My invention relates to manipulators and more especially to improvements in mechanism for turning over and otherwise manipulating rails or the like articles of various sizes adapted to be charged into or received from cooling boxes or tanks for the controlled cooling of rails.

Up to a few years ago it was the usual practice in the manufacture of railway rails to roll the rail and cut it into standard lengths of 33 feet, although rails are and were sometimes cut in double lengths, or 66 feet. As the head of the rail has a considerable greater thickness than the flanges, when the rail leaves the final roll pass the flanges will be somewhat cooler than the head and will not contract as much as the head of the rail when cooled. If the rail section was allowed to cool in this manner the tread surface of the head of the rail would be slightly concaved while the base surface of the rail would be correspondingly convex. To compensate for this greater shrinkage of the head of the rail, the rail sections just after they have been cut into lengths are given a slight camber so that the head of the rail is slightly convex while the base of the rail will be correspondingly concaved. In this manner when the rail cools it will be substantially straight. After the rail sections are cambered they were transferred to a hot bed and allowed to cool and then conveyed to the rail finishing building and run through a straightening machine.

It has been found in actual practice that rails which are allowed to cool quickly on the hot bed very often fail in service on account of shatter cracks which are formed therein during the quick cooling operation. To prevent the formation of shatter cracks in the rails they are now allowed to cool to about 932° F. on the hot bed and then transferred to cooling boxes or tanks where they are allowed to remain and cool slowly for about twenty-four hours or until cold.

When the rails reach the proper temperature on the hot bed, they are pushed off preferably five at a time onto a roller feed table which advances the rails to a work receiving table opposite the cooling boxes, of which twelve are shown, all in one line, five on one side of the work receiving table and seven on the other.

When the rails are on the hot bed and when they are advanced to the work receiving table adjacent to the cooling boxes they are supported on their sides in the position shown in Figure 3; this is desirable for the reason that when rails are shifted supported on their bases the flanges of the rails which are comparatively thin have a tendency to ride over each other and become twisted. In order to align the rails properly in parallel relation with the cooling boxes, the rails have to be righted or turned substantially a quarter of a revolution with their heads uppermost as indicated in Figure 4. The five rail sections now seated on their bases are then picked up by means of a pair of magnets which are suspended near each end of the rail sections from an overhead traveling crane and charged into one of the cooling boxes. Each cooling box is wide enough to receive a row of ten rail sections. After the first row has been charged into a cooling box additional rows are superimposed thereon until the cooling box is filled and a cover is then placed over the top of the same. After the rails have been cooled slowly in the manner described, they are taken out of the cooling boxes five at a time by means of the magnets and then turned on their sides, as indicated in Figure 3, but with their heads extending in the reverse direction and conveyed to a gagging press where the rails are finally straightened and then conveyed to the rail shipping yard.

Heretofore this turning and aligning the rail sections before charging them into the cooling boxes and after the controlled cooling operation has been done manually which required considerable time and labor as the rails are very heavy and hard to manipulate, especially when the rails are hot. With my device I can automatically turn and align a plurality of rail sections whereby the time required for this operation is greatly reduced and manual labor for performing this operation eliminated.

One of the objects of my invention relates to the manner of automatically turning a plurality of rail sections or the like disposed on their sides and supported on a work receiving table to an upright position resting on their bases with their heads uppermost.

Another object of my invention relates to the means for supporting a plurality of rail sections on their bases above the work receiving table just after they have been taken out of the cooling boxes.

A further object of my invention relates to the mechanism for turning the rail sections on their sides and depositing them on the work receiving table after the controlled cooling operation.
Other objects and details of my invention will hereinafter appear.

Having thus given a general description of my invention, I will now, in order to make the same more clear, refer to the accompanying four sheets of drawings forming a part of this specification and in which like characters refer to like parts. Figure 1 is a diagrammatic view of a rail treating plant showing the general arrangement of the cooling boxes for the controlled cooling of rails and the parts of the mill adjacent thereto;

Fig. 2 is a top view of the roller work receiving table located between the cooling boxes and the rail manipulating device associated therewith;

Fig. 3 is an end elevation with parts in section of the roller work receiving table and a portion of the rail manipulating device taken on the line 3–3 of Fig. 2, but drawn on a larger scale with the rails supported on their sides on the work receiving table in the position they assume when they are received from the hot bed;

Fig. 4 is an elevation also taken on the line 3–3 of Fig. 2, showing the position of the rails after they have been pushed laterally off the roller work receiving table over the arc-shaped plates at the forward ends of the slide rails onto the link belt chain conveyors whereby the rails are rotated a quarter of a revolution and seated on their bases and advanced to the stops to align the rails;

Fig. 5 is a detail longitudinal section through the forward end of one of the sliding bars taken on the line 5–5 of Fig. 7, showing more clearly the manner of mounting the pusher fingers;

Fig. 6 is a transverse section taken on the line 6–6 of Fig. 2; and

Fig. 7 is a top plan view of a portion of one of the rail manipulators drawn on a larger scale.

Referring now to the various characters of reference upon the drawings, the numeral 1 designates the portion of the roller table leading from the rolling mill, upon one portion of which (not shown) the rail is received after the finishing roll pass and cut into lengths and each section given a slight camber to compensate for contraction during the cooling operation. The rail sections are then pushed or transferred lying on their sides onto the hot bed 2, where they remain until they reach the proper desired temperature; they are then pushed off preferably five at a time onto the roller table 3 and advanced still resting on their sides to the work receiving table 4 located between the cooling boxes 5, as shown in Fig. 3. As illustrated in Fig. 1, seven cooling boxes are located on one side of the work receiving table and five on the other, this number may be varied if desired. Before charging the rail sections 8 into the cooling boxes they have to be turned with their heads uppermost and resting on their bases and then aligned. This is accomplished by manipulating means in which the numeral 7 indicates a pair of spaced rails mounted on supports 8 near the end of each of the work receiving table 4. Each pair of spaced rails 7 are adapted to form a sliding way for a sliding bar 9 each having a rack 10 on its lower surface meshing with a pinion 11 on shaft 12 adapted to be rotated by means of a motor 13. A pusher finger 14 is pivoted as at 16 in a recess 16 in the forward end of each sliding bar 9 having a downwardly weighted extension 17 for normally holding the pusher finger in a vertical position.

Fig. 3 illustrates the rail sections 6 disposed on their sides and the forward end of the slide bar in the retracted position. When it is desired to turn the rail sections so the ends will be uppermost, the sliding bars are advanced until the pusher finger 14 pivoted to each sliding bar engages the head of the rail adjacent thereto, and as the sliding bars are advanced the rail sections are pushed over the arc-shaped surface 18 of the plates 19 secured to forward end of one of each of the pairs of rails 7 and thereby each of the rail sections is turned substantially a quarter of a revolution and seated on the pair of spaced rails 20 which carries them laterally until they engage the stops 21.

In order to support the central portion of the rails a skid 22 is secured to support 23 at a point midway between the two sliding bars 8 having a plate 24, with an arc-shaped surface 25 similar to the plates 19 and adapted to assist in turning the rail sections 6.

These link belt chain conveyors each have an idler sprocket wheel 26 at one end having their axles 27 journal in bearings 28 which are backed up by means of a thrust block 29 and a sprocket wheel 30 supports the opposite end of each of the link belt chain conveyors which are mounted on a shaft 31 journal in bearings 32 which is driven by means of a motor 33. A plate 34 is secured to the superstructure 35 for supporting the central upper portion of each of the link belt chains 20.

After the rail sections have been turned and assembled in alignment as indicated in Fig. 4, a magnet is lowered from an overhead traveling crane (not shown) to engage the heads of each of the end portions of the rail sections and they are thereby raised and charged into a cooling box in boxes of ten each, the five rail sections forming half a row.

If the rail sections are not properly aligned after reaching the stationary stops 21, the travel of the link belt chain conveyors can be reversed upon the rail section at the opposite side of the row engages the pivoted stops 36, each having an extension 37 adapted to normally hold the pivoted stops in a vertical position.

After the first row of ten rail sections have been placed in the cooling box the operation is continued by superimposing a plurality of similar rows of rail sections thereon until the cooling box is filled, a cover is then placed over the cooling box and the rails are allowed to cool slowly for about twenty-four hours, or until they have become cold, or cool enough to stand handling. The two magnets suspended from the overhead traveling crane then pick up the rail sections five at a time and transfer them to skids 38 which extend upwardly from each of the sliding bars 9. The rail sections will then be seated on their bases with their heads uppermost in the position illustrated in Fig. 6. The rail sections now have to be turned on their sides. To accomplish this step brackets 39 are secured to each pair of slide rails 7 at an intermediate point and extend upwardly therefrom and are connected together at their upper ends by means of an angle 40. A horizontally extending arm 41 is pivoted centrally at 42 to the brackets, each having an offset forward end 43 adapted to engage a rail section and a rearwardly extended weighted portion 44 adapted to engage a stop 45 for holding the arm normally in a stationary position.

To turn the rail sections on their sides the sliding bars are retracted and in so doing the rail section adjacent to the offset forward end
43 of the arms 41 will be engaged and as the sliding bars continue to slide backwardly the rail sections will pass over the concaved forward ends 46 of the skids 38 and be turned on their sides in a manner similar to that shown in Fig. 3, but with the heads in the reverse direction. The work receiving table will then be actuated by means of the motor 47 and the rail sections will then be advanced to the roller table 3, where they are pushed off into the finishing building 48 and passed through a rolling press (not shown), and then conveyed to the rail shipping yard 49.

For illustration, I have described my invention as adapted for manipulating five rail sections at a time, but I wish it understood that I may vary the number without departing from the spirit of my invention.

Although I have shown and described my invention in considerable detail, I do not wish to be limited to the exact and specific details shown and described, but may use such substitutions, modifications or equivalents thereof, as are embraced within the scope of my invention or as pointed out in the claims.

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

1. A manipulator for rails or the like adapted to be transferred from a hot bed to a cooling box, comprising a roller work receiving table adapted to receive simultaneously a plurality of the rails on their sides from the hot bed, a conveyor adjacent to the roller work receiving table extending transversely thereto, a sliding bar mounted in slide ways extending transversely through the roller work receiving table, a pusher finger pivoted to the slide bar adapted to engage one of the rails to transfer the plurality of rails in succession during the forward stroke of the sliding bar onto the conveyor, and stationary means for automatically turning the plurality of rails in sequence approximately a quarter of a revolution on their axes during the transferring operation.

2. In a manipulator for rails or the like adapted to be transferred from a hot bed to a cooling box, comprising a work receiving table adapted to receive simultaneously a plurality of rails thereon, a transversely extending conveyor adjacent to the work receiving table, sliding bars each having a pusher finger pivoted directly thereto adapted to engage a rail for automatically transferring the plurality of rails in sequence from the work receiving table onto the conveyor during the forward stroke of the sliding bars, and stationary means for automatically turning the plurality of rails approximately a quarter of a revolution on their axes in sequence during the transferring operation.

3. In a manipulator for turning and aligning rails or the like in parallel relation, comprising a work receiving table adapted to receive simultaneously a plurality of rails thereon disposed on their sides, a transversely extending conveyor adjacent to the work receiving table, reciprocating sliding bars extending transversely of the work receiving table, a pusher finger pivoted directly to the forward end of each slide bar for engaging and automatically transversely transferring the plurality of rails during the forward stroke of the sliding bars from the work receiving table onto the conveyor, means between the work receiving table and the conveyor for automatically turning the rails in sequence approximately ninety degrees on their axes to seat said rails on their bases on the conveyor, and means for aligning the rails in parallel relation on the conveyor.

4. In a manipulator for turning and arranging rails or the like in parallel relation adapted to be transferred into a cooling box, comprising a roller work receiving table adapted to receive simultaneously a plurality of rails thereon disposed on their sides, a conveyor extending transversely to the work receiving table, a pair of reciprocating sliding bars associated with the roller work receiving table, a pusher finger pivoted to the forward end of each sliding bar adapted to engage a rail to project the plurality of rails laterally from the roller work receiving table onto the conveyor during the forward stroke of the sliding bars, means between the roller work receiving table and the conveyor for turning the rails in sequence approximately ninety degrees to seat the rails on their bases on the conveyor, means for operating the conveyor to move the plurality of rails transversely of the roller work receiving table on the conveyor, and means for simultaneously transversely aligning the plurality of rails on the conveyor.

5. In a manipulator for turning and aligning rails or the like arranged in parallel relation, comprising a roller work receiving table adapted to receive simultaneously a plurality of rails thereon disposed on their sides, a conveyor adjacent to the work receiving table, a pair of spaced rails each forming a slide way extending transversely between the rollers near the opposite ends of the roller work receiving table, a reciprocating sliding bar between each pair of spaced rails, a vertically disposed plate having an arc-shaped edge extending from the forward end of each of the pair of spaced rails forming the slide ways, a pusher finger pivoted to the forward end of each sliding bar adapted to engage a rail to project the plurality of rails laterally from the roller work receiving table over the arc-shaped edges of the plates to turn the rails with their heads uppermost and seat them with their bases on the conveyor, means for operating the conveyor, and stops adjacent to each end of the conveyor for transversely aligning the plurality of rails in parallel relation.

6. In a device of the character described for rails or the like adapted to be transferred from a hot bed to a cooling box, means for advancing a plurality of rails to a work receiving table, a conveyor extending transversely to the movement of the rails on the work receiving table, sliding bars reciprocating transversely through the work receiving table each having a pusher finger pivoted directly thereto for engaging and transferring the rails from the work receiving table onto the conveyor during the forward stroke of the sliding bars, means for turning the rails successively approximately ninety degrees during the transferring operation, and means for simultaneously transversely aligning the rails in parallel relation on the conveyor.

7. In a device of the character described, comprising a work receiving table adapted to receive simultaneously a plurality of rails thereon, a sliding bar mounted in a slide way near each end of the work receiving table and extending transversely through the upper portion thereof, a conveyor adjacent to the work receiving table adapted to simultaneously convey the rails at right angles to the line of travel of the rails on the work receiving table, means for reciprocating the sliding bars, a pusher finger pivoted to the for-
ward end of each sliding bar adapted to engage the rails on the table and project them laterally by one continuous stroke of the sliding bars over an arc-shaped surface to turn the plurality of rails in sequence approximately ninety degrees and deposit them directly on the conveyor, and stops for arranging the rails in parallel relation on the conveyor.

8. In a manipulator for turning and arranging a plurality of rails or the like in parallel relation, comprising a work receiving table adapted to receive simultaneously a plurality of rails thereon, a conveyor adjacent to the work receiving table and extending at right angles thereto, a pair of spaced rails extending transversely through the upper portion of the work receiving table near each end, a sliding bar between each pair of spaced rails, means for reciprocating the sliding bars, a pusher finger pivoted to the forward end of each sliding bar adapted to engage and simultaneously push the plurality of rails laterally off the work receiving table directly onto the conveyor, means for rotating the rails approximately by a quarter of a revolution on their axes during the transferring operation and means for arranging the plurality of rails in parallel relation on the conveyor.

9. In a manipulator for turning and arranging a plurality of rails or the like in parallel relation, comprising a work receiving table adapted to receive simultaneously a plurality of rails thereon, a pair of spaced conveyors adjacent to the work receiving table and extending at right angles thereto, a pair of spaced rails extending transversely through the work receiving table near each end, a sliding bar between each pair of spaced rails, means for reciprocating the slide bars, a pusher finger pivoted to the forward end of each sliding bar adapted to engage and push the plurality of rails laterally off the work receiving table onto the conveyor, a plate having a convex edge secured to the forward end of each of the pair of spaced rails adapted to rotate the plurality of rails approximately ninety degrees on their axes as they pass from the work receiving table to the conveyor, and a stop near each end of the conveyors for arranging the plurality of rails in parallel relation thereon.

10. In a manipulator for rails or the like adapted to be transferred from a hot bed to a cooling box, comprising a work receiving table adapted to receive simultaneously a plurality of rails thereon, a pair of spaced link belt conveyors adjacent to the work receiving table, reciprocating slide bars each having a pusher finger for engaging and transferring the rails during one continuous stroke of the slide bars from the work receiving table to the spaced link belt conveyors, means for automatically turning the rails successively approximately ninety degrees on their axes during the transferring operation, and a stop at the opposite end of each of the spaced link belt conveyors for arranging the plurality of rails in parallel relation on the spaced link belt conveyors.

11. In a manipulator for rails or the like adapted to be transferred from a hot bed to a cooling box, comprising a work receiving table, a pair of spaced link belt conveyors adjacent to the work receiving table and extending at right angles thereto, means for transferring the rails from the work receiving table to the spaced link belt chain conveyors, vertically extending plates having convex edges for automatically extending plates having convex edges for automatically turning the rails approximately ninety degrees on their axes during the transferring operation, a fixed stop at one end of each of the link belt chain conveyors and a pivoted stop at the opposite end thereof adapted to engage the rails to arrange them in parallel relation on the said conveyors.

12. In a manipulator for turning and arranging a plurality of rails or the like in parallel relation adapted to be transferred into a cooling box, comprising a work receiving table adapted to receive simultaneously a plurality of rails thereon, a pair of spaced link belt conveyors, adjacent to the work receiving table and extending at right angles thereto, a pair of spaced rails adapted to form a slide way extending transversely through the upper portion of the work receiving table near each end, a sliding bar between each pair of spaced rails, means for reciprocating the sliding bars, a pusher finger pivoted to the forward end of each sliding bar adapted to engage and push the plurality of rails laterally off the work receiving table onto the link belt conveyors, a vertically disposed plate having a convex edge secured to the forward end of one of each of the pair of spaced rails and adapted to rotate the plurality of rails approximately ninety degrees on their axes as they pass from the work receiving table to the link belt conveyors, and a stop near each end of the link belt conveyors for arranging the plurality of rails thereon in parallel relation.

13. In a manipulator for rails or the like adapted to be transferred from a hot bed to a cooling box, comprising a work receiving table adapted to receive simultaneously a plurality of rails thereon, a pair of spaced link belt conveyors adjacent to the work receiving table and extending at right angles thereto, a pair of spaced rails adapted to form a slide way extending transversely through the work receiving table near each end, a sliding bar between each pair of spaced rails, means for reciprocating the sliding bars, a transversely extending skid adapted at an intermediate point between the spaced rails for supporting the central portion of the plurality of rails, a pusher finger pivoted to the forward end of each sliding bar adapted to engage and push the plurality of rails laterally off the work receiving table onto the link belt conveyors, a vertically disposed plate having a convex edge secured to the forward end of each of each of the pair of spaced bars and the skid adapted to rotate the plurality of rails approximately ninety degrees on their axes as they pass from the work receiving table to the link belt conveyors, and a stop near each end of the link belt conveyors for arranging the plurality of rails thereon in parallel relation.

14. In a manipulator for turning and arranging a plurality of rails or the like for conveying, comprising a work receiving table adapted to receive rails thereon, slideways extending transversely through the work receiving table, a sliding bar mounted in each slideway, means for reciprocating the sliding bars, and means for rotating the plurality of rails substantially ninety degrees on their axes during the reciprocation of said sliding bars.

STEWART W. BAUER.
CERTIFICATE OF CORRECTION.


STEWART W. BAUER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, second column, lines 2 and 3, claim 11, strike out "extending plates having convex edges for automatically"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 14th day of April, A. D. 1942.

Henry Van Arsdale,
Acting Commissioner of Patents.