the same between said contact points is forced away from the associated finger member to force the portion of said flexible member between said contact points away from the associated finger member to press the articles between said finger members against the second of said finger members for grasping and lifting the same.

10. In an article handling device, the combination of a pair of spaced apart finger members adapted to receive articles therebetween and to support other articles thereon, a flexible member associated with one of said finger members, means for preventing longitudinal motion of said flexible member with respect to its associated finger member at one point, means for maintaining said flexible member in contact with its associated finger member at another point, means for lifting said finger members, and an operating connection between said finger members and said flexible member operable by the weight of the articles supported upon said finger members in the lifting thereof to force the portion of said flexible member between said points

away from the associated finger member to press the articles between said finger members against the second of said finger members for grasping and lifting the same.

11. In an article handling device, the combination of a pair of spaced apart finger members adapted to receive articles therebetween and to support other articles thereon, a flexible member associated with one of said finger members, means for preventing longitudinal motion of said flexible member with respect to its associated finger member at one point, means for maintaining said flexible member in contact with its associated finger member at another point, means for lifting said finger members, and an operating connection between said finger members and said flexible member operable by the weight of the articles supported upon said finger members in the lifting thereof to apply a longitudinal force to said flexible member, whereby the portion of the same between said points is forced away from the associated finger member to press the articles between said finger members against the second of said members for grasping and lifting the same.

12. In an article grasping device a grasping member, and mechanism for applying a force thereto for grasping an article, the area of grasping contact between said member and said article increasing with an increase of said force.

13. In an article handling machine adapted to lift a stack of articles having a basic course formed of parallel rows of articles having openings therebetween, the combination of a supporting frame, a plurality of horizontal finger members supported thereon and adapted to be inserted in said openings, a relatively thin flexible member associated with each of said finger members, confining means at a plurality of points along said finger members adapted to permit longitudinal movement only of said flexible members at said points, and mechanism for applying a compressive force to the ends of said flexible members, whereby said members are forced away from said finger members between said points of confinement to press said articles against adjacent finger members for grasping and lifting the same.

14. In an article handling device, the combination of a pair of spaced apart finger members adapted to receive an article therebetween, a flexible member associated with one of said finger members, a confining member attached to said finger member and adapted to prevent movement of one end of said flexible member away from said finger member, an abutment attached to said finger member for preventing longitudinal movement of the said end of the flexible member with respect to said finger member in one direction, a second confining member adapted to prevent movement of another portion of said flexible

member away from said finger member, and mechanism for applying a longitudinal force to said flexible member whereby the portion of said member between said confining members will be forced away from said finger member to press said article against the other of said finger members for grasping the same.

15. In an article handling device, the combination of a pair of spaced apart finger members adapted to receive an article therebetween, a flexible member associated with one of said finger members, a combined confining and abutment member attached to said finger member and adapted to prevent movement of one end of said flexible member away from said finger member and to prevent longitudinal movement of the said end of the flexible member with respect to said finger member in one direction, a second confining member adapted to prevent movement of another portion of said flexible member away from said finger member, and mechanism for applying a longitudinal force to said flexible member whereby the portion of said member between said confining members will be forced away from said finger member to press said article against the other of said finger members for grasping the same.

16. In an article handling device, the combination of spaced apart finger members adapted to receive articles therebetween, a flexible member associated with one of said finger members, a combined confining and abutment member attached to said finger member and adapted to prevent movement of one end of said flexible member away from said finger member and to prevent longitudinal movement of the said end of the flexible member with respect to said finger member in one direction, a second flexible member associated with said finger member, a second combined confining and abutment member adapted to prevent movement of another part of said first flexible member away from said finger member, to prevent movement of one end of the second flexible member away from said finger member and to prevent longitudinal movement of the said end of the second flexible member with respect to said finger member in one direction, a third confining member adapted to prevent movement of another portion of said second flexible member away from said finger member, and mechanism for applying a longitudinal force to the opposite ends of both of said flexible members whereby the portion of said first flexible member between the first and second confining members and the portion of said second flexible member between the second and third confining members will be forced away from said finger member to press said articles against the other of said finger members for grasping the same.

17. In an article handling device, an article grasping element including an elongated

gated finger member having a longitudinal recess in one side, an elongated flexible member normally disposed within said recess, means for confining portions of said flexible member within said recess and mechanism for forcing other portions thereof out of said recess to make contact with an article to be grasped.

18. An article grasping element as defined by claim 17 characterized by said recess communicating with the lower surface of said finger member to prevent accumulation of foreign matter between said finger member and said flexible member.

In witness whereof, we have hereunto affixed our signatures.

GRAFTON E. LUCE.
FRANK G. SENTER.

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