July 3, 1951 E. T. PETERSON 2,559,460

PILING EQUIPMENT FOR STRUCTURAL MATERIAL

Filed Aug. 10, 1945 8 Sheets-Sheet 1

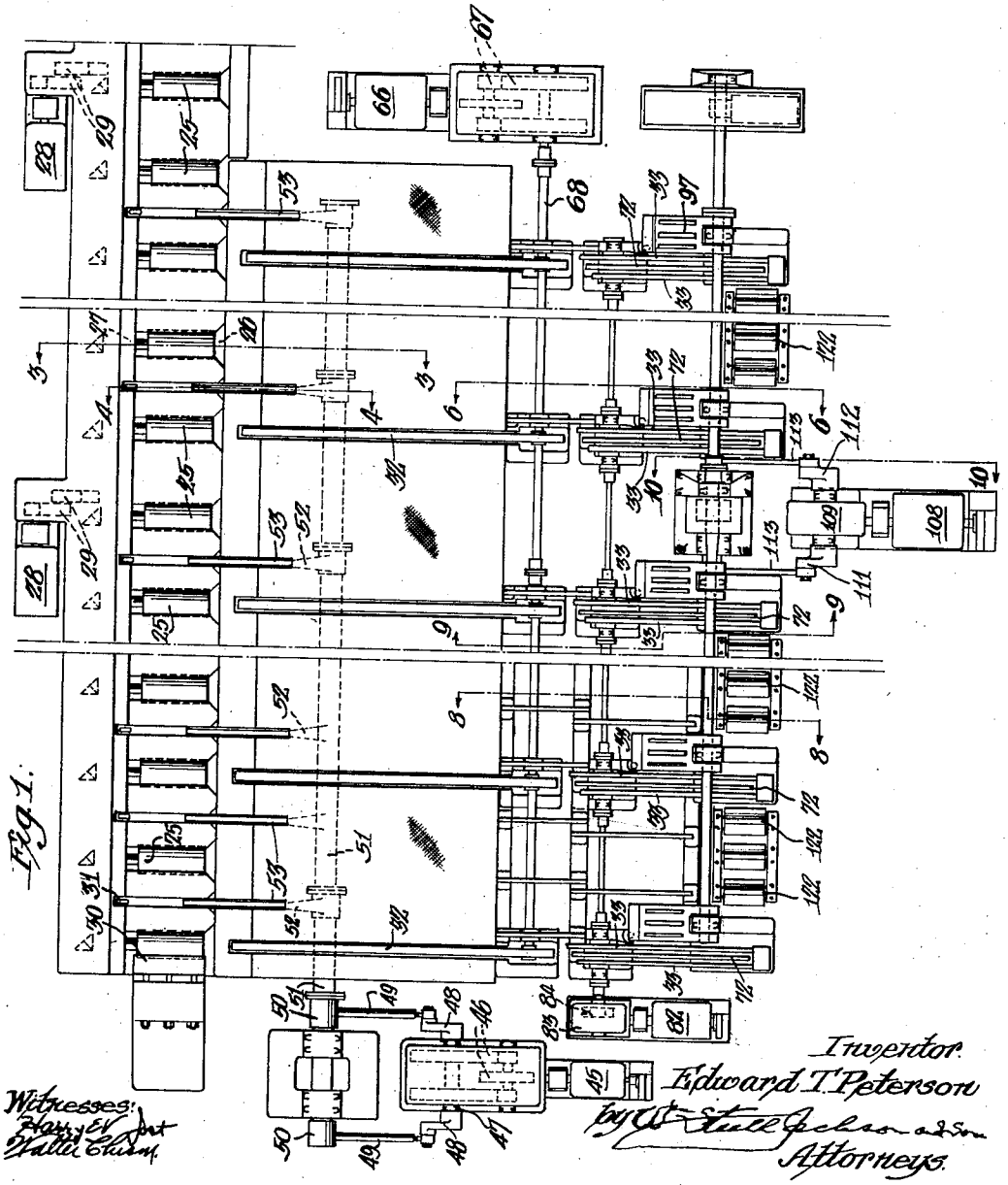


Fig. 1.

Witnesses:

Inventor
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PILING EQUIPMENT FOR STRUCTURAL MATERIAL

Filed Aug. 10, 1945 8 Sheets-Sheet 2

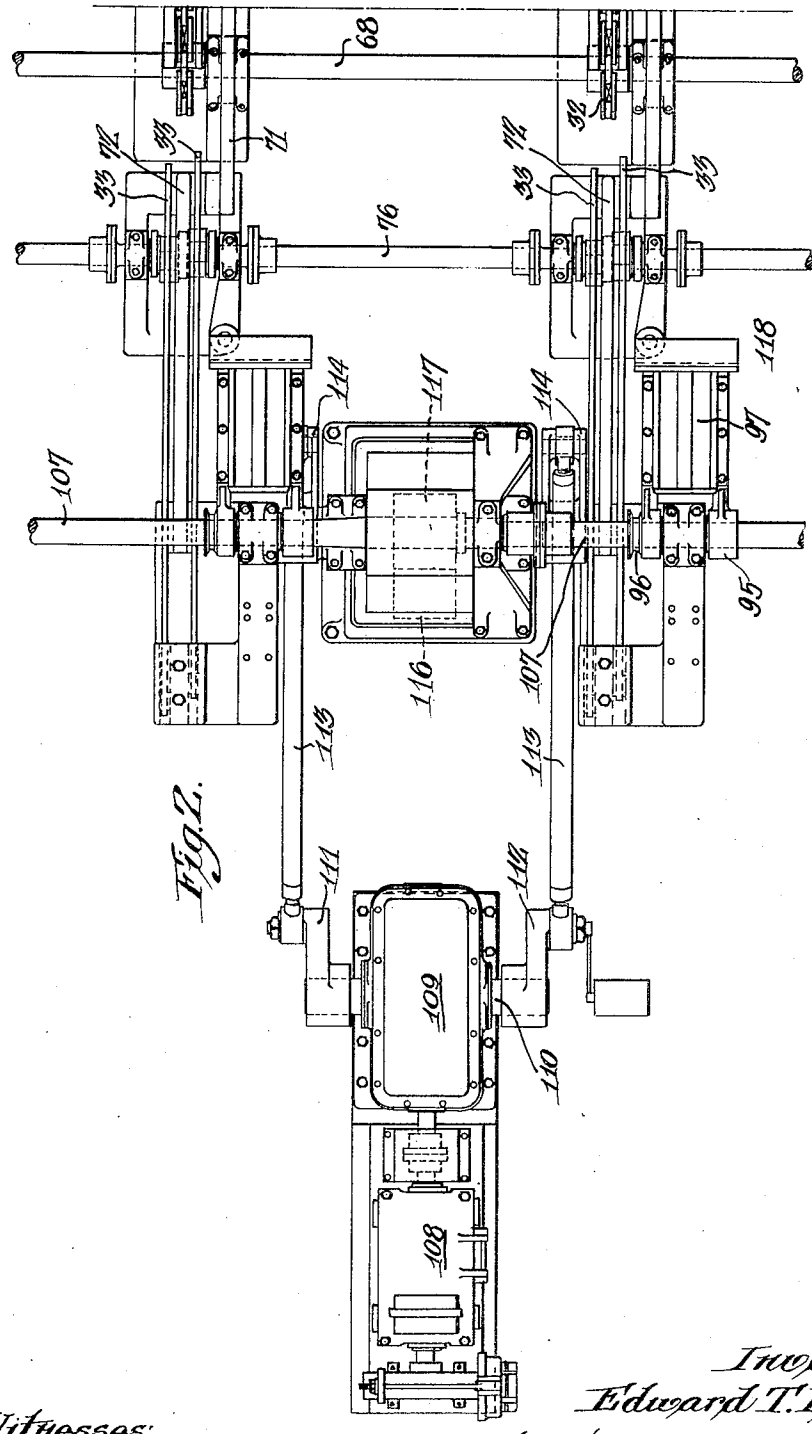


Fig. 2.

Witnesses:
Harry E. Foot
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July 3, 1951 E. T. PETERSON 2,559,460

PILING EQUIPMENT FOR STRUCTURAL MATERIAL

Filed Aug. 10, 1945 8 Sheets-Sheet 3

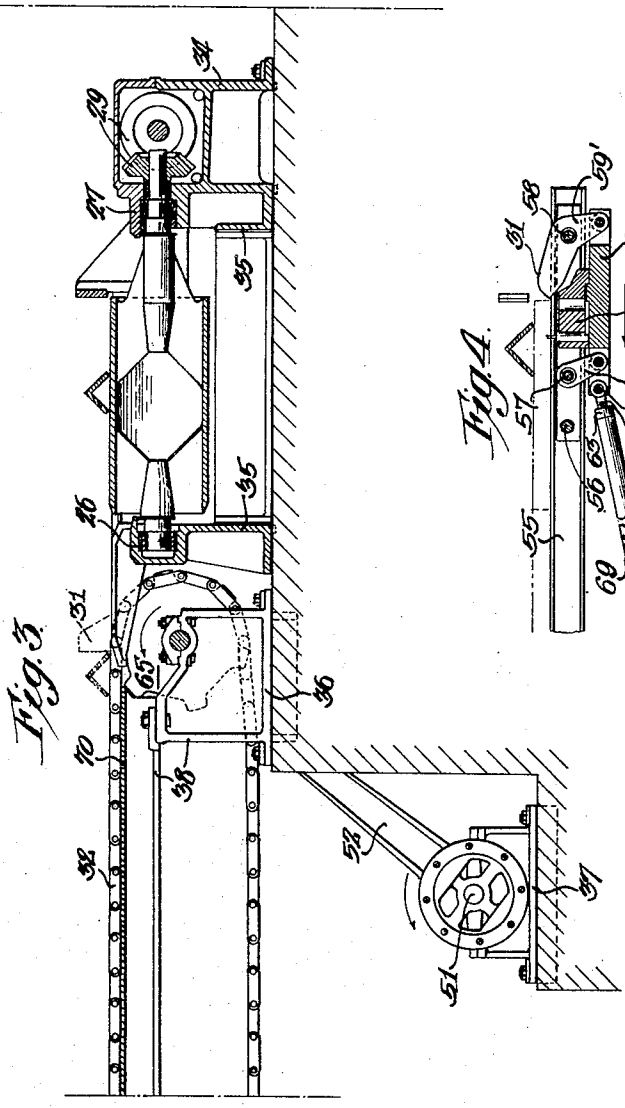


Fig. 3.

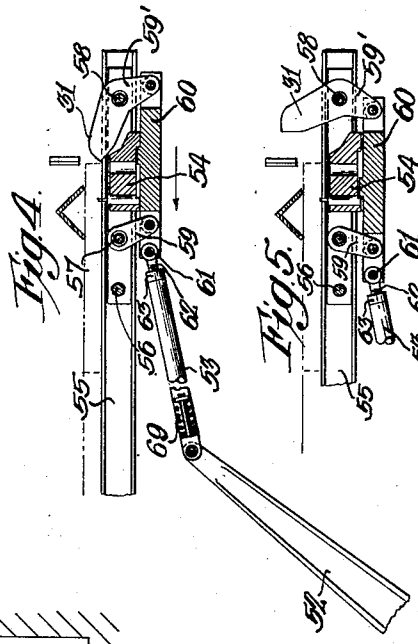


Fig. 4.

Fig. 5.

Witnesses:
Harry E. Dart
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PILING EQUIPMENT FOR STRUCTURAL MATERIAL

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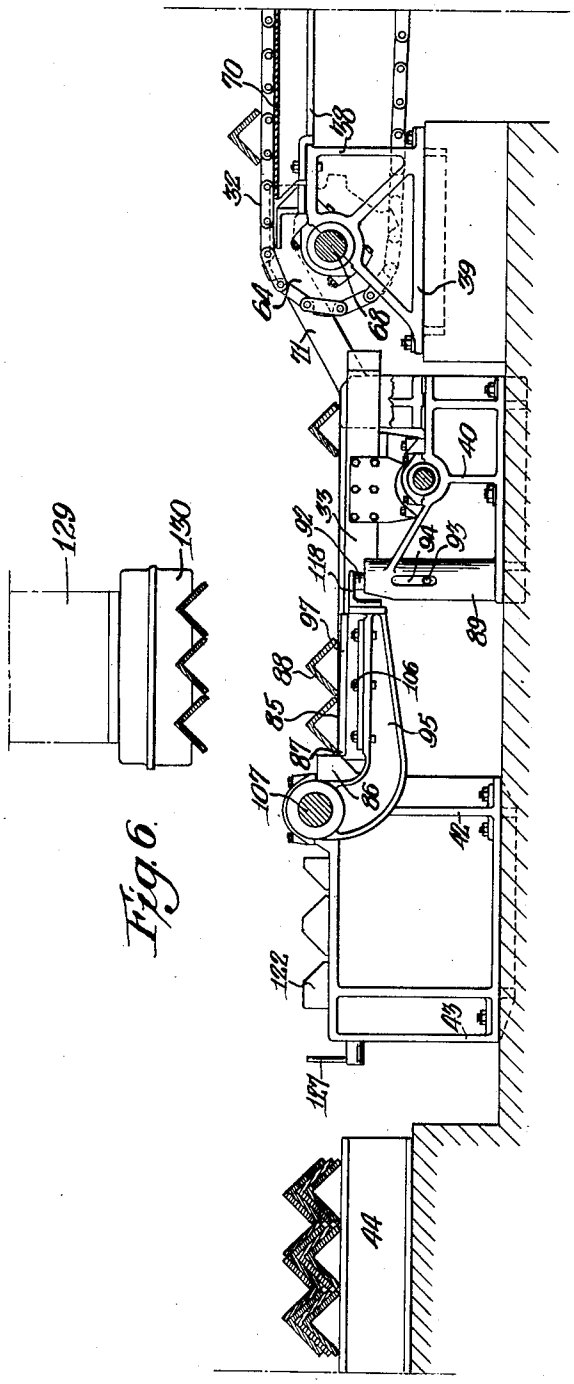


Fig. 6.

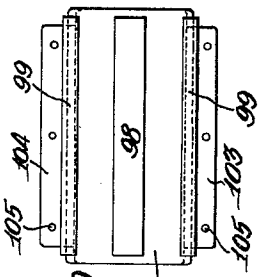


Fig. 19.

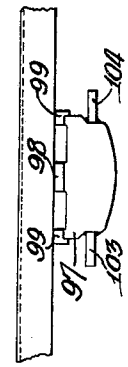


Fig. 20.

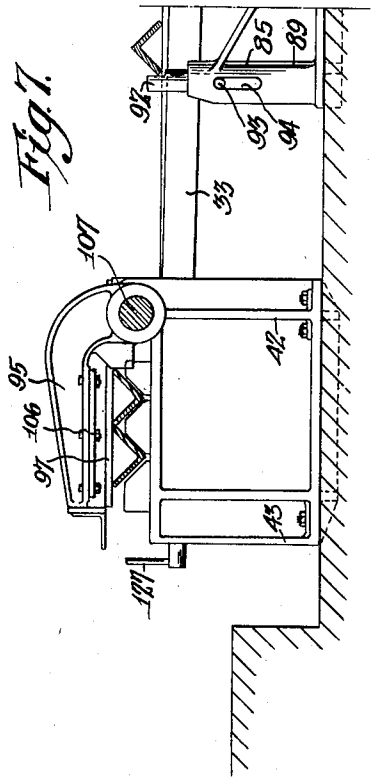


Fig. 7.

Witnesses:
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PILING EQUIPMENT FOR STRUCTURAL MATERIAL

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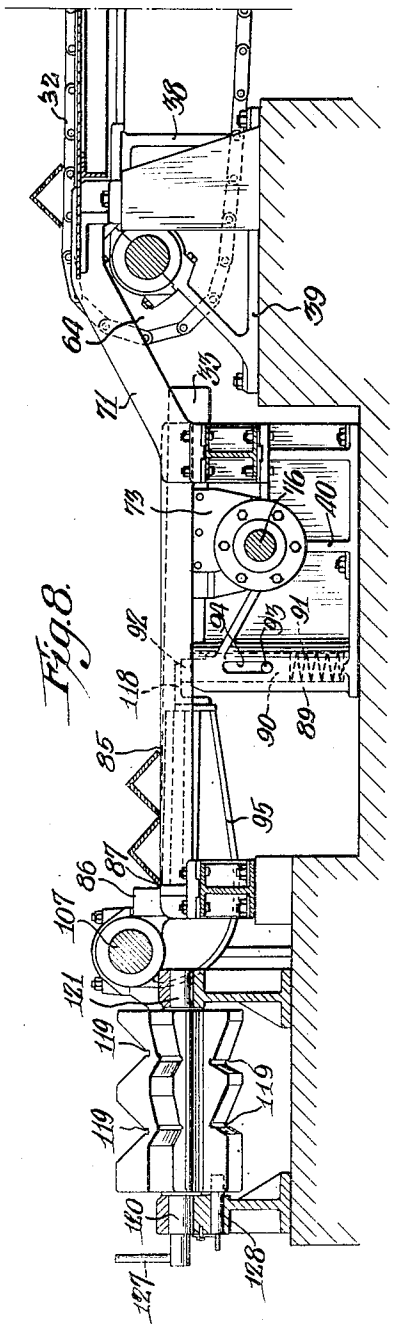


Fig. 8.

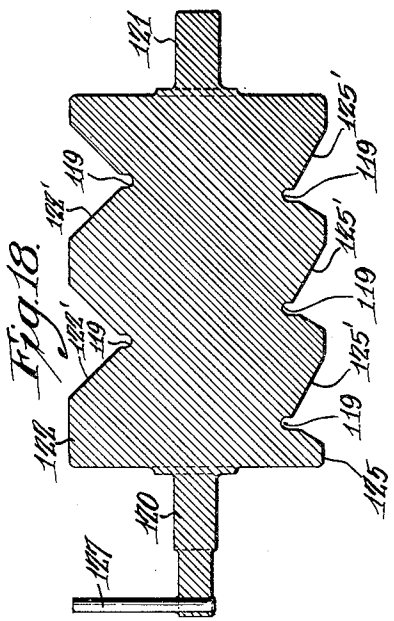


Fig. 18.

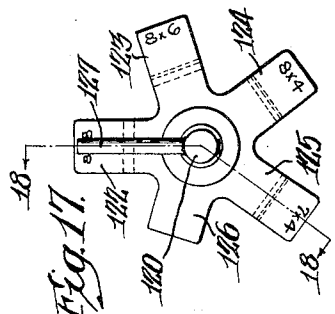


Fig. 17.

Witnesses:
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July 3, 1951 E. T. PETERSON 2,559,460

PILING EQUIPMENT FOR STRUCTURAL MATERIAL

Filed Aug. 10, 1945 8 Sheets-Sheet 6

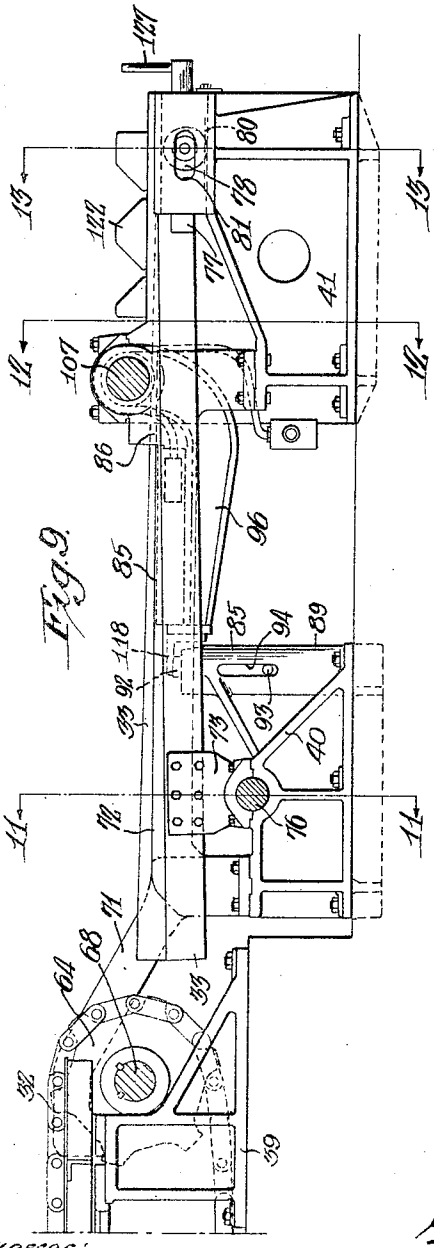


Fig. 9.

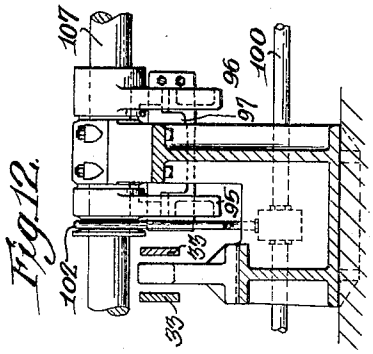


Fig. 12.

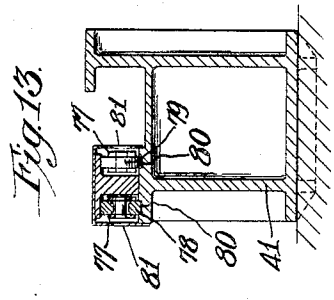


Fig. 13.

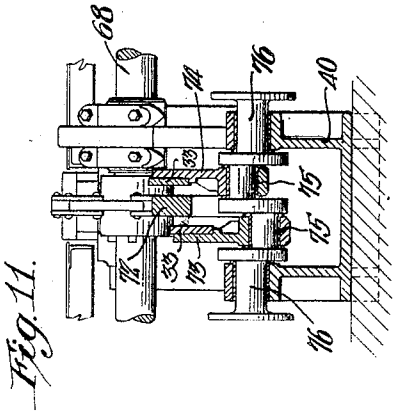


Fig. 11.

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July 3, 1951 E. T. PETERSON 2,559,460

PILING EQUIPMENT FOR STRUCTURAL MATERIAL

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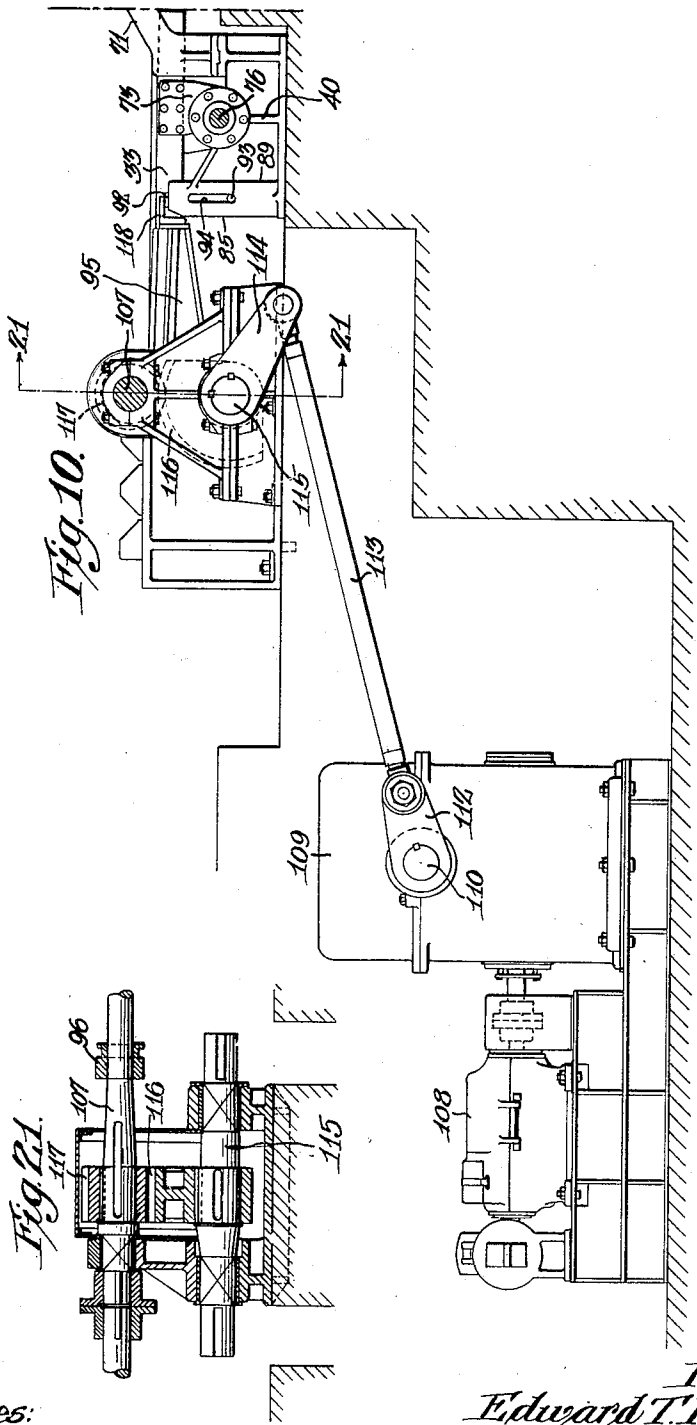


Fig. 10.

Fig. 11.

Witnesses:
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July 3, 1951 E. T. PETERSON 2,559,460

PILING EQUIPMENT FOR STRUCTURAL MATERIAL

Filed Aug. 10, 1945 8 Sheets-Sheet 8

Fig. 14.

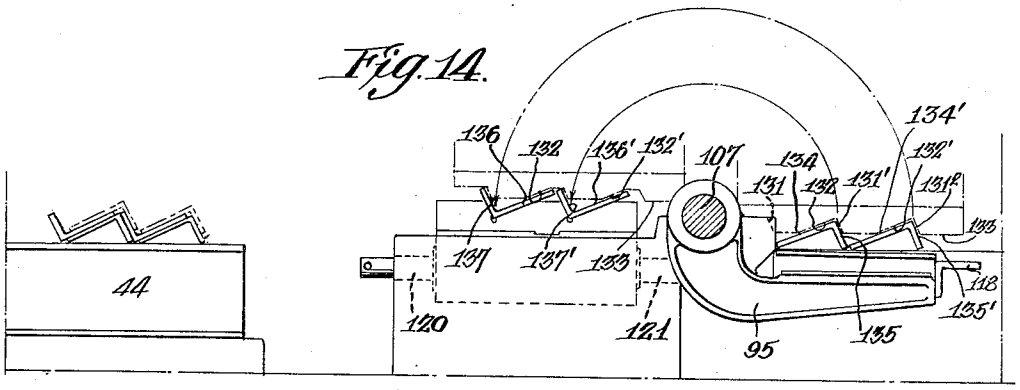


Fig. 15.

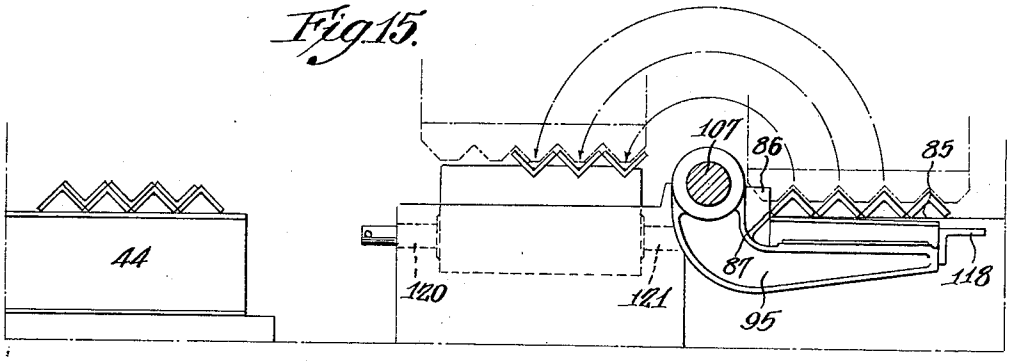
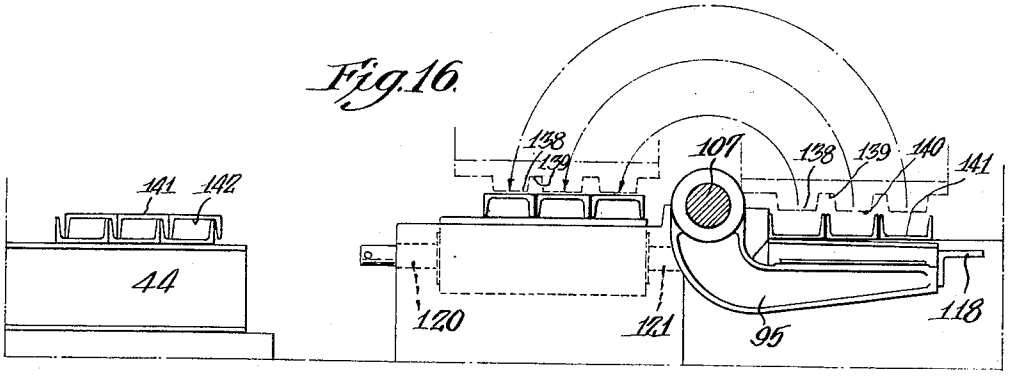


Fig. 16.



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Patented July 3, 1951

2,559,460

UNITED STATES PATENT OFFICE

2,559,460

PILING EQUIPMENT FOR STRUCTURAL MATERIAL

Edward T. Peterson, Reading, Pa., assignor to Birdsboro Steel Foundry and Machine Company, Birdsboro, Pa., a corporation of Pennsylvania

Application August 10, 1945, Serial No. 610,121

10 Claims. (Cl. 214—1)

1

My invention relates to a structural shape assembly bed and to mechanism by which shapes can be transferred directly to form part of a pile being formed and can be turned over and then transferred for an interleaving rest of the pile.

One of the purposes of the invention is to facilitate piling shapes and interlocking the piles so as to hold the shapes together as a unit.

A further purpose is to provide a magnet turnover by which rolled shapes may be turned over to reverse the face which is presented, as a step in the process of piling.

A further purpose is to provide a magnetic clutch turn-over and a magnetic clutch crane using the same assembly bed and transferring by the crane to a storage pile directly from the bed and, at intervals intermediately from the shapes which have been turned over, so as laterally to interlock the shapes piled.

A further purpose is to form adjoining piles of nested structural shapes side by side and to use intermediate layers of shapes extending across from pile to pile between the layers to tie the several piles together.

A further purpose is to use the run-out rolls, drag-hooks, chain conveyors and shuffle bars of a structural mill bed to assemble structural shapes in position for transfer or for turn-over, a layer at a time, and to transfer them directly or after turn-over to a place of storage where the layers are intermingled to tie the layers together.

A further purpose is to feed a plurality of shapes successively by run-out rolls, drag-out mechanism, conveyors and shuffle bars to a point at which a layer of them may be lifted bodily and turned upside down with respect to their previous positions.

A further purpose is to use a turn-over to reverse the face which is up in shapes already upon an assembly bed, to pick up the shapes by crane either from their normal or from their reversed positions, and to pile the shapes at a convenient point, some layers having normal position and some turned over.

A further purpose is to provide a receiving table from a plurality of star wheels, varying the parts of the wheels used according to the contours of the structural shapes which are to be piled.

2

The subject matter relating to the star wheel has been embodied in divisional application Serial No. 195,940, filed November 16, 1950, for Star Wheel.

A further purpose is to form receiving tables suitable to the work handled from star wheels having a plurality of grooved ribs differing in size, shape and relation of grooves from rib to rib according to the structural shapes which they are intended to receive.

Further purposes will appear in the specification and in the claims.

My invention relates both to the structures and to the methods involved.

I have preferred to illustrate one main form only of my invention, with several variations in the construction offered, selecting a form which is practical, effective and reliable and which well illustrates the invention.

Describing the drawings in this preferred form:

Figure 1 is a top view showing various sections of a structure involving my invention.

Figure 2 is an enlarged top plan view of part of the structure of Figure 1.

Figures 3 and 4 are enlarged fragmentary sections taken upon lines 3—3 and 4—4 respectively of Figure 1.

Figure 5 is an enlarged fragmentary section corresponding in position to Figure 4, but with the parts in positions different from the positions in Figure 4.

Figure 6 is an enlarged section taken upon lines 6—6 in Figure 1.

Figure 7 is an enlarged fragmentary section corresponding generally with Figure 6, but with the parts in positions different from their positions in Figure 6.

Figures 8, 9 and 10 are enlarged fragmentary sections taken upon lines 8—8, 9—9, and 10—10 of Figure 1.

Figures 11, 12 and 13 are sections of Figure 9 taken upon lines 11—11, 12—12 and 13—13, respectively.

Figures 14, 15 and 16 are fragmentary sections corresponding with part of Figure 6 but showing the invention as handling different types of structural shapes in the several views.

Figure 17 is an end view of a star wheel which may be used.

Figure 18 is a section of the structure of Figure 17 taken on line 18—18.

Figure 19 is a top plan view of the turn-over magnet seen in other figures.

Figure 20 is a broken end view of the turn-over magnet seen in Figure 19.

Figure 21 is a section upon line 21—21 of Figure 10.

Similar numerals indicate like parts.

Normal structural mills handle successively different structural shapes such as angles, Z bars, channels, I beams and any other structural shapes as they come.

The various channelled shapes may have variant lengths, from the entire length of the bed to any predetermined part of the length of the bed, corresponding with the desired shorter length of bars which are being handled and piled together because they have the same size and shape in cross section.

My invention is intended to turn over shapes and to pile groups of these shapes of whatever character which have been assorted into shapes of the same type and size of cross section and of the same lengths. I gather the shapes rolled as they come from the shears. They are carried lengthwise on run-out rolls from which they are dragged laterally by dogs. Chain conveyors receive them and deliver them to skids upon which they slide to the shuffle bars of the assembly bed.

For piling purposes I transfer some of the shapes directly to the pile, carrying them over in layers and nesting the shapes in individual piles, side by side, to the extent of any desired number of layers. Alternately, if desired, or at any intervals determined upon, I turn over the shapes of one or more layers ("turning over" the complete layer) and then transfer these turn-over shapes to the top of the pile as thus far built, staggering them laterally with respect to the shapes last previously piled so that the turned-over or reversed shapes of one or more intermediate layers interlock laterally from individual pile to individual pile. By thus interleaving from one pile to another, I tie adjoining piles together throughout the groups of piles being deposited.

In Figure 1 several units of feeding mechanism are shown from among the large number of parallel units extending the length of the bed. This length is not standardized. Run-out rolls are seen at 25 supported by suitable bearings 26 and 27, seen best in Figure 3. The rolls are driven by motors 28 through gearing 29.

The run-out rolls in Figure 1 receive structural shapes at the right from shears not shown, and transmit the shapes to the left in the figure to the end of the run at 30. In the several spaced sections which have been illustrated in Figure 1 the units are parallel and are in the main identical except for the driving mechanism shown.

The units comprise drag-off dogs 31, chain conveyors 32, shuffle bars 33 and the various operating mechanism and skids connected with them. All of the units are supported upon suitable frame parts indicated at 34 to 44.

Bearings are supplied for the various revolving or oscillating parts and the construction as thus far broadly described supplies a structural shape assembly bed delivering rolled and cut shapes in parallel position. They are ready for transfer to storage or for other purpose.

The present invention has to do primarily with the assembly bed and the handling of the shapes

from this assembly bed to store the shapes in piles and at intervals to interlink the piles upon a suitable storage site.

Though my invention is directed primarily to the assembly bed, to turn-over mechanism and to the piling accessory mechanism associated with it, by which shapes delivered upon an adjacent assembly bed are turned over intermediately and piled, and by which the piles may desirably be interlocked, the complete bed includes the other mechanisms by which the shapes are brought together upon the assembly bed. These mechanisms will be described briefly.

The drag-off hooks.—The drag-off hooks or dogs 31 (see Figures 1,3–5) are the normal dogs for this purpose, operated by the usual connections, including a motor 45, intermediate gearing 46, rotatable shaft 47, cranks 48, connecting rods 49, oscillating crank arms 50, shaft 51, levers 52, links 53 and dog-operating slide 54. Slide 54 is a carriage adapted to reciprocate in guides 55. The sides of slide 54 are held together by pins 56, 57 and 58. 59 and 59′ are arms suspending operating bar 60 pivoted to the levers. Arms 59′ are extended above to form the drag-out dogs 31. Links 53 are pivoted to the bars at 61.

So that the extent to which the drag-out dogs reach across the run-out rolls may be adjusted, the ends of the links 53 are internally threaded so that the terminal connection 62 from the links may be threaded into the links and may be locked by nuts 63. The connections between the links 53 and the arms 52 are made through compression springs 69 and bolts pivoted to the arm.

The dogs 31 swing with the arms and are depressed as seen in Figure 4 when the carriages are sliding toward and under the run-out rolls so as to pass under shapes upon these rolls. They reverse in position and are lifted as seen in Figure 5 when the links are tensioned to pull the carriages, and with them the dogs to the left in Figures 4 and 5. The guides for the carriages support the weights of the shapes during their passage from the run-out rolls to the chain conveyors.

The chains 32 are supported (Figures 3, 6 and 9) upon driving sprocket wheels 64, idlers 65 and intermediate supports 70 and are driven by motor 66, gearing 67 and shaft 68 (Figure 1). Conveyor chains 32 convey the shapes over skids 70 from the point to which they are delivered by the drag-out hooks until they reach and slide down upon diagonal skids 71 (Figure 9). They thus reach the shuffle bars 33 and skids 72 of the assembly bed.

The shapes are dragged by dogs 31 across the table rollers and skids spanning the gap between rollers and conveyor, onto the chains 32. The shapes rest on the chains and are transferred across the chain transfer and discharged upon skids 71. The shapes then slide down by gravity onto the shuffle bar assembly along stationary bars. Shuffle bars 33 move the shapes across the bars until a sufficient number of shapes has been assembled in a group suitable for piling.

The shuffle bars (Figures 9 and 11) are connected at their driving ends by brackets 73 with bearings 74, surrounding cranks 75 upon crank shaft 76, so that, as the cranks turn, the shuffle bars are progressively lifted, transferred forwardly, lowered and transferred rearwardly to engage and shift the shapes as the shuffle bars successively occupy and move in their higher positions. At the opposite ends 77 (Figure 13) of the shuffle bars they are formed into forks within

which rollers 78 and 79 are supported. The rollers engage within grooves in a guide 80 so that these ends merely ride forwardly and rearwardly. The rollers are seen best in Figures 9 and 13. The rollers are provided with bearings which are accessible through longitudinal slots 81.

The shuffle bars 33 are driven by motor 82 (Figure 1) through gearing 83, including worm and worm gear at 84, all well known in the art.

The shuffle bars carry the shapes over to the left in Figures 6 and 8 (to the right in Figure 9) until they pass upon the section 85 of the bed, engaging the stops 86 at the ends 87 of this section.

During all this travel the shapes which have stable positions, such as the angles 88 in Figure 3, will generally travel in stable position and this position may be maintained throughout the lateral transfer.

Additional stops are seen in Figure 8. They comprise supports 89 and plungers 90 within the supports. Springs 91 tend to press the plungers upwardly so that the noses 92 of the stops will tend to extend above the table to be engaged by and stop lateral travel of the shapes as the latter are fed transversely across the sections 85 except as these stops are held down when the turn-over arms are in their normal positions. The plungers are limited in their upward movements by pins 93 operating in slots 94.

At each turn-over location there are two turn-over arms 95 and 96 which are spaced to span a magnet 97, shown in Figures 19 and 20. The magnet, as shown, is provided with a magnet pole 98 of one polarity and the poles 99 of opposite polarity, all extending across and normally beneath the shapes. Current is supplied, Figure 12, from any suitable source through conductors 100, 102 to the magnet coils so as to energize the coils as soon as the turn-over arms begin to lift for the turn-over and continue to magnetize them until the turn-over movement has been completed, but to cut off the current for the return movement.

Flanges 103, 104 are welded to the sides of the magnets. These flanges are apertured at 105 and are held to the arms by bolts 106 (Figure 6).

The turn-over arms 95, 96 are secured to and turn over with rocker shaft 107, suitably supported. The rocker shaft is oscillated or rocked by the mechanism seen best in Figures 2, 10 and 21, comprising a motor 108, gearing 109 terminating in a rotating shaft 110 carrying crank arms 111, 112, all operating in suitable bearings.

The crank arms 111, 112, are linked by connecting rods 113 with rocker arms 114 upon the oscillatory shaft 115.

The shaft 115 is rigidly connected with and oscillates a circular rack or segmented gear 116 which meshes with a gear 117 upon rocker shaft 107, upon which the turn-over arms 95, 96 are mounted and by which these arms are rocked.

The throws of arms and levers 114 are so proportioned that though arms 111, 112 revolve, levers 114 are oscillated and not revolved and the oscillation of levers 114 is translated into oscillation of shaft 107 and turn-over arms through 180°, whereby the turn-over arms swing or oscillate from positions at which the magnets carried by the arms are below the assembly bed, to positions where they have revolved, counterclockwise as viewed in Figure 8, through 180°, and as soon as the current is turned off they deposit the shapes turned over in position for the shapes to be picked up by a magnet crane.

The turn-over arms, in their positions as seen in Figure 8, are far enough below the structural shape assembly bed to leave room below said bed for the lifting magnet seen in dotted lines in Figure 8.

When the turn-over arms and their magnets are in the position seen in Figures 2, 6, 8 and 10 at the ends of their clockwise strokes in these figures, then brackets 118, carried by or movable with the arms, press the noses 92 down and the shapes are then free to move to the left in these figures without interference by these stops, and to cover the turn-over arms and their lifting magnets. In all other positions of the turn-over arms the stop noses are raised to block movement of the shapes to the left, at and because of the noses.

The turn-over arms with their magnets are intended, of course, to turn over individual shapes or layers of shapes from their initial position when picked up (for convenience called their stable position) to intermediate positions at which some types of shape at least will not be stable. Where the shapes are deposited in unstable position they are supported to maintain them upside down as distinguished from some angular relation other than upside down with respect to their initial positions.

To maintain the positions of the shapes, I provide a plurality of notched bars upon which individual shapes, or the shapes of a row or layer, are deposited and which hold the shape or shapes in the position intended. These bars are special for one type or size of shapes and the bars can be changed so that the bars used from point to point may be selected according to the type and size of the shapes and may be uniform from point to point throughout the length of the bed.

Each of the individual bars is distinct and separate in its function, permitting individual shapes or a layer of shapes to nest within notches 119 in its surface so as to maintain the alignment of the shapes, or to correct it if there be any lack of alignment, and to hold the shapes in their proper positions.

The positions of the shapes upon the bars must be such that they can be picked up from the bars by the lifting magnet of a crane. Since the turn-over magnet lies below the assembly bed in horizontal position at the start, and delivers the bars so as to present an upper horizontal face after the turn-over, the throw of the turn-over must be approximately 180° and for convenience has been assumed to be this angle.

In order to mount and change the notched or grooved bars, ribs, guides, or rests to advantage and to render a maximum variety of these available in minimal space, I supply what I have termed a star wheel, in which the ribs or teeth extend horizontally transversely across the individual shapes which are to be supported.

The general star wheel construction permits the ribs or rests to be formed much in the shape of the teeth of gears, each "tooth" forming a separate rib, which may be notched or contoured to receive and support a particular size or type within each of the rib notches or grooves. The turning of the star wheel makes available any of its ribs or teeth. It is thus possible not only to supply a variety of notched ribs upon a given star wheel, but to select a variety of notches grouped upon the same star wheel which corresponds with shapes most frequently handled upon the bed.

Star wheels are shown in Figures 8, 17 and

18 which carry a number of bars of different notch contours or of different sizes of the same shape. By turning individual star wheels to new positions or by substituting other star wheels which will have ribs suited in contour to the particular shape being handled, accommodations may be made for the entire product to be handled by a mill. Differences in star wheel notch contours accommodate different shapes as shown in Figures 14, 15 and 16, for example:

The star wheel shown in Figures 8, 17 and 18 is a preferred form which may be used in any of the illustrations. Its shafts 120, 121 are mounted upon proper bearings so that ribs 122, 123, 124, 125 and 126 are available. They are notched at 122'—125' and can be turned by handle 127 so as to bring one or the other of the ribs up. The wheel can then be locked in any of the different positions by hand-operated pin 128 supported in the frame and engaging within one of successive apertures in the star wheel. One of the ribs shown is plane; i. e. it presents a flat contour.

When the turn-over arms are at the right in Figure 8 and the spring-pressed stop is down, the normal feed carries the shapes over the turn-over magnet. Operation of the turn-over carries the shapes through approximately 180° and rests them within the notches of the appropriate star wheel bars or teeth.

Feeding of the shapes laterally is interrupted while the turn-over arms are operating but when the turn-over magnet has returned to its normal position beneath the assembly bed, a new layer of shapes is fed in over the magnet.

The straightened shapes can be lifted directly from their positions above the turn-over arms or from the turned-over position by a magnet crane 129 (Figure 6) capable of lifting the shapes and carrying them over to the positions at which they are to be stored. Such cranes are provided with the usual hooks and lifting and traversing mechanisms. The hooks support chucks 130, whose faces may, of course, be plane, but are shown as grooved on their under-faces parallel to the lengths of the shapes.

The walls of the grooves fit a part at least of the upper or outer surfaces of the shapes, for the double purpose of reducing magnetic leakage to improve the lifting power and of maintaining the adjacent shapes in their initial positions and spacings with respect to each other and with respect to the surfaces or piles of shapes.

In most of the types of shapes the outer (upper) contours of the individual shapes as they are delivered upon the bed and the inner (lower) contours of the same shapes are nearly alike, or are alike.

I beams and H beams will have the same upper and lower contours for the same beams, and channels will have flats both above and below. However, the flanges in shapes such as angles and Z bars are tapered and the sloping surfaces presented between the flanges in upper and lower contour will differ by an amount approximating the combined tapers of the flanges. But even where the contours do differ, a composite or intermediate contour may be given to the crane magnet faces which nearly enough will approximate the faces with which they engage to give good results, causing the crane magnet to fit acceptably against the outer (upper) or inner (lower) contours of the individual shapes. This is seen at the right in Figures 14 and 15.

To apply this first in Figure 14, the downwardly facing grooves in the crane magnet or "grab" present from left to right short, abrupt surfaces 131, 131', 131^2 sloping downwardly and to the left, and also longer, less abrupt connecting surfaces 132, 132' sloping downwardly and to the right above the lower magnet line 133. It will be noted here that though the shapes in Figure 14 are angles they have unequal flanges.

The surfaces 132 and 132' at the right of Figure 14 engage with outer shape surfaces 134, 134' and the surfaces 131' and 131^2 engage with outer shape surfaces 135, 135'.

When the faces of the same crane magnets are used to engage and lift the same type of shape in turned-over or upside-down position (supported by a rib of the star wheel in this figure) the faces 132, 132' engage the inner surfaces 136, 136' of the shapes and the surfaces 131, 131' engage the inner faces 137, 137' of these shapes, all with sufficient approximation to full engagement definitely to improve the lifting power of the magnet.

The same crane magnet faces can therefore be used as a magnetic chuck to lift the angles from their positions at the right in Figure 14 and carry them over, depositing them at the left in this figure, one layer or many layers before tying the individual piles together, and then to lift identical angles from their positions upside-down resting upon the star wheel bars and to carry them over to the left in this figure to act as ties, one tie layer or many tie layers and of the same or a different number of shapes in the tie layers as in the normal layers, permissibly one fewer or one more in the tie layer or layers with some shapes.

In all of the figures—as in Figure 14, the lowermost layer will ordinarily be in normal position, i. e. in the position in which the shape would lie upon the assembly bed and the shapes for this layer will be carried as a layer across from the position at the right in Figure 14 where they rest initially on the assembly bed to the position on the loading platform at the left in Figure 14 by a magnet crane which will carry them over unchanged in position and unchanged in spacing. As many layers will be carried over as are desired, remembering that the individual piles are not to be piled up high enough so that they will lean, the top of one pile with respect to the top of the next, appreciably before tying. The single layer shown is for illustration purposes only, as many layers may be laid permissibly in the same positions before tying. In Figure 6 the piles are three-high before tying. When a tying layer is laid it may be taken as a tie only, after which the former piling will be resumed or may be used as the first layer of a new set of piles which may subsequently be "tied" by a layer or set corresponding with the initial layer or layers, and so on.

In Figure 14 it is the intention to pile first as many layers as desired, of angles, for example, all facing down (considered to be "normal") and subsequently to tie adjacent shapes of one or more of these layers together by storing upon them one or more layers of angles with the same contours facing up, the shapes being slightly staggered in adjoining layers with respect to the shapes in the adjacent layer next below, so that each shape which is slightly staggered will cooperate in part with one of two adjacent shapes in the layer below and in part with the other of these two shapes in the adjacent layer, preventing the individual shapes in this layer from shifting in position transversely of the shapes and hence

holding the piles from falling sidewise. So far as this description is concerned, the first layer or layers of shapes laid in the storage position may face either up or down if they will reliably stay in one position, but for convenience I have started with the outside contours facing up and shapes of the first tying the layer having these outer contours facing up to each other by a second layer in full lines in the reverse, i. e. with the outer contours facing down.

The number of layers in duplicate position typified by having their outer contours facing down—or up, as the case may be—before a tying layer or a plurality of layers in tying position is superimposed in staggered position upon the last such layer, will depend upon the size and type of the shapes and upon the width of the pile.

After one or more layers of shapes in normal position has been laid, called "normal" because they lie as they are fed in on the bed, the tie is effected by a layer which is fed from the skids and shuffle bars over the assembly bed and over the turn-over magnets. It is lifted from beneath by the turn-over magnets. The layer is turned to the position near the middle of Figure 14 where the shapes are intermediately supported upon the star wheels. The inner faces of the short flanges and the inner faces of the longer flanges of these shapes—here angles—now face upwardly.

If the same crane magnet which was available to lift the shapes directly from the bed and carry them over to the positions seen in Figure 6 at the left, where they became the three "normal" layers beginning three piles in storage, be now used to lift and carry the "turned-over" layer of shapes, a second layer is deposited on the pile in Figure 14. This forms a tying layer and may be followed by other like layers.

In Figure 14, one layer only has been shown which has been lifted over directly from the bed position, i. e., one "normal" layer only, one layer only in tying position and one layer each upon the bed and in upside-down position rested in notches within star wheel bars. The layer upon the bars is ready to be used at any time for tying or to rest upon a tying layer to start new piles, and where so used is staggered laterally with respect to the normal shapes previously stored.

The shapes upon the star wheels can be retained there indefinitely while the crane carries as many layers of normal shapes over to storage as may be desired.

In Figure 15 the shapes are angles of equal flange dimension. They are to be deposited in one or more layers in upside-down position. One layer only has been transferred directly from the bed and one layer from upside-down position. The process of piling continues with any desired number of layers tying them in, and so on.

In Figure 16 the lowermost layer of channels in storage, at the left, has the flanges up, which means from the showing in the rest of the figure, that this lowermost layer has been transferred, not from the bed but from the intermediate position at which the channels are upside-down with respect to their bed position.

In Figure 16 the first layer of channels has been supplied by using the crane to transfer first from the intermediate (upside-down) position, for the first layer of the pile with subsequent transfer of a layer from the position on the bed, staggered with respect to the first layer, following by alternate layers which lie in one or other of these two positions.

Applying the same idea of reducing the magnetic loss in the use of the crane lifting magnet to Figure 16, the lifting magnet is provided with flat-faced ribs **138** and with grooves **139** between them, the walls of the grooves being far enough apart to straddle the double flanges of adjoining channels as seen at the middle in Figure 16. Under these circumstances the flat lower faces **140** of the ribs engage the upper surfaces **141** of the channels at the right in Figure 16 so that the crane may lift the channels and carry them over to a position at which they can start a pile, if that be the intention, or in which as shown at the left in Figure 16 they become, let us say, the second layer in the pile, the channel under them having the flanges facing upwardly.

When the upside-down channels are to be lifted, as for the first layer seen at the left in Figure 16, the ribs **138** nest into the insides of the channels to permit the lower faces of the ribs to engage with the bottoms **142** of the channels to be lifted.

It will be evident that, except as the upside-down forms may be unstable as a bottom layer (which would be the case in Figures 14 and 15) it does not matter whether the bottom of the pile be taken direct from the bed as in Figures 14 and 15, or be taken from the intermediate upside-down position to which the shapes have been turned from the initial position by the turn-over arms.

It will be evident that the mechanism by which the shapes are fed to an open assembly bed provides a feed for these shapes from the shears to the bed which insures a continuous supply so long as the mechanism is operated and shapes are available from the shears and that the feed of the shapes to the bed may be controlled by operating the run-out rolls and the mechanism, filling it continuously or by stopping it at intervals when it is desirable to interrupt the flow of shapes for any reason.

By feeding or not feeding shapes to the run-in rolls or by controlling the operation of the conveyors, shuffle bars, etc., the feeding of the shapes to the section **85** of the bed over the turn-over arms may be controlled, and the bars fed may be located edge to edge and up against the stop **86**. On the other hand, while the turn-over arms are in intermediate position transferring shapes to the star wheels, and until they return to the position seen in Figure 14, the noses **92** project above the bed and prevent accidental feeding of shapes beyond the positions of the noses.

It is further apparent that with every type of rolled shape in which individual shapes or piles of shapes lying side by side are to be overlapped, there is a distinct advantage in being able to turn the layers of shapes upside-down and slightly stagger them for the purpose of tying together the individual shapes in one row and of thus preventing lateral movement of the shapes of individual piles.

It will be evident that the structural shapes which will internest in accordance with the piling procedure of the present invention will in transverse cross section have a convex side and an opposite hollow side, the piling being such that in any two juxtaposed layers the shapes are parallel with one another in each layer and parallel in the two layers, but staggered in one layer with respect to the other layer so that the shapes of one layer internest in the hollows of the shapes of the other layer, thus applying a lateral locking action or tying action to the pile.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such in so far as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Mechanism for piling structural shapes, comprising two spaced beds, an inverter between the beds, means on one bed for supporting articles right side up, and means on the other bed for supporting articles upside down, in combination with a magnetic crane for successively picking up articles from the beds for a piling operation.

2. Mechanism for piling structural shapes comprising two spaced beds, a magnetic chuck inverter between the beds and operating on articles taken from one bed to the other bed, means on one bed for supporting articles right side up, means on the other bed for supporting articles upside down, in combination with a magnetic crane for successively picking up rows of articles from the beds for a piling operation.

3. Mechanism for manipulating structural shapes comprising a bed, means for feeding shapes laterally upon the bed to form a layer of parallel shapes, a second bed, means on the second bed for supporting a layer of shapes in inverted position, a storage support for piling, a magnetic inverter between the bed and the second bed gripping a layer from below on the bed, mechanically turning the layer upside down so that the layer and the shapes are inverted and depositing the shapes in inverted position on the second bed and magnetic crane means for picking up layers of shapes alternately from the bed and from the second bed, depositing them on the storage support in successive layers of parallel shapes parallel to one another for piling, and staggering inverted shapes with respect to shapes which are right side up in the pile.

4. In mechanism for piling structural shapes, means for magnetically gripping a plurality of parallel shapes simultaneously at a number of points along the lengths thereof and for lifting and swinging the shapes about an axis parallel to the lengths of the shapes through an angle to turn them upside down, means for receiving and supporting the shapes in their upside down position while preventing rotation and a magnetic crane for picking up the upside-down shapes and transferring them to a piling position.

5. In a magnetic crane, a crane magnet having a holding surface having parallel grooves whose groove sides are angularly positioned to one another and are adapted to engage structural angles in either upright or inverted position and in which the adjoining sides of adjoining grooves are angularly positioned to one another and spaced from one another by an amount so that the adjoining sides of adjoining grooves engage the angles when they are inverted with respect to the position of the angles when they are engaged in the grooves as first mentioned.

6. Mechanism for piling structural shapes, comprising two spaced structural shape beds, means on one bed for supporting shapes right side up, means on the other bed for supporting shapes upside down, means for feeding the shapes laterally upon the one bed, a magnetic chuck, crane means for lifting and traversing the chuck, whereby the shapes may be gripped magnetically and transferred mechanically, a turn-over magnetic chuck below the one bed and including a shaft between the two beds, and mechanical means for revolving the turn-over chuck and depositing a layer at a point where it can be picked up from above by the crane.

7. Mechanism for piling structural shapes, comprising two spaced structural shape beds, means on one bed for supporting shapes right side up, means on the other bed for supporting shapes upside down, means for feeding the shapes laterally upon the one bed, a magnetic chuck, crane means for lifting and traversing the chuck, whereby the shapes may be gripped magnetically and transferred mechanically, a turn-over magnetic chuck below the one bed and including a shaft between the two beds, and mechanical means for revolving the turn-over chuck and depositing a layer of shapes at a point where the layer can be picked up from above by the crane.

8. Mechanism for piling structural shapes, comprising two spaced structural shape beds, means on one bed for supporting shapes right side up, means on the other bed for supporting shapes upside down, means for feeding the shapes laterally upon the one bed, a crane, a magnetic chuck for the crane, operating mechanism for the crane, lifting and traversing the chuck, whereby the shapes may be gripped magnetically and transferred mechanically, a turn-over magnetic chuck below the one bed and including a shaft between the two beds, mechanical means for revolving the turn-over chuck and depositing a layer at a point where it can be picked up from above by the crane, and a stop to prevent lateral feeding of the shapes over the bed when the turn-over magnet is above the level of the bed.

9. Mechanism for piling structural shapes, comprising two spaced structural shape beds, means on one bed for supporting shapes right side up, means on the other bed for supporting shapes upside down, means for feeding the shapes laterally upon the one bed, a crane, a magnetic chuck for the crane, operating mechanism for the crane lifting and traversing the chuck, whereby the shapes may be gripped magnetically and transferred mechanically, a turn-over magnetic chuck below the one bed and including a shaft between the two beds, mechanical means for revolving the turn-over chuck and depositing a layer at a point where it can be picked up from above by the crane, a stop to prevent lateral feeding of the shapes over the bed when the turn-over magnet is above the level of the bed and means carried by the turn-over chuck for moving the stop out of position to permit lateral feed of the shapes over the turn-over chuck.

10. In a piling mechanism for structural shapes, two spaced beds, means on one bed for supporting shapes right side up, means on the other bed for supporting shapes upside down, and the one bed being adapted to receive a layer of parallel shapes, a plurality of crane chucks above the layer having grooves in the chuck faces approximately fitting the exposed faces of the shapes, means for lifting and lowering the chucks and for transferring them to a storage place for piling the shapes, means for energizing the crane chucks, a plurality of magnetic turn-over chucks normally lying beneath the shapes on the one bed and including a shaft between the two beds, means for energizing the turn-over chucks, and means for revolving the turn-over chucks across

the bed about an axis outside of the shapes and depositing the shapes upside down within the reach of the crane magnetic chucks and to return the chucks.

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