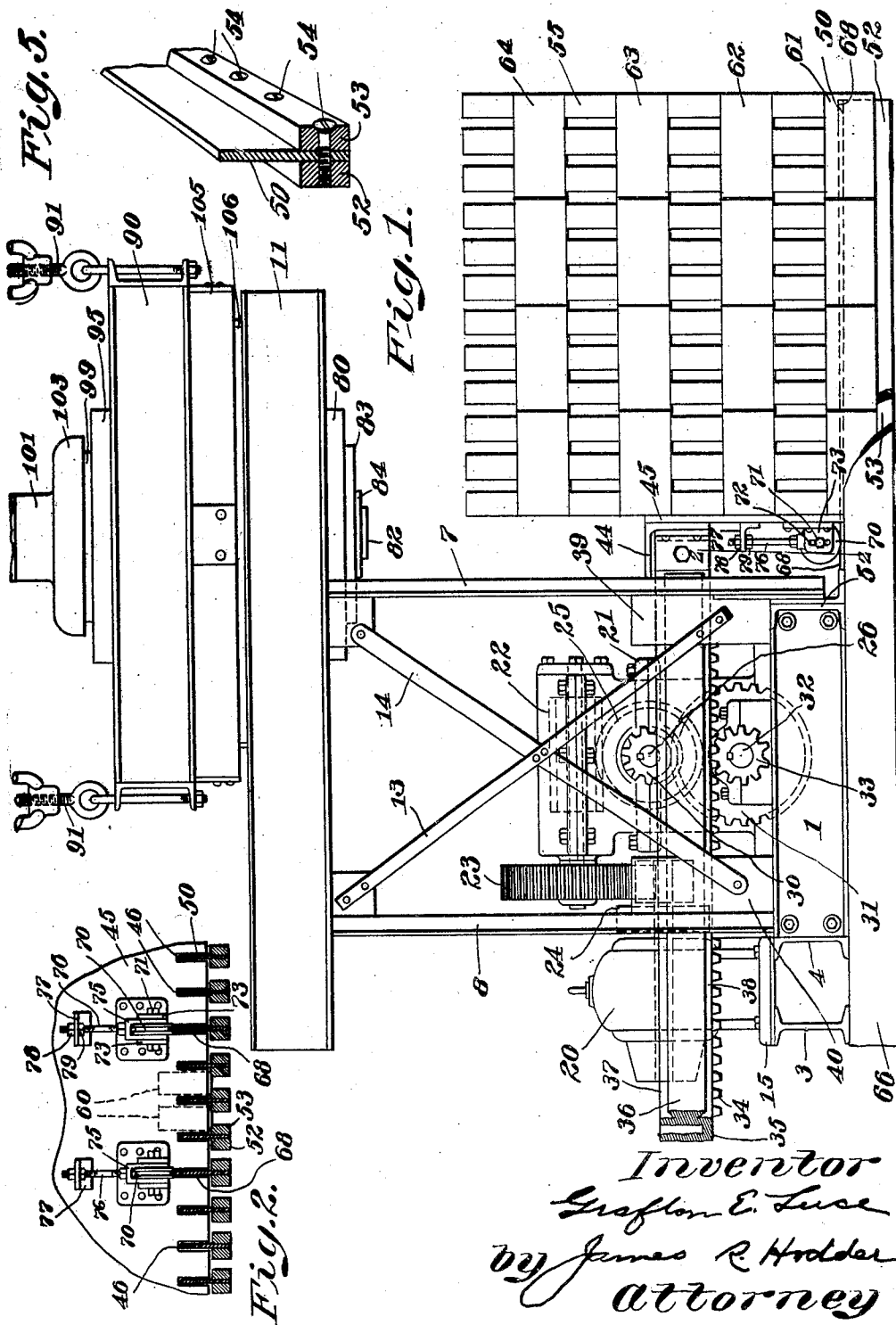


G. E. LUCE.
BRICK HANDLING AND SETTING APPARATUS.
APPLICATION FILED NOV. 15, 1918.

1,335,344.

Patented Mar. 30, 1920.

7 SHEETS—SHEET 1.



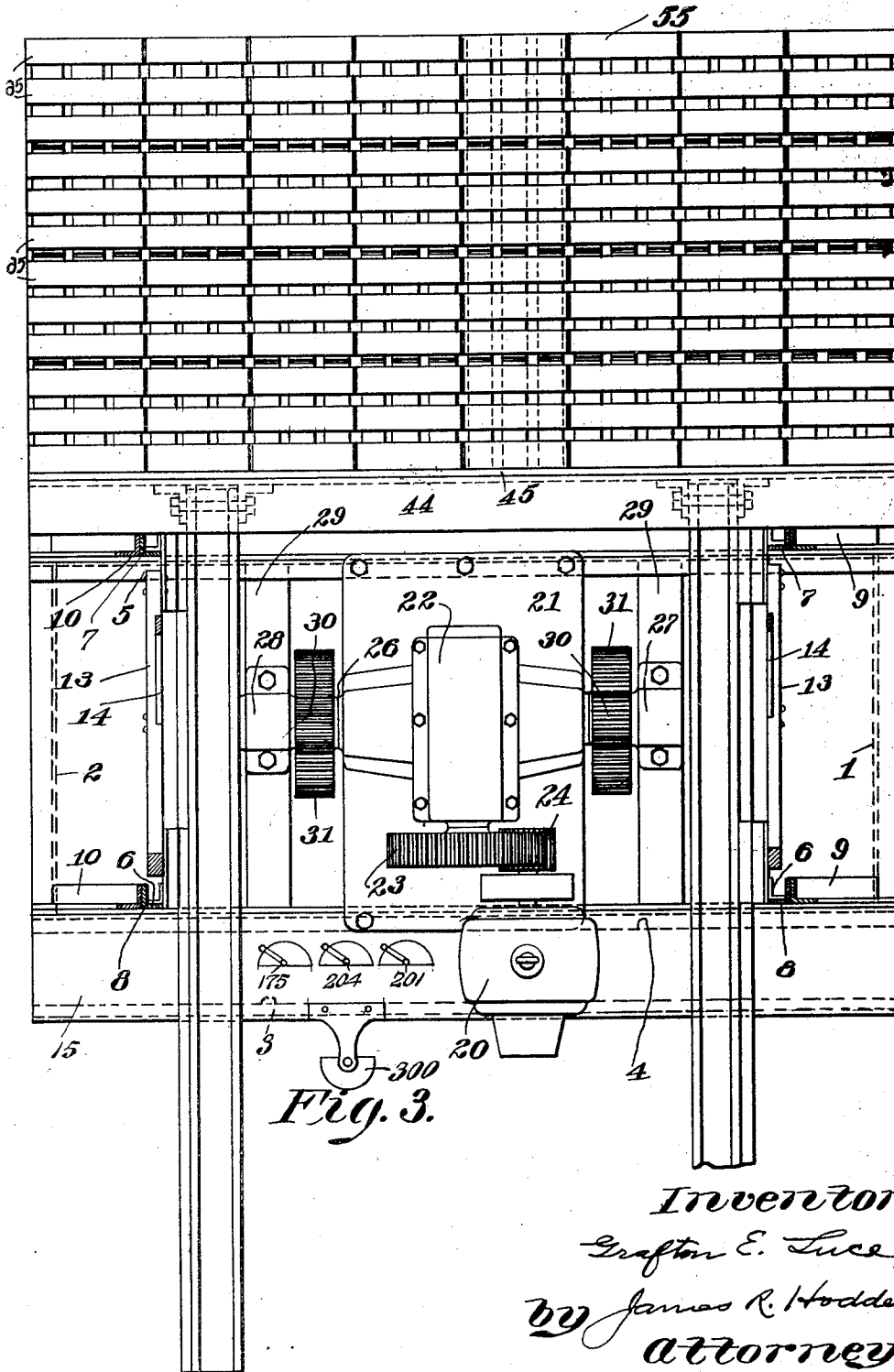
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7 SHEETS—SHEET 2.



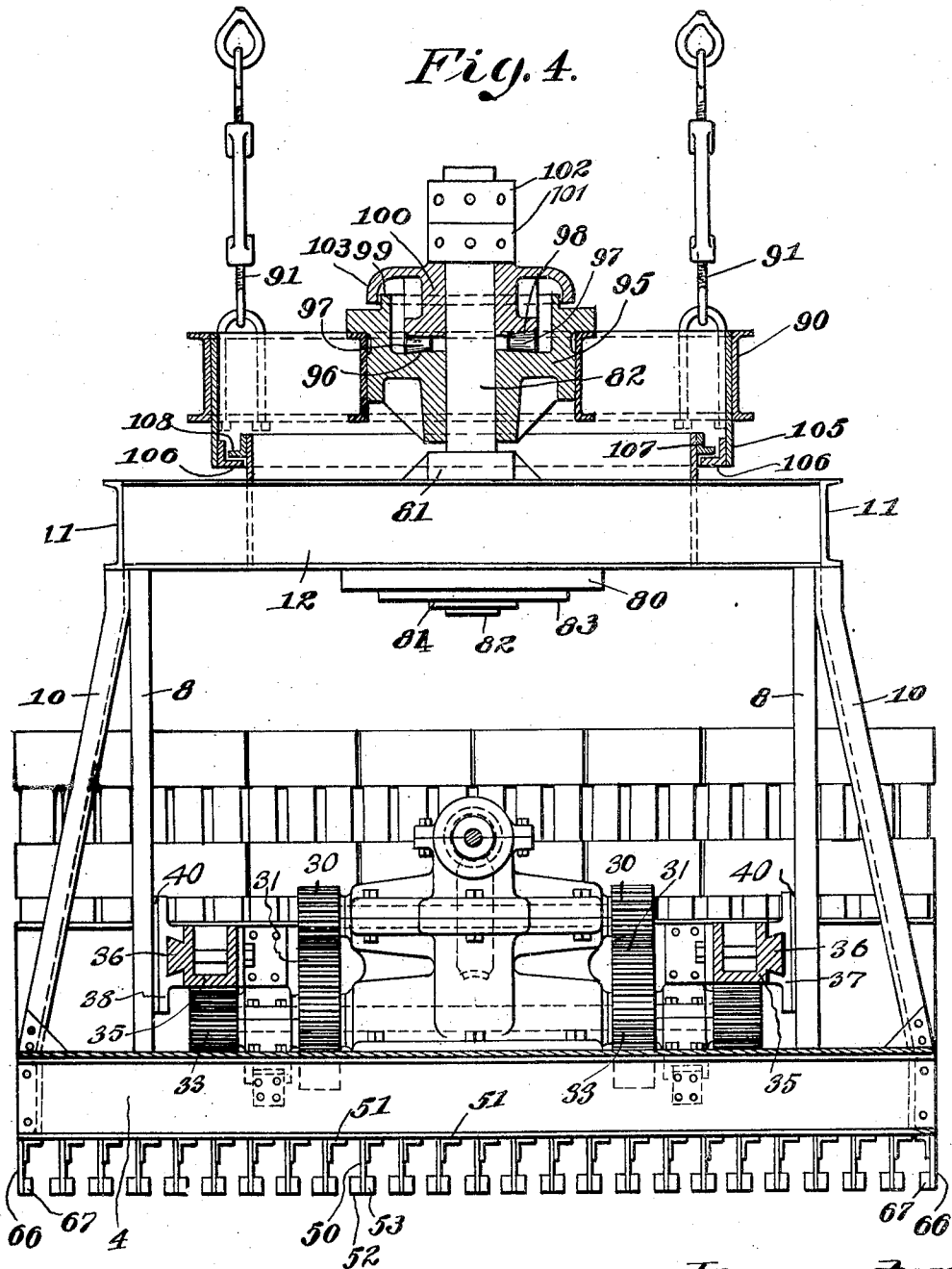
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7 SHEETS—SHEET 3.

Fig. 4.



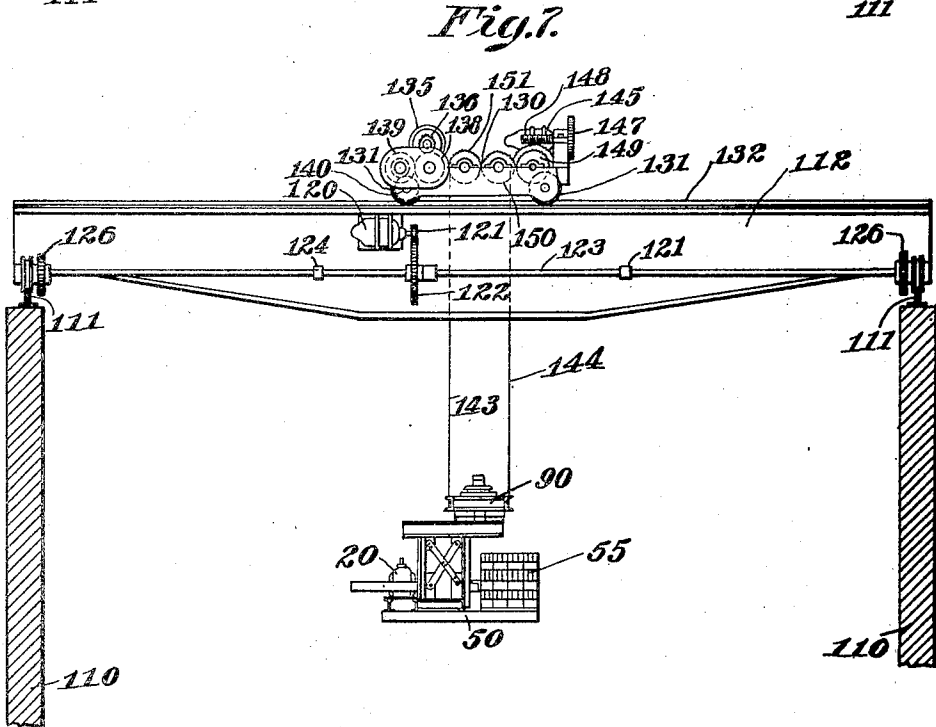
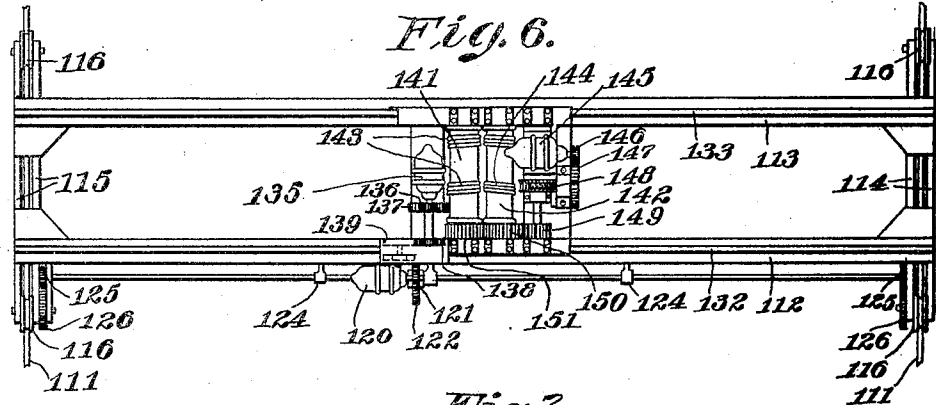
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7 SHEETS—SHEET 4.

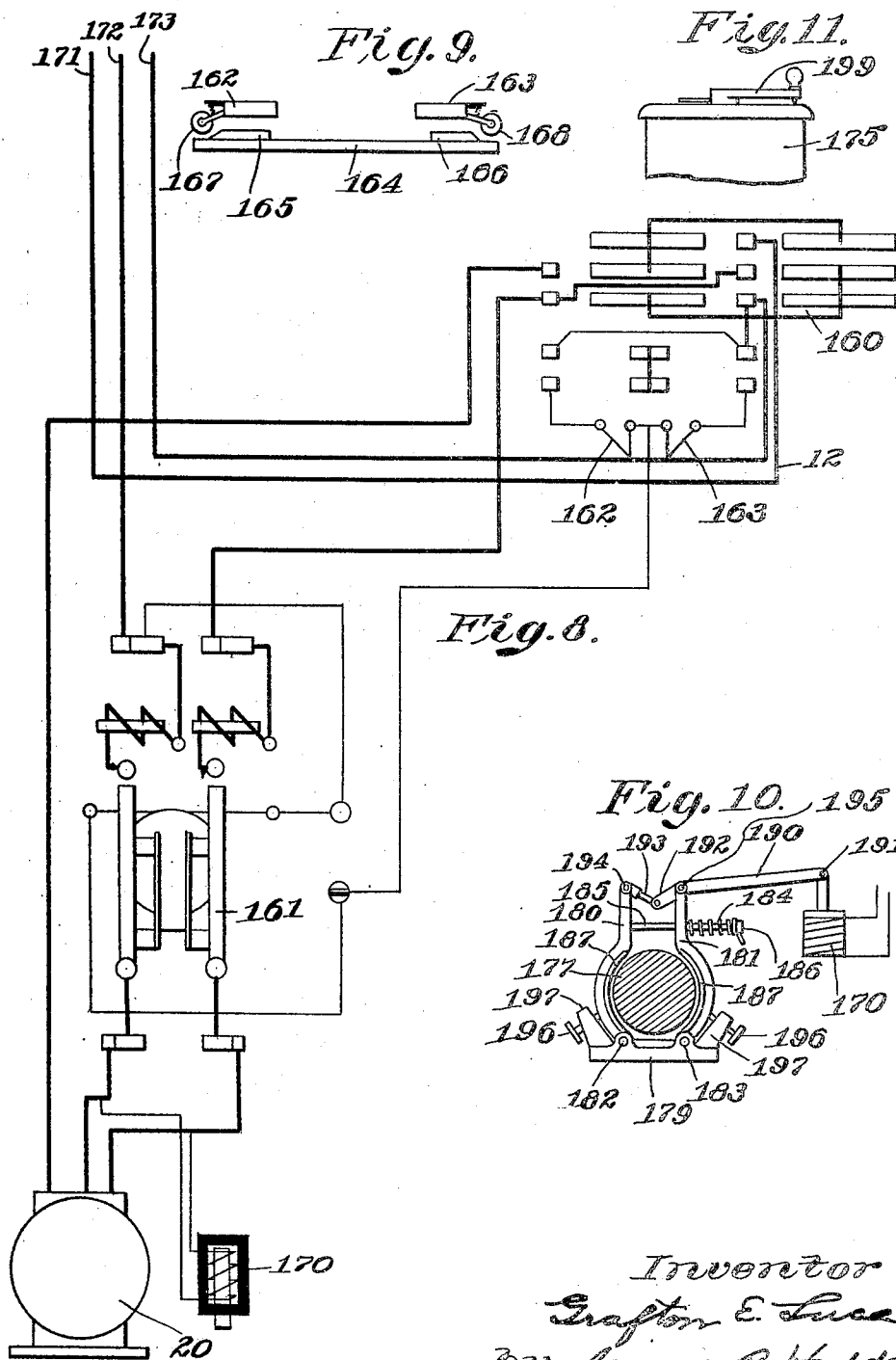


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7 SHEETS—SHEET 5.



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Patented Mar. 30, 1920.
 7 SHEETS—SHEET 6.

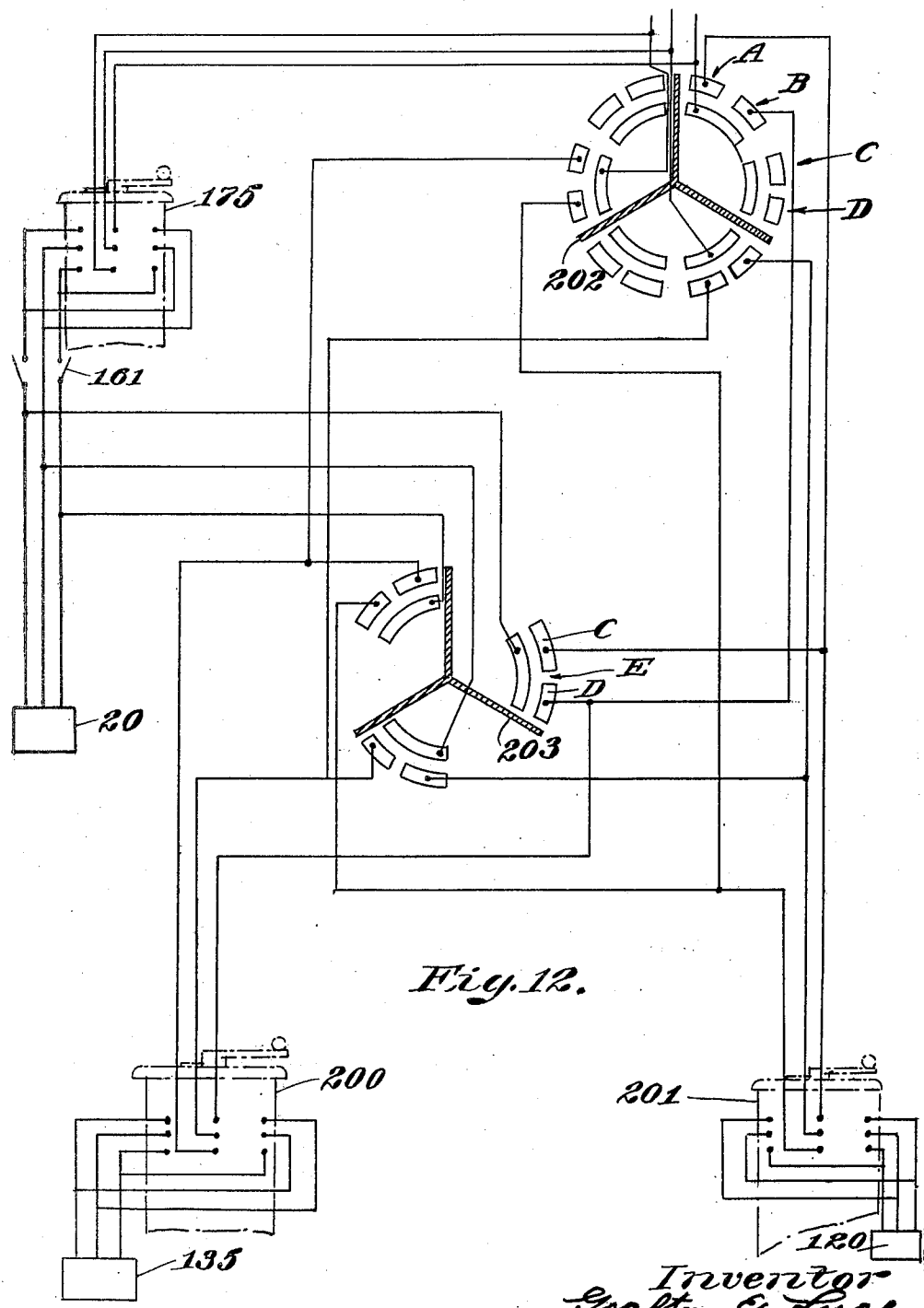


Fig. 12.

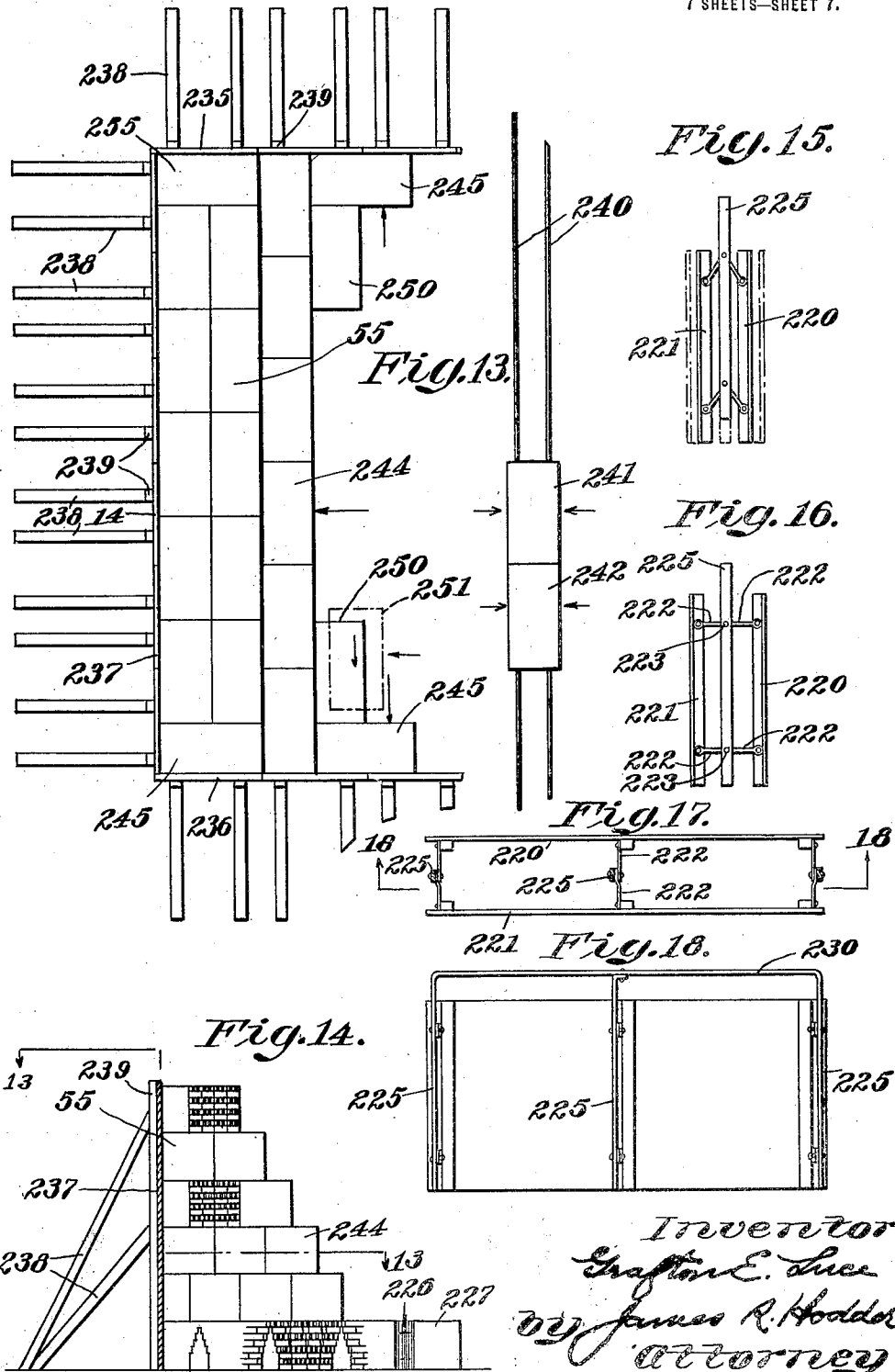
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1,335,344.

Patented Mar. 30, 1920.

7 SHEETS—SHEET 7.



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UNITED STATES PATENT OFFICE.

GRAFTON E. LUCE, OF CHICAGO, ILLINOIS.

BRICK HANDLING AND SETTING APPARATUS.

1,335,344.

Specification of Letters Patent. Patented Mar. 30, 1920.

Application filed November 15, 1918. Serial No. 262,664.

To all whom it may concern:

Be it known that I, GRAFTON E. LUCE, a citizen of the United States, and a resident of Chicago, Illinois, whose post-office address is 140 North Pine avenue, Chicago, Illinois, have invented an Improvement in Brick Handling and Setting Apparatus, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My present invention is an improved machine for handling brick, green, dry, or burnt brick, particularly in a pile or unit stacked relation, and the object of the invention is to improve and perfect apparatus for this purpose.

In prior brick handling apparatus, wherein a machine having brick lifting devices and a "push out" for unloading or setting, operating by ejecting the brick load or unit stack from the carrying portion, the action of the "push out" forcing the stack of brick from the carrying portion by sliding it off the brick engaging fingers, not only marred and damaged the bricks that came in contact with the lifting fingers, but also distorted the entire stack formation, often causing the bricks or some of them to actually fall when unloading or at least disarranging the spaced relation of the brick. Furthermore, a serious difficulty with such apparatus, in practice, was and is that a wall, form, or equivalent fixed resistant surface, has first to be prepared, and against this surface or resistance the stack of brick, to be unloaded, must be forced in order to allow the "push out" to back-off the apparatus and brick engaging devices or fingers during unloading. An additional objection and difficulty experienced was that the entire apparatus, suspended by a traveling crane, depended upon the "push out" to back out from the stack, both the crane and the brick carrying apparatus, thus still further tending to distort the stacked relation of the brick unit with the carrying fingers by swinging them in a circle, proportionate to the difference in speed between the crane and setting apparatus. Such swinging of the apparatus inclined the same so as to engage the forward or outer ends of the fingers on the previously set brick thus destroying the free movement of the machine and shifting the center of gravity of the entire machine and stack, throwing

it out of alinement and frequently causing the brick to fall or become distorted, requiring resetting by hand.

In my present improved apparatus, I have provided means to overcome, eliminate, and obviate the difficulties above briefly outlined and to add still further improvements so that a practical brick handling and setting apparatus of this type can be economically built and successfully used. To this end I provide an apparatus utilizing a turn table support carried by a movable crane, together with means to simultaneously actuate the travel of the crane with the same speed and travel as the "push out" devices during unloading and loading without relying upon the thrust of the "push out" to move both the brick setting apparatus and its supporting crane. Furthermore by employing the turn table, I provide automatic means to take care of and compensate for torsional or other distorting strains on the apparatus, also the turn table provides means whereby I can set these brick lengthwise or crosswise of the kiln or in any other angular position, as required, while maintaining the setting apparatus level. The prior apparatus, already referred to, was and is limited to a direct forward and backward travel with relation to the kiln or walls, whereas it is most desirable and necessary to set brick in a kiln, when building up the kiln with unit stacks, to set them at right angles or staggered positions, not only for bonding the kiln but for giving the kiln the proper shape. I therefore wish to claim the combination, in a brick setter of this type employing a "push out," with a turn table or equivalent support.

A most important and distinctly novel feature in my present improved machine consists in the provision of automatic controlling devices for the movement of the "push out" in unloading the machine as well as for controlling the travel of the supporting means *i. e.* the crane and the carriage thereon, while loading or unloading, and as such automatic control is most important in practice, I wish to claim the same broadly. In this feature of the automatic control, preferably by electrical means, I believe that I have so improved and developed this type of brick handling apparatus as to make the same commercially successful. Accordingly I provide a motor to move the "push out" forwardly and backwardly

with automatic "limit switches" to stop the motor and apply a brake thereto, thus exactly determining the forward or backward limit of movement of the "push out." Furthermore in combination with this automatic control of the "push out," I provide means to simultaneously and automatically control the motor, either on the crane or on the carriage moving transversely on the crane, which will operate the travel of the support for the brick setting apparatus in direction of movement with the "push out" on the setting apparatus itself. By having these motors on the crane and on the carriage timed and controlled with the timing and controlling of the "push out," during both loading and unloading as above explained, I am enabled to have the brick lifting fingers operate substantially in horizontal plane and eliminate danger of swinging or inclining the same, particularly during unloading, which would upset the spaced relation of the brick and even cause the same to tumble down. An important advantage of my arrangement, whereby the uniform movement of travel of the brick lifting apparatus and its support, enables the brick lifting fingers to be positioned closely adjacent the ground or previously set brick, but without touching them, allowing freedom of movement of the apparatus in unloading. Because the brick fingers are thus maintained in a horizontal plane, all danger of distorting the lower brick on which a load is to be set, is eliminated, such difficulty being found in the setters in common use. In addition to this automatic control of the motors for both crane and carriage, I provide an independent controlling operation for the same, so that the crane and carriage may be moved at any desired speed and without any relation to the "push out." Also a usual or suitable motor on the carriage to operate the drums, carrying flexible cables, which support the turn table and lifting apparatus thereto, may be of usual construction and this motor operated from the same controlling station. Therefore I thus provide means under the control of the operator to move the entire crane and its carriage into position to pick up the load, then raising the apparatus with its load of brick and thereupon operating the motor to move the crane forwardly or carriage laterally to position its load of brick in a kiln at desired height, stopping the same in desired location, permitting the load to be swung on its turn table, this operation being preferably by hand, and then operating the motor to move the "push out" and simultaneously operating the motor for backing out the crane or the carriage at a speed uniform with the backing out action of the "push out." By employing proper motors and suitable automatic controls therefor, I can load and un-

load the setters with great speed and accuracy and from a central controlling station.

In my present improved apparatus, I have formed the brick lifting fingers with removable flanges or side members on which the bottom row of bricks in the pile or stack would rest. This enables me to build a strong and economical construction of lifting fingers within the proper limit spaced relation of the unit stack and also obviates the difficulties of the ordinary T sections wherein the flange and vertical web are united or joined in the corners with a rounded fillet. Such curved section would, of course, damage and mar the right angled corners of the brick supported thereby. I form the T with its vertical web and brick supporting sections, removably attached thereto, and having well defined right angled corners. This allows an equal bearing on the bottom of the brick, whereas a curved fillet in the corner of the T does not give a uniform bearing. Furthermore by having the flanges, thus removable, I am enabled to use my apparatus to unload burnt brick from a kiln and lift out units and transfer same to wagons or cars by simply removing the flange portions of the fingers and then sliding the fingers in spaces between the brick which will thus enable the apparatus to pick up all the brick above the top of the fingers.

Still further novel features in my present invention consist in means to facilitate the forward and backward movement of the "push out," by supporting the same at predetermined points, thus eliminating distortion of the fingers or changing the gravity centers, simplifying the power required and enabling the "push out" to work uniformly across the entire width of the apparatus, holding the same in alinement and at right angles with the unit stack during the entire time of travel of the "push out" and consequently during unloading of the stack of brick.

In the operation of my improved brick setting apparatus, particularly when employed in setting brick in a kiln, I have devised a novel means whereby my brick setter can be employed to set the benches between the arches. It will be appreciated that in kiln construction it is necessary to have a plurality of firing arches or combustion chambers widthwise of the kiln. In accordance with my present invention, I am enabled to use my improved setting apparatus for setting these benches between the arches, employing a suitable and preferably a novel type of form therefor. This feature is of particular importance in practice and I therefore wish to claim the same broadly. These forms also are of use in alining the entire kiln, outside and corners, particularly

where a field kiln is being built, the sides of which must be scoved for burning, as will be more fully described.

The operation of setting the lower course 5 or the benches between the arches throughout the kiln, which formerly had to be set by hand, is exceedingly important. My present invention will successfully perform the above described operation, and in connection therewith I employ a suitable and 10 novel type of removable and collapsible form of suitable width, height and length to define the proper opening for the arches of a kiln, and which may be used repeatedly. 15 While in temporary position in a kiln, and cooperating with the unloading device, such form acts as a resistant wall against which the unloading device forces the pile of bricks to be unloaded.

20 Additional important features, novel constructions and advantages will be hereinafter more fully pointed out and claimed.

Referring to the drawings illustrating a preferred embodiment of the invention—

25 Figure 1 is a side elevation, partly in cross section, showing the setting apparatus and a load of brick thereon;

Fig. 2 is a fragmentary cross sectional view on the line 2—2 of Fig. 1;

30 Fig. 3 is a plan view of the apparatus with the upper support and turn table removed;

Fig. 4 is a rear view of the setting apparatus showing the turn table supporting 35 construction partly in cross section;

Fig. 5 is an enlarged detail, in cross section, illustrating the lifting fingers and the detachable flanges thereon;

40 Figs. 6 and 7 are plan and side views respectively, of the traveling crane and supporting carriage movable transversely of the crane by which the setting apparatus is moved;

45 Figs. 8, 9, 10, and 11 are plan and detail views respectively of the wiring control, tripping device, brake and control for operating the motor on the push out;

Fig. 12 illustrates the wiring control for connecting the push out motors with a crane and carriage motors so that the same may be 50 operated in desired combination interchangeably or independently.

Fig. 13 is a diagrammatic plan view of the preferred manner of building a kiln on 55 the line 13—13 of Fig. 14, Fig. 14 being a cross sectional view on the line 14—14 of Fig. 13; and

60 Figs. 15, 16, 17, and 18 are enlarged detail views illustrating the collapsible form employed for use in setting the lowermost benches when building a kiln, to provide spaces for the arches.

The setting apparatus will be first described, as shown in Figs. 1, 2, 3, 4, and 5.

65 The present setting apparatus is preferably

designed as a brick handling and carrying device with a power plant on one portion, brick carrying fingers adjacent thereto as the brick carrying portion, and a support in 70 balanced relation substantially centrally of the entire apparatus and so arranged and constructed as to maintain the center of gravity of the apparatus within the supporting devices whether the brick carrying 75 fingers or portion are loaded to any extent or entirely free of a load. To this end, also, I prefer to construct the entire brick handling apparatus as an open framework.

As shown in the drawings, the setting apparatus is built upon a framework, preferably of I beams, channel beams, or the 80 like, consisting in the side frames 1 and 2, cross beams 3, 4, and 5, securely bolted together at the respective junctions of each, by suitable angle irons, as clearly shown at 85 6, Fig. 3. This gives a strong bottom framework and to the corners are secured uprights of angle irons or the like—7, 7 and 8, 8. Side braces 9, 9 and 10, 10 respectively, rigidly uniting the base framework with 90 the upper supporting beams 11, 11 and 12, 12 constituting an upper framework; cross straps 13 and 14 are also provided to still further afford strength to the structure.

On the cross beams 3 and 4 at the rear of 95 the machine is a plate 15 on which a motor 20 is mounted. On the base frame, already described, is a plate 21 carrying reduction gearing within a casing 22 connected with the motor 20 by a gear 23 and the pinion 24 100 turned by the shaft of the motor 20. The reduction gearing within the casing operates through a worm in mesh with a gear 25 (shown in dotted lines, Fig. 1) to turn the shaft 26 extending transversely thereof, 105 said shaft having suitable end bearings 27 and 28 on cross braces 29, 29 and carrying toothed gears 30, 30 adapted to mesh with gear wheels 31, 31 mounted on axle 32 at each side of the base, which axle carries 110 pinions 33, 33 in mesh with the teeth 34 of a rack bar 35, also at each side of the base. Each rack bar, preferably has a dovetailed rib 36 adapted to slide within fixed guide ways 37 and 38, affixed to plates 39 and 115 40, secured to the uprights and cross straps. At the forward end from the upright, viewing Fig. 1, these rack bars are securely bolted to a cross beam 44, carrying a push bar or plate 45. This push bar extends width- 120 wise of the entire apparatus and also extends downwardly below the level of the base frames and is provided with a series of slots 46, 46 adapted to fit over the vertical webs 50 of the brick engaging fingers (see 125 Fig. 2). These fingers 50 extend underneath the base frame, being united thereto by angle irons 51, 51 and project forwardly or to the right, viewing Fig. 1, and constitute the brick engaging portion of the 130

apparatus on which a load or stack of brick, indicated generally at 55 rests. Secured to the bottom of each of the web portions 50 of these fingers are flanges 52 and 53, on each side, united by headed bolts 54, 54, at a plurality of points lengthwise of the fingers 50 where the same project beyond or to the right of the base frame and angle irons 51. These detachable flange members 52 and 53 are adapted to support and carry beneath the bottom or foundation row of the stack, the webs 50 being spaced from each other a suitable distance to carry the bricks 60 (see Fig. 2) between which a series or set of brick engaging fingers 50 may be of suitable length and of appropriate total width to carry such unit stack or pile of brick, as may be desired, for any particular work. As herein shown, the fingers are of sufficient length, in front of the push bar 45, as the latter is retracted, as shown in Fig. 1, to carry a pile of 4 brick widthwise or end to end, as illustrated in Fig. 1 by the rows 62, 63, and 64 and 8-brick lengthwise as clearly shown in Fig. 3 by the rows 65, 65. The push bar 45 thus extends downwardly between each of the vertical webs 50 and in position to engage the endmost brick in the bottom rows 61. At the outermost side of the apparatus and of the brick carrying fingers is arranged a plate 66 with a single flange 67 secured thereon, this constituting the outer boundary of the brick lifting fingers.

In order to support the push out 45 and properly carry the weight of the rack bars thereof, as the same are moved forwardly during the unloading operation and also to enable the entire movable push bar mechanism to operate uniformly and apply its pressure with substantially equal force throughout the extent of the brick stack 55, I mount a plurality of adjustable supporting wheels, secured immediately back of the push bar 45 and adapted to roll upon predetermined fingers 50. A plurality of such roller supports are arranged and I may desire to form the fingers, on which they roll, of slightly greater height and therefore of increased strength, as indicated at 68, 68, Figs. 1 and 2. Each support comprises a roller 70 having its axles 71, 71 sliding vertically in a slot 72 through brackets 73 on either side of the roller and bolted to the rear of the push bar 45 adjacent the lower portion. These wheels are flanged and therefore automatically tend to guide and hold the push bar in right angled alignment during its travel. I prefer to make these supports adjustable and to this end I mount each roller in a yoke 75, so that the same slides within the side bracket 73, the axle 71 passing through said yoke to engage the slot 72. To this yoke I secure a stem 76 which extends upwardly through a

second bracket 77, a pair of lock nuts 78 and 79 threaded onto the upper end of each stem 76, which serves to adjust the roller vertically. In the construction thus far described, it will be seen that the brick handling apparatus comprises two fixed portions, the base frame carrying the motor or power plant and extending therefrom and affixed thereto are the brick engaging fingers constituting the brick carrying portion for the load 55. To discharge this load of brick is provided the movable push bar secured to the end of the rack bars 36 and with its forward portion supported upon the rollers 70, so that, upon operation of the motor 20, the rack bars and push bar will be moved forwardly, removing the load of brick 55 pushing the same off the lifting fingers and the flanges 52 and 53 on each; or pushing the entire apparatus rearwardly thus withdrawing the lifting fingers from under the stack of brick. Preferably the latter is the preferred method of operation and to this end it is necessary to have some resistant surface, wall, or form, or the like against which the stack may be first positioned before the apparatus is backed off and the pile of brick unloaded. When merely a push-off of the load of brick onto a support or the like, was relied upon to thus furnish suitable resistance for the backing off of the apparatus, but in practice this method of operation was found to be impossible and as a part of my invention, I have devised an appropriate and suitable resistance form of frame against which such a load may be alined and the brick carrying device backed off therefrom. This is particularly important in setting the lowermost benches in a kiln as the same must be accurately spaced from each other to provide for the arches, as already mentioned.

The brick setting apparatus as thus far described, can be handled by a crane or other support, but I prefer to employ a rotatable support which will not only permit the entire apparatus either while loading or while being unloaded, to be supported in balanced relation, but will also have suitable broad bearings to maintain the apparatus substantially level and therefore to have the center of gravity of both the power carrying portion and the brick carrying portion within the said bearings, under varying loads or when entirely free of brick. I accordingly supply a suitable overhead turn table support in balanced relation, both to the power carrying portion and to the brick carrying portion. The upper framework including the side bars 11, is extended forwardly partially overhanging the brick setting fingers and to this upper part of the frame is secured a plate 80, and hub 81 through which a central shaft 82 passes, having secured thereto, at its lowermost end portion, a bear-

ing plate 83 held in position by a nut 84 threaded onto the shaft 82. The entire brick setting apparatus is suspended by this central and rotatable shaft 82 from an upper framework 90, which in turn is supported by a plurality, preferably four, chains, ropes, or other supporting cables, as indicated at 91, 91, providing adjustment through the I bolts and turn buckles of usual construction. This upper frame 90 has a heavy central casting 95, formed to receive the shaft 82 and having a raceway 96 adapted to receive a series of roller bearings 97 between said raceway and a corresponding raceway 98 on the upper casting 100, also formed to receive the shaft 82 and on which the weight of the brick setting apparatus and shaft 82 is supported through a pair of lock nuts 101 and 102 threaded thereon, as clearly shown in Fig. 4. I also form the casting 100 with a peripheral flange 103 adapted to overlap and protect this bearing and the rollers, therein, the lower casting 95 having a corresponding up-standing flange 99.

In many States it is desirable to have a safety catch or element of security in the operation of devices such as the brick setting apparatus herein shown and for this purpose, I provide a circular plate 105 depending from the turn table supporting framework 90 and having an angle iron 106 secured around its lower portion to provide a bearing or flange. Adjacent thereto and of slightly less diameter is a circular plate 107 secured to the top frame of the setting apparatus and with a projecting flange consisting in the angle iron 108 overlapping the lower angle iron 106. This construction permits a free rotation of the brick setting apparatus on the supporting shaft 82 while providing a safety catch, in case the shaft 82 or any of its retaining portions should break with undue weight thus eliminating any complex or expensive additions. It will thus be seen that the brick setting apparatus is rotatably supported in balanced relation and is yet capable of easily being turned by hand to set and unload brick in building up a kiln, with one load at right angles to another or otherwise.

As illustrated in Figs. 6 and 7, I show a traveling crane adapted for traveling lengthwise of a kiln and a carriage mounted for movement transversely of the same to which carriage the brick setting apparatus is suspended by flexible cables, being wound on drums mounted on the carriage. This traveling crane is of usual construction and mounted upon side walls or supports 110, 110, carrying tracks 111, 111. This crane comprises beams 112 and 113 united at each end by braces 114 and 115, which braces have suitable journal bearings for wheels 116, 116, 116, 116. In order to supply motive

power for the traveling crane, any suitable mechanism and arrangement may be installed, but I prefer to utilize a motor 120 having its pinion 121 in mesh with a gear 122, keyed on a shaft 123 extending through suitable bearings 124, 124, and having on its opposite ends, gears 125 and 125 in mesh with gear wheels 126, 126, which in turn are keyed to the axles of the adjacent wheels 116, 116, whereby rotation of the motor 120 will operate through the gearing, to turn the wheels 116 and thus move the entire crane on the tracks 111.

The carriage which I have designated at 130 is movable transversely of the crane, sets of wheels 131, 131 on said carriage being arranged to traverse tracks 132 and 133 mounted on top of the beams 112 and 113 respectively. To move this carriage, a motor 135 is employed, which motor is mounted upon the carriage and has a pinion 136 on its shaft, said shaft having a gear 137 in mesh with a gear 138 on the said carriage, which engages a gear 139 which in turn rotates the shaft 140 of a pair of the wheels 131 adjacent to the motor, in order to move said carriage on the tracks on top of the crane transversely thereof. A pair of winding drums 141 and 142 are mounted on the carriage to which two pairs of flexible cables, 143, 143, and 144, 144 are wound respectively, said cables extending downwardly to engage the upper framework 90, carrying the turn table, and in turn supporting the setting apparatus, as already described, said cables being adjustably secured to said framework through the I-bolts and turn buckles, as indicated at 91, 91. These drums are rotated in suitable directions to simultaneously wind up the cables, for raising the setting apparatus, or for unwinding said cables to lower the apparatus, by a motor 145 operating gears 146, 147, a worm 148 and gears 149, 150, and 151 to turn the drums.

The operation of the traveling crane and its carriage will be readily understood on reference to the drawings. The crane is movable transversely of the kiln to approximate position for picking up a load of brick and the carriage 130 is movable transversely of the crane into desired position while the setting apparatus is lowered for loading, the setter being rotated on its turn table and the carriage then moved so that the lifting fingers will engage a load of brick, which has been run into the kiln on cars, thereupon the setting apparatus is hoisted a proper distance and the train and carriage moved for setting the load of brick in the kiln at any desired point and height, the setting apparatus being rotated on its turn table to unload the unit stack of brick, indicated generally at 55, in position, at right angles with and in alinement with the face of the kiln at which said unit stack of brick is

to be unloaded. When this is accurately positioned or "spotted," the motor 20 on the setting apparatus and either the motor 135

to move the carriage or the motor 120 to move the traveling crane—depending upon whether the setting apparatus is to be backed off in alinement with the crane movement or in the line of travel of the carriage,—is connected to operate in unison with the motor 20 on the setting apparatus. Thereupon the controller is moved into position to operate the motors in predetermined timed relation so that both the backing off movement of the setting device, as the unit stack 55 is unloaded, and the setting fingers 50 are withdrawn, the support for the setting device, *i. e.* the frame 90 and the carriage 130 are moved rearwardly at the same speed, either by the travel of said carriage on the crane or by the travel of the crane itself. The control of the travel of the support for the setting device simultaneously and in unison with the travel of the push out on the setting device, is most important in operating an apparatus of this type, particularly when the upper tiers or courses of a kiln are being set, since the length of the cables is extremely short and the danger of swinging the setting apparatus during unloading with relation to its overhead supports is accentuated. The simultaneous movement and control of both overhead support and push out, as above described, eliminates all such danger of thus swinging the setting fingers, distorting the spaced relation of the unit stack of brick 55 scraping across the top row of the previously set brick and even upsetting and tumbling of the brick being unloaded.

The important feature of controlling the extent of travel of the push out when backed off the apparatus during unloading, as well as when retracting the push out, replacing it to normal position so as to permit the fingers 50 to be slid off or moved under the stack of brick to be lifted, will now be described.

In my prior application, Serial No. 259,770, filed October 26, 1918, I have illustrated a suitable method of controlling the motor and limiting the movement of the reciprocating frame carrying the fingers and in the present application, I utilize a somewhat similar method of controlling the push out. I have elected to claim in this application, broadly, the combination of such controlling device for limiting the movement of a motor on a brick setting apparatus. In the present application also, I have shown, illustrated, and have elected to claim herein the means of controlling the travel of the overhead support, by controlling the motor either of the crane or of the carriage in the direction required, in timed relation with the backing off of the motor in the setting

apparatus, either for operating the motor on the setting apparatus for loading or unloading.

Referring to Fig. 8, I have illustrated in preferred form, a suitable electrical controlling mechanism whereby the motor on the setting device, operating the push out, is actuated to move the push out and automatically disconnect it at the desired limit of movement of the push out and simultaneously a brake is applied, stopping the rotation of the motor and the travel of the push out. This operation of the motor and push out on the setting device is arranged for independent actuation, when desired, as well as in conjunction with the motors, respectively, on the carriage and the crane, when desired, as will be explained.

Referring to Fig. 8, the motor 20 on the setting apparatus is here shown in diagrammatic form and the electrically controlling apparatus comprises the full reverse drum master switch or controller 160, a 2-pole magnetic contactor or switch 161, two limit switches 162 and 163, a tripping mechanism 164 (see Fig. 9) having beveled contact faces 165 and 166 to contact with the tripping wheels 167 and 168 of the limit switches 162 and 163 respectively, together with a solenoid brake 170, illustrated in enlarged cross section detail in Fig. 10. The incoming power is taken into the master switch 160 through the wires 171, 172, and 173 and connections through the proper terminals. This master switch or controller 160 functions to control the flow of current to and to change the direction of rotation of the motor 20 and to complete the circuit to the coil of the magnetic switch 161 after power has been applied through the controller 160, which is mounted in the controller casing 175. The magnetic switch is connected in the power line between the master switch 160 and the motor. The limit switches 162 and 163 are connected in the coil circuit of the magnetic switch. These limit switches are mounted at a convenient place on the setting apparatus adjacent one of the rackbars 35 which reciprocates to move the push out forwardly when unloading and to retract the same when loading. The tripping device 164 is mounted on the rackbar so as to contact with the tripping wheels 167 at the limit of one direction of movement and with the tripping wheel 168 at the direction of the other limit of movement. It will be appreciated that this arrangement could be reversed if desired and the tripping device 164 could be mounted on the fixed part of the framework and the limit switches on the reciprocating rackbar or other movable part, if desired. The solenoid 170 operates the brake mechanism, as illustrated in Fig. 10, and a drum 177 secured to the shaft of the motor 20 has a pair of brake arms 180

and 181 pivoted at 182 and 183 respectively to a base plate 179, the said brake arms being normally held together by a coiled spring 184 encircling the rod 185 and bearing between an adjustable nut 186 and the brake arm 181, said rod 185 being threaded into a correspondingly tapped recess in the other arm 180. Friction members 187, 187 on the inner surface of the arms 180 and 181 may be provided. A toggle actuated by the solenoid 170 to separate the brake arms against the tension of the coiled spring 184 when the current is supplied through the electric device, just described, consists in a lever 190, having its outer end pivotally secured at 191 to the movable part of a core operated by the solenoid and the inner end of said arm is pivoted at 192 to a second toggle arm 193 which latter is secured to the brake arm 180 at 194, the long lever 190 being pivoted at 195 to the brake arm 181. Demagnetization of the solenoid 170 releases this toggle mechanism and allows the spring 184 to instantly close the brake arms about the brake wheel 177 and stop the motor and consequently stopping travel of the rack-bars and push out. Adjustable stops 196, 196 threaded through lugs 197, 197, serve to limit the outward movement of the brake arms, as shown. The operation of the apparatus just described will be readily understood on reference to the drawings. The attendant will throw the controller handle 199 of the controller 175 in the direction required to produce the desired rotation of the motor for operating the push outs either forwardly or rearwardly. Immediately the magnetic switch 161 will close, thereby completing the circuit of the motor. The motor 20 will then start up and run at its predetermined speed, moving the push out through the engagement of the train of gears with the rack-bars 35, as already described, until the controller is either turned off, or until the automatic limit switches are actuated to break the circuit, deenergizing the motor and the solenoid and thereupon the brake mechanism sets and the motor, rackbars and push out stop. Considering that the above description applies to the "forward" direction of operation, *i. e.* during the unloading of the apparatus and the backing off the same from the unit stack of brick, the same operation would result when the controller is thrown to the reverse direction, namely, the motor and solenoid brake would be energized to release the same, the contactor would close, the motor would run at full speed until it was stopped by the limit switches tripping at the end of travel or by being stopped through the throwing of the controlling handle, into "off position". In order to have the travel of the over head supporting device, *viz.* the carriage 130 or the crane, move simultaneously and in timed

relation with the operation of the push out on the setting apparatus, during the backing off or unloading operation, as well as positioning the apparatus for loading, the motors 20 on the setting device, 135 on the carriage, and 120 on the crane, are connected for control at a single point and for uniform or desired speed of operation.

Referring to Fig. 12, I have illustrated a suitable control for these three motors to operate the carriage, crane, and push out in synchronism as well as independently of each other. This mechanism includes a controller 175 for the motor 20, a controller 200 for the motor 135, and a controller 201 for the motor 120. A transfer switch having a 3-arm connecting member 202 and under the same a similar 3-arm member 203, are arranged to be electrically interlocked with the controllers 175, 200, and 201 and with the magnetic solenoid 170. The operation of the solenoid 170 and the limit switches, has already been described. The controllers for the motors 135 and 120 are preferably of the starting and speed regulating type, the resistant material being designed in accordance with standard practice for giving reasonably close speed regulation for ordinary conditions of load. In addition, an extra amount will be furnished and arranged in two or three steps as required and adjusted to give the speeds required when either one is operated in conjunction with the motor 20. The transfer switch, of the 3-arm type, as mentioned and shown, has four operating positions; movement of the 3-arm switch 202 to position A permits operating of motor 120 through its controller 201 at any desired speed independently of any other motor. Position B permits operation of motor 135 at any desired speed through its controller 200 independently of the other motors. When the transfer switch is in the position C the controllers for the setter motor 20 and the crane motor 120 are united. That is, the operation of the controller 201 is made subject to, or depends upon, the operation of the controller 175 for the setter motor. In order to operate these two motors simultaneously the workman first sets the transfer switch 203 in the position C, as just described, and he then sets the handle of the controller 201 properly for the direction of rotation in which he desires the motor 120 to run and for the speed at which he desires to have this motor operate. When he turns the handle of the controller 175 to start the motor 20, he will switch current on to the motor 120 and start it simultaneously with the starting of the motor 20. When he desires to stop the motors he returns the handle of the controller 175 to its neutral position again. Since the connection controlled by the switch 203 are tapped into the line leading

to the motor 20 at a point behind the switch 161, the control of both motors is made subject to the limit switches 162 and 163 so that the operation of either of these switches will stop both the motors 20 and 120. Position D of the transfer switch connects the controllers 175 and 200 and enables the workman to operate the motors 20 and 135 in unison in the same manner that the motors 20 and 120 are operated together as just described. The controllers are shown only diagrammatically and no attempt has been made to show the connections to the speed regulating resistances, since these connections are well understood by those skilled in this art and an attempt to illustrate them would merely be confusing.

These controllers 175, 200 and 201 are located on the plate 15, within convenient reach of the operator, who may sit on the seat 300 attached to the plate 15, as shown in Fig. 3.

The wiring diagram and apparatus, illustrated in Figs. 8 and 12, together with the descriptions above is suitable for illustrating the functions for A. C. motors or D. C. motors. The type of motor, especially referred to in the drawings, are 3-phase A. C. motors. For 2-phase, 4-wire, an additional line wire would be involved.

Referring to Figs. 13, 14, 15, 16, 17, and 18, I have illustrated in plan and vertical views suitable forms as well as showing a partial kiln construction with the desired method of bonding the unit brick, for use in operating the setting apparatus employing a push out. As already explained, it is important and necessary to have the resistant surface, wall, form, or the like, against which the push out will operate to back off the setting apparatus during unloading. In order that the setting apparatus may be employed, also, in setting the brick for the lower benches, it is necessary and important to have a suitable form spacing these unit stacks to constitute the fire arches or combustion chambers and afterward to remove these forms. I have therefore devised a novel type of collapsible form so that the same could be used repeatedly, applied quickly in position and removed readily. These collapsible forms are of wood or metal and comprise a pair of sides 220 and 221 of suitable height for the arches to be built and of appropriate width for setting a unit stack of brick thereagainst. A plurality of toggle members 222, 222, 222, 222 are employed pivotally united at 223, 223 to a central operating rod 225. As shown in Fig. 16, the removable form is in position with the toggle members in alinement and extended. This form, in order to place the unit stack of brick to form the arches, is applied to the previously set brick, as indi-

cated at 226 in Fig. 14 and against this form the next bench or unit stack of brick 227 is positioned. Thereupon the rod 225 is operated to break the toggle joints, thus automatically drawing the sides 220 and 221 inwardly and facilitating to remove the entire form; thereafter the top of the arch may be built and completed by hand as usual. I desire to provide a plurality of operating rods 225 for each form and to actuate all of the same simultaneously. I unite them to a crossbar 230 so that an upward pull of the crossbar 230 simultaneously operates the rods 225 breaking the entire set or series of toggles throughout the width and height of the form, thus simultaneously collapsing it. Thereupon the form may be moved for use in setting the next adjacent unit row and so on, widthwise entirely across the kiln.

As shown in Figs. 13 and 14, it is also necessary to provide a suitable form for the sides 235 and 236 and the end 237 of the kiln in order to have resistant surface against which the machine may be backed off during unloading. Such sides may be of wood or metal, or particularly at the end of the kiln the same may be formed of temporary doors. Suitable braces 238, 238, and 239, 239 are also arranged in position and the various units of bricks, designated generally at 55, 55 are unloaded in bonded positions, as clearly illustrated in Figs. 13 and 14. It will be appreciated that I will follow out the usual practice in kiln building, of laying in a pair of tracks 240 on which cars 241 and 242, upon which brick may be piled in spaced relation which may be run into the kiln from the drier. The operator then operates the crane, traveling carriage 130 and hoisting mechanism to lower the setting apparatus and position it adjacent a load of brick on one of the cars, then moving the crane and apparatus so as to engage and lift the unit stack 55 of brick from the car. Thereupon the hoisting apparatus is raised sufficiently to clear the car and for the height of a course of brick unit stacks being built into a kiln in the various stepped relation of these units, as shown in Figs. 13 and 14. The motor on the crane and that on the carriage are independently operated to move and position the carriage, crane, and setting apparatus with the load of brick thereon, at substantially the position where the load 55 is to be unloaded or built into the kiln. Thereupon, if the unit stack is being unloaded, as for example, in the type of kiln indicated at 244, requiring the backing off movement of the crane in conjunction with the action of the push out, during unloading, the controller for operating the crane motor 120 and the push out motor 20 are connected for simultaneous actuation and proper speed relation, so that the apparatus

may be moved backwardly simultaneously with the movement and in the same direction with the travel of the push out and rackbar during unloading.

5 In case the load is to be in position, as for example, indicated at the several units 245, 245, *z. e.*, at right angles, with the line of travel of the crane, and in alinement with the line of travel of the carriage, then when
10 the setting apparatus with its load of brick is in position for unloading, the motor 20 and carriage operating motor 145 are connected and operated simultaneously and in proper speed relation during unloading. In
15 case it is desired to unload a unit stack of brick, as indicated at 250, moving the same angularly or cornerwise to secure proper pressure to set the unit stack snugly in the corner, the crane and carriage would be in
20 position to stop the load substantially as indicated in dotted lines at 251 and then the crane motor 120 and carriage motor 145 could be connected and operated simultaneously, until the unit stack of brick was accurately cornered, whereupon the motor 20 operating the push out would be connected
25 with the crane motor 120 and the carriage motor 145 would be disconnected, whereupon both the motors 20 and 120 would be
30 operated for backing out the crane and operating the push out for unloading.

The brick setting apparatus and the various capabilities for automatic control both disconnecting the travel of the push out and
35 rackbar on the setting apparatus and combining the motors for operating the crane and carriage with the push out motor, in proper speed and timed relation therewith, to move back the support of the brick setter
40 simultaneously with the backward movement of the push out, are thus arranged and are capable of a relatively high speed of operation and accuracy. The automatic means securing this result are an improved
45 part of my present invention and are intended to be covered broadly in certain of the appended claims. The important means for supporting the setting device in balanced relation and with a pivot or turn table adapted to hold the apparatus substantially level whether loaded or unloaded and
50 during the operation of the motor and push out, also is a feature of the present invention, while the provision of the forms to
55 provide, proper, suitable, and necessary resistant surfaces for the backing out of the apparatus, not only at the sides and ends of a kiln, but also when setting the lower benches, greatly enlarges the capability of
60 the field of usefulness of an apparatus of this type.

The importance of my arrangement of forms will be appreciated when it is realized that the prior setters of this type was

expected to operate by first pushing off a 65 few of the brick on the setter while the setting apparatus was stationary and then after a few brick had been pushed off, a sufficient resistance was thus produced to complete the unloading by backing out the ap- 70 paratus. Such operation necessarily destroyed the entire spaced relation of the unit stack and of course it was impossible to use such an apparatus in setting the lower benches of a kiln or the outside walls of a 75 scoved kiln; also the provision for supporting the push out during its travel forwardly and backwardly on the setting apparatus insures uniform pressure being applied widthwise of the stack, lessens the 80 power required, and enables increased speed of operation, and eliminates all torsional strain or cramping in the bearings of the rackbars when the push out is at the forward limit of movement. Furthermore, the 85 fact that this push out must be moved at substantially uniform speed and stopped at almost exactly the desired point when the lowermost bricks are raised from the lifting fingers, shows the importance of prop- 90 erly supporting and controlling the push out and also the necessity of the automatic limit switches or equivalent control. It will be seen that I have invented a practicable, commercial brick setting apparatus includ- 95 ing a self-contained power plant, which operates to unload the brick. Automatic controlling means are provided for the various elements of the apparatus, while the controlling devices are arranged at the rear of 100 the motor within convenient reach of the operator. The operator is in the best and most ideal position to guide and operate the entire apparatus, especially the brick engaging fingers during loading or unloading. 105 This feature of having the operator stationed on the brick setting apparatus with the automatic controlling devices already described, furthermore enables one operator to handle the crane, the carriage, and the 110 setting apparatus; whereas formerly, in mechanical brick setting devices, one operator was on the traveling crane or carriage and one or more additional attendants handled the setting devices. In my improved appa- 115 ratus, the operator on the setter is practically positioned on the plane with the brick setting fingers and therefore is enabled to gage the distances of the same as well as to aline the fingers and the entire apparatus 120 with greater accuracy than if stationed in any other position. This advantage is of very great importance and constitutes one of the important practical improvements over a device wherein the attendant was sta- 125 tioned on a platform above the brick unit where it was difficult for him to see how to work the apparatus and was as objection-

able in practice as if he was on the crane, actually requiring additional operators to manipulate the setter and therefore greatly reducing the speed of operation and capability of work.

My present invention is further described and defined in the form of claims as follows:

1. Brick handling and setting apparatus of the kind described, having brick carrying devices, power actuated means to remove the brick carrying devices from a unit stack of brick during unloading, a movable overhead support and mechanism to automatically operate and control the travel of said support in timed relation with a power actuated unloading means.

2. Brick handling and setting apparatus of the kind described, having brick carrying devices, power actuated means to remove the brick carrying devices from a unit stack of brick during unloading, a movable overhead support and mechanism to automatically operate and control the direction and speed of travel of said support in unison with the travel of the power actuated unloading means.

3. Brick handling and setting apparatus of the kind described comprising brick carrying devices, power actuated means to unload a unit stack of brick therefrom, a plurality of movable overhead supports for the apparatus, movable in divergent directions, and mechanism to automatically control the direction of movement and speed of a predetermined support in timed relation with the action of said power actuated unloading means.

4. Brick handling and setting apparatus of the kind described comprising brick carrying devices including an alining support, power actuated means to unload a unit stack of brick therefrom, a plurality of movable overhead supports for the apparatus, movable in divergent directions, and mechanism to automatically control the direction of movement and speed of a predetermined support in timed relation with the action of said power actuated unloading means, while permitting independent control of the direction and speed of the alining support.

5. Brick handling and setting apparatus of the kind described comprising brick carrying devices, power actuated means to unload a unit stack of brick therefrom, a plurality of movable overhead supports for the apparatus, movable in divergent directions, and mechanism to automatically control the direction of movement and speed of operation of a plurality of said supports in timed relation from a single point of control.

6. Brick handling and setting apparatus of the kind described comprising brick carrying devices, power actuated means to un-

load a unit stack of brick therefrom, a plurality of movable overhead supports for the apparatus, movable in divergent directions, and mechanism to automatically control the direction of movement and speed of a predetermined support in timed relation with the action of said power actuated unloading means, in combination with automatic disconnecting means operable by the power actuated unloading mechanism.

7. Apparatus of the kind described including a brick setting device, a traveling crane, a transverse carriage thereon, and flexible means to raise and lower the setting device on said carriage, a motor on the setting device constructed and arranged to unload a unit stack of brick carried thereby, a motor on the said carriage controlling this travel transversely of the crane, a motor on the crane controlling this traveling movement and means to automatically operate the setting apparatus motor with either the carriage motor or crane motor to control the direction of movement thereof in unison with the unloading action of the motor on the setting apparatus.

8. In a brick setting apparatus of the kind described having a plurality of brick carrying fingers, a movable push out arranged to reciprocate over said fingers, power actuated means to reciprocate said push bar and adjustable anti-friction supports for the push bar during its reciprocation.

9. In a brick setting apparatus of the kind described having a plurality of brick carrying fingers, a movable push out arranged to reciprocate over said fingers, power actuated means to reciprocate said push bar and adjustable flanged rollers adapted to contact with predetermined brick carrying fingers to support the push bar during its reciprocation and constituting, automatically alining, and guiding means therefor.

10. In combination, a brick setting apparatus of the kind described having brick carrying fingers and power actuated unloading means therefor, a turn table support for the apparatus of sufficient diameter for the center of gravity of said apparatus whether loaded or unloaded to be within the support afforded by said turn table, together with an interlocking safety catch member normally out of contact during rotation of the apparatus on its turn table, but affording means to hold the apparatus to said turn table in case of breaking the pivotal bearings.

11. A brick handling and setting apparatus of the character described, comprising a brick setter, a traveling crane, a carriage mounted to travel transversely on said crane, and supporting said setter, an electric motor on the setter constructed and arranged to unload a unit stack of brick carried by said setter, electric motors respectively on said

carriage and crane for operating them, controllers for all of said electric motors, and means for enabling the workman to operate the setter motor in unison with either the crane or carriage motors from a single controller.

12. A brick handling and setting apparatus of the character described, comprising a brick setter, a traveling crane, a carriage mounted to travel transversely on said crane and supporting said setter, an electric motor on the setter constructed and arranged to unload a unit stack of brick carried by said setter, electric motors respectively on said carriage and crane for operating them, controllers for all of said electric motors and an electrical selecting apparatus operable at the will of the workman to unite the control of any desired number of said motors in a single controller.

13. A brick handling and setting appara-

tus of the character described, comprising a brick setter, a traveling crane, a carriage mounted to travel transversely on said crane, and supporting said setter, an electric motor on the setter constructed and arranged to unload a unit stack of brick carried by said setter, electric motors respectively on said carriage and crane for operating them, controllers for all of said electric motors, a transfer switch connected with said controllers and operable to unite in a single controller the control of the setter motor with either the crane motor or the carriage motor.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses.

GRAFTON E. LUCE.

Witnesses:

JAMES R. HODDER,
GEO. H. MAXWELL.