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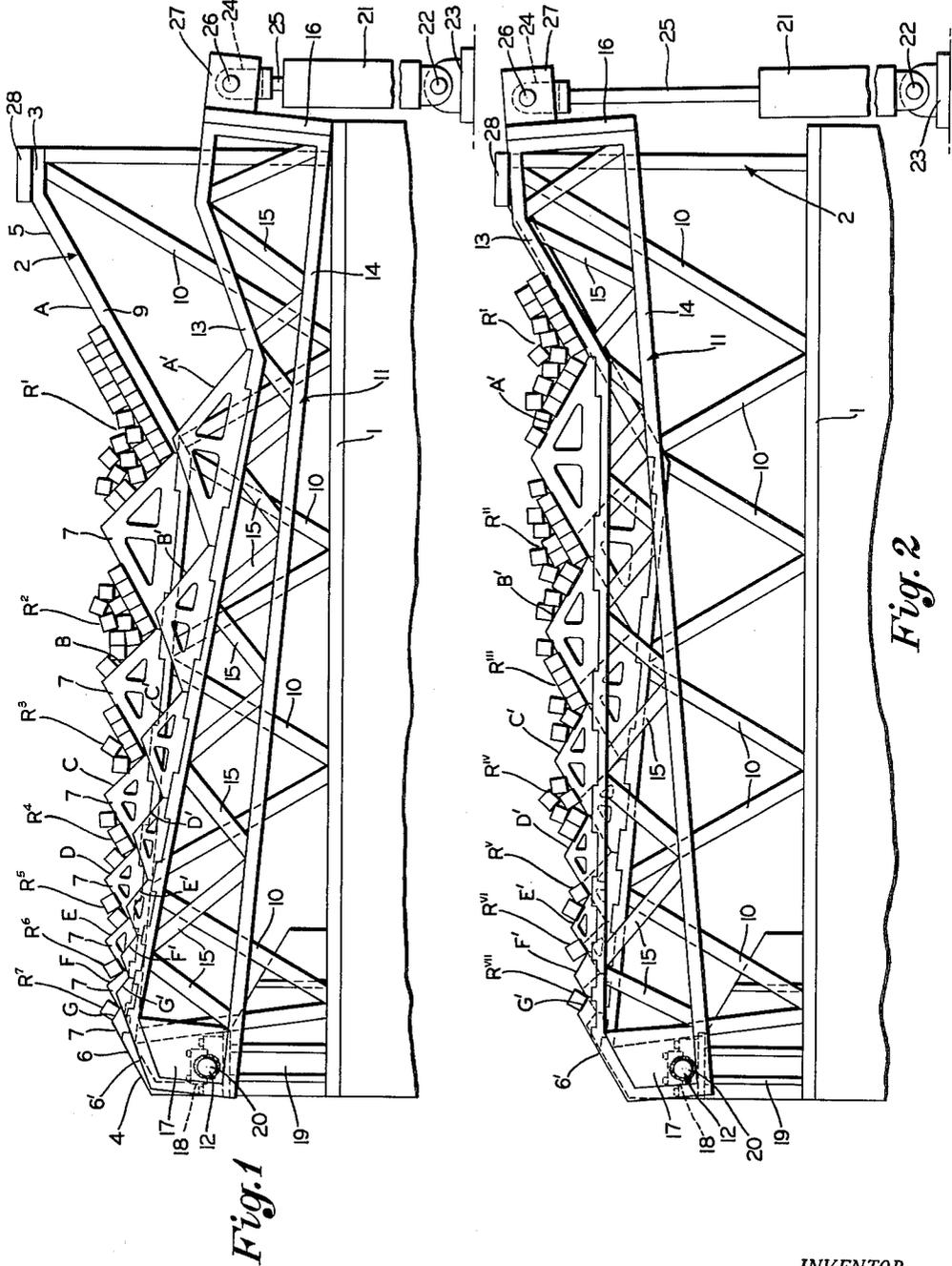
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2,995,235

APPARATUS FOR UNSCRAMBLING AND SEPARATING BARS

Filed July 10, 1959

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

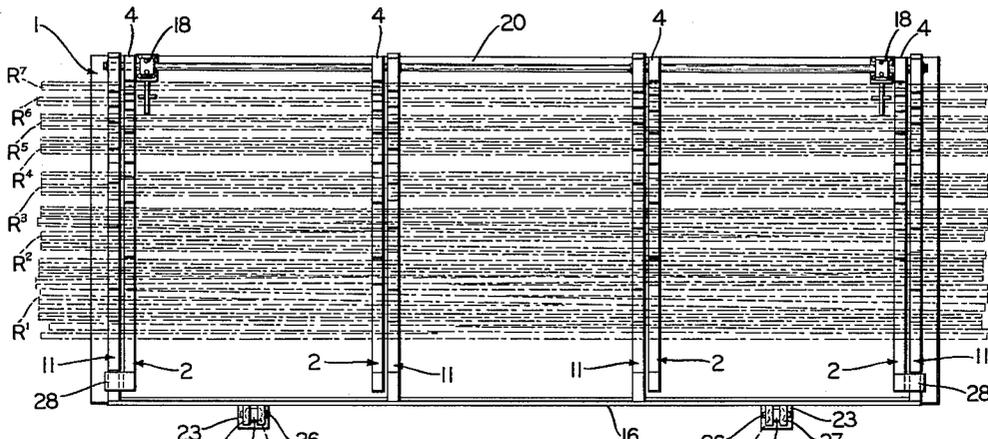


Fig. 3

Fig. 4

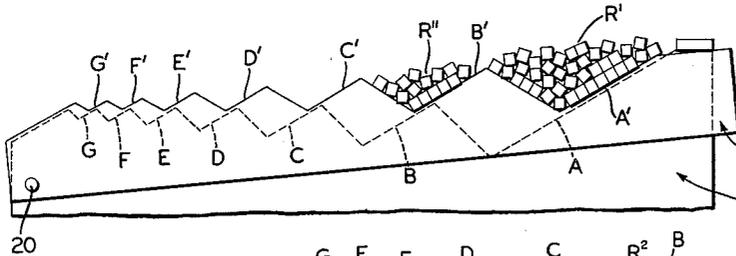
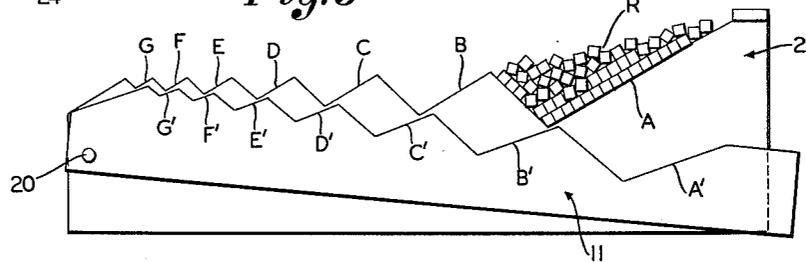


Fig. 5

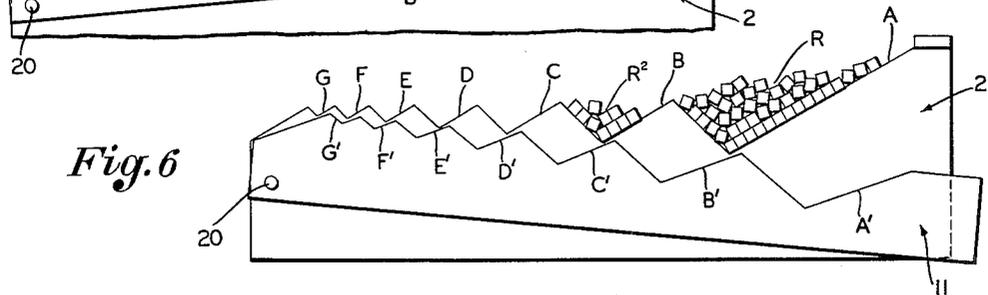


Fig. 6

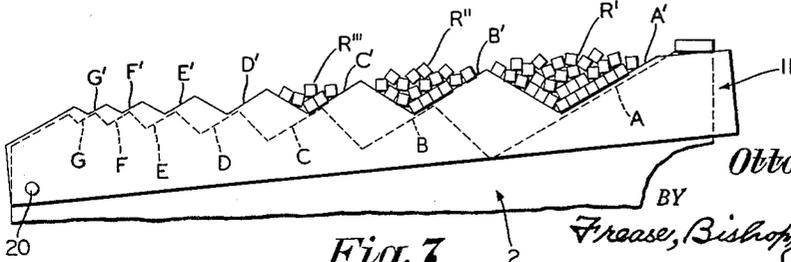


Fig. 7

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APPARATUS FOR UNSCRAMBLING AND SEPARATING BARS

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4 Claims. (Cl. 198-29)

The invention relates to apparatus for handling metal bars and the like, and more particularly to an apparatus for unscrambling and separating a bundle of bars and discharging them one at a time.

Steel bars and the like, after being produced in a rolling mill, are piled in bundles, usually comprising a considerable number of bars. These piles or bundles of bars are frequently more or less scrambled in the manner of jackstraws.

For the purpose of performing subsequent operations upon the bars, such as inspection, scarfing and the like, it is necessary that these piles or bundles of bars be unscrambled and separated and removed one at a time from the piles or bundles.

Owing to the considerable length and weight of such bars, and the scrambled condition of the piles or bundles thereof, this is a difficult and dangerous operation, which is usually accomplished manually under present steel mill practice.

Although some attempts have been made to unscramble and separate such piles of bars mechanically, there is no satisfactory apparatus in actual use for performing such unscrambling and separation of the piles or bundles of bars.

It is a primary object of the invention to provide an apparatus for receiving a scrambled pile or bundle of bars, and for quickly and readily unscrambling and separating the bars and discharging them one at a time therefrom.

Another object of the invention is to provide an apparatus of the character referred to including a plurality of spaced stationary rails having laterally aligned series of notches of progressively decreasing size in their upper surfaces, with means for continuously moving the bars from each set of notches to the next smaller notches in said rails.

A further object of the invention is to provide such an apparatus in which the bars are moved in progressively decreasing numbers from each set of notches to the next smaller notches and are finally discharged one at a time from the apparatus.

A still further object of the invention is to provide an apparatus of this character in which the bars are separated and moved through the notches in the stationary rails by means of vertically movable rails having similarly shaped notches in their upper surfaces.

Another object of the invention is to provide an apparatus of the character referred to in which the notches in the movable rails are staggered relative to the notches in the stationary rails.

A further object of the invention is to provide such an apparatus in which the movable rails are fulcrumed at the forward or discharge end of the apparatus, and means is provided for oscillating the movable rails relative to the stationary rails.

The above and other objects, apparent from the drawings and following description, may be attained, the above described difficulties overcome and the advantages and results obtained, by the apparatus, construction, arrangement and combinations, sub-combinations and parts which comprise the present invention, a preferred embodiment of which, illustrative of the best mode in which applicant

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has contemplated applying the principle, being set forth in detail in the following description and illustrated in the accompanying drawings.

The invention may be briefly described in general terms as comprising a base upon which are mounted a laterally spaced plurality of stationary rails having aligned series of notches of progressively decreasing size from the charging end of the apparatus to the discharge end thereof.

Cooperating with the stationary rails is a plurality of movable rails having similar notches in their upper surfaces. The notches in the movable rails are located somewhat rearwardly of the similar notches in the stationary rails, so that with each upward and downward movement of the movable rails, a portion of the bars are removed from each set of notches in the stationary rails and moved to the next smaller set of notches therein.

The movable rails are fulcrumed at the forward or discharge end of the apparatus, and fluid cylinders are operatively connected to the rear ends of the movable rails, so as to oscillate them between a position below the stationary rails and a position thereabove.

A bundle or pile of rods is deposited, crosswise of the stationary rails, in the largest notches at the charging end thereof. The movable rails are then oscillated, moving progressively decreasing numbers of the bars from each set of notches in the stationary rails to the next smaller set of notches, thus unscrambling and separating the bars and finally discharging them one at a time from the discharge end of the apparatus.

Having thus briefly described the invention, reference is now made to the accompanying drawings showing a preferred embodiment of the invention, in which;

FIG. 1 is a side elevation of the apparatus, with bars in progressively decreasing numbers from the charging end to the discharge end thereof, the movable rails being in the lowered position;

FIG. 2 is a view similar to FIG. 1, with the movable rails in raised position;

FIG. 3 is a top plan view on a smaller scale;

FIG. 4 is a diagrammatic view showing the apparatus with a bundle of rods located in the largest notches in the charging end of the stationary rails, with the movable rails in lowered position;

FIG. 5 is a similar view, with the movable rails in raised position, showing some of the rods separated from the bundle and located in the second set of notches in the movable rails;

FIG. 6 is a similar view, with the movable rails returned to lowered position, showing some of the rods separated from the bundle and located in the second set of notches in the stationary rails;

FIG. 7 is a similar view, showing the next step in the operation of the apparatus, with the movable rails again in raised position and some of the rods received in the third set of notches therein,

FIG. 8 is a similar view, showing the movable rails returned to lowered position and some of the rods located in the third set of notches in the stationary rails;

FIG. 9 is a similar view, showing the movable rails again raised and some of the rods received in the fourth set of notches therein;

FIG. 10 is a similar view, showing the next step in the operation of the apparatus, with the movable rails returned to lowered position and some of the rods received in the fourth set of notches in the stationary rails;

FIG. 11 is a similar view, showing the movable rails again in raised position and some of the rods received in the fifth set of notches therein;

FIG. 12 is a similar view, showing the movable rails returned to lowered position with some of the rods de-

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posited in the fifth set of notches in the stationary rails;

FIG. 13 is a similar view with the movable rails again in raised position and one of the rods received in the next to the last set of notches therein; and,

FIG. 14 is a similar view with the movable rails returned to lowered position and said one rod deposited in the next to the last set of notches in the stationary rails.

Referring now more particularly to the embodiment of the invention illustrated in the drawings, in which similar reference characters refer to similar parts throughout, the apparatus may be of the general construction shown in FIGS. 1 to 3, being mounted upon a horizontal base plate or pad 1, of a length sufficient to permit the handling of the largest rods, bars, tubes and the like, and of suitable width to provide for the necessary unscrambling and separating operations of the apparatus.

A plurality of laterally spaced stationary rails, indicated generally at 2, are fixed upon the top of the base plate or pad 1, these stationary rails being of sufficient length to permit a pile or bundle of rods or the like to be deposited upon the charging ends thereof and to be unscrambled and completely separated as they are advanced upon said rails, and discharged one at a time from the discharge ends thereof.

For the purpose of the invention, each of these stationary rails is provided in its upper surface with a series of substantially V-shape notches of progressively decreasing size from the charging end to the discharge end of the rail.

The number and size of these notches may vary, depending upon the cross-sectional size of the bars to be separated in the apparatus. The embodiment of the invention illustrated in the drawings is adapted for separating bars of two-inch cross section, and for this purpose a series of seven notches in each rail has been found desirable.

These notches are indicated at A, B, C, D, E, F and G, progressively decreasing in size from the charging end 3 to the discharge end 4 of each stationary rail 1. The largest notch A, at the charging end of the rail, has one edge 5 extending upwardly and rearwardly to the charging end of the rail, and of considerably greater length than the other edge of this notch. This provides sufficient surface within the notches A to receive a bundle or pile of a considerable number of bars. As shown in FIG. 1, the rear edge of each of the succeeding notches B to G may be slightly longer than the forward edge thereof.

Beyond the last or smallest notch G, of each of the stationary rails 2, the top edge of the rail is inclined downwardly and forwardly as indicated at 6, for the purpose of discharging the bars one at a time from the apparatus.

Owing to the continual movement of the bars through the notches in the rails 2, the edges of the rails forming the notches are subjected to considerable wear which rapidly deforms their edges. In order to compensate for this wear, the edges of the rails forming the notches may be reinforced.

As shown in the drawings, this may be accomplished by providing removable triangular blocks of hardened steel, as indicated at 7, forming hardened edges for the several notches. Thus, when there is considerable wear at any point along the edges of the rails, the worn block or blocks may be removed and replaced, without the necessity of removing and replacing an entire rail. This results in a considerable saving in material and labor.

For the purpose of reducing the weight of the apparatus, the stationary rails 2 may be of fabricated structural design, each rail comprising a top chord member 9 supported by web struts 10 connected at their lower ends to the base plate or pad 1.

A vertically movable rail, indicated generally at 11, is associated with each of the stationary rails 2. These

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movable rails are preferably arranged to oscillate up and down relative to the stationary rails 2. For this purpose, the movable rails are preferably fulcrumed at their forward or discharge ends, as indicated generally at 12.

For the purpose of reducing the weight of the apparatus, the movable rails may also be of fabricated structural design. Each movable rail may comprise the top and bottom chord members 13 and 14 respectively, connected by the web struts 15. An elongated bar 16 is shown connected to the chord members 13 and 14 of all of the movable rails at the rear ends thereof, and a plate 17 is connected to the chord members at the forward end of each movable rail.

Bearing members 18 are supported upon bracket supports 19, extending upward from the base plate 1, and a shaft 20 is journaled therein. This shaft is shown extending through and welded to the front plates 17 of the movable rails, forming a fulcrum around which the movable rails may be oscillated.

Each of the movable rails is provided with a series of notches corresponding to the notches in the stationary rails, but staggered relative thereto, and indicated at A', B', C', D', E', F' and G'. As best shown in FIGS. 1 and 2, the notches in the movable rails are located rearwardly of the corresponding notches in the stationary rails.

For the purposes of oscillating the movable rails 11, any suitable power means may be operatively connected to the rear ends thereof. This means is shown as comprising one or more upright fluid cylinders 21, each cylinder being pivotally connected at its lower end as at 22 to a stationary support 23.

Ears 24 are formed at the upper end of the piston 25 and are pivoted at 26 to the ears 27 on the bar 16. Thus, when the cylinders 21 are operated, the movable rails 11 are moved in unison from the lowered position shown in FIG. 1 to the raised position shown in FIG. 2.

For the purpose of limiting the upward movement of the movable rails, relative to the stationary rails, stop lugs 28 are provided on the upper rear portions of at least some of the stationary rails. These stop lugs are laterally disposed in the path of the rear end portions of the movable rails, so as to be contacted thereby, as shown in FIG. 2, to limit the upward movement of the movable rails.

In the operation of the apparatus, with the parts in the position shown in FIG. 4, with the movable rails in lowered position, a bundle or pile of rods as indicated at R, is placed across the charging ends of the stationary rails 2, and deposited in the largest notches A at the charging ends of the rails. The bundle of rods may be conveyed to the apparatus in any customary manner, as by a chain sling suspended from a crane or hoist.

Usually bundles of rods handled in this manner become scrambled, at least a portion of the rods being criss-crossed in the manner of jackstraws, as indicated in FIG. 3. In the operation of the apparatus, as hereinafter described, the rods are unscrambled and separated and moved progressively forward through the apparatus.

The cylinders 21 are now operated to continuously oscillate the movable rails upward and downward between positions below the stationary rails to positions thereabove, and with each complete reciprocation of the movable rails, a portion of the bars are picked up from each set of notches in the stationary rails and deposited in the next set of notches therein.

Upon the first upward movement of the movable rails 11, as shown in FIG. 5, the major portion of the bundle of rails R are picked up by the notches A' of the movable rails, as indicated at R', and the remainder thereof are picked up by the notches B', as indicated at R''.

Then upon the downward movement of the movable

rails, as shown in FIG. 6, the rods R' from the notches A' of the movable rails, and a portion of the rods R'' from the notches B' are redeposited in the notches A of the stationary rails, as indicated at R in FIG. 6, while the remainder of the rods R'' from the notches B' of the movable rails are moved forwardly to the notches B of the stationary rails, as indicated at R² in FIG. 6.

Upon the next upward movement of the movable rails, as shown in FIG. 7, some of the rods R from the notches A of the stationary rails are picked up by the notches A' of the movable rails as indicated at R' in FIG. 7, while the remainder of the rods from the notches A and some of the rods R² from the notches B of the stationary rails are picked up by the notches B' of the movable rails, as indicated at R''. The remainder of the rods R² from the notches B of the stationary rails are picked up by the notches C' of the movable rails, as indicated at R''' in FIG. 7.

As the movable rails 11 again move down to the position shown in FIG. 8, the rods R' from the notches A' and some of the rods R'' from the notches B' of the movable rails are deposited in the notches A of the stationary rails, as indicated at R in FIG. 8. The remainder of the rods R'' from the notches B' and some of the rods R''' from the notches C' of the movable rails are deposited in the notches B of the stationary rails, as indicated at R², while the remainder of the rods R''' from the notches C' in the movable rails are advanced to the notches C of the stationary rails, as indicated at R³ in FIG. 8.

Then as the movable rails again move up to the position shown in FIG. 9, the bars R, R² and R³ in the notches A, B and C respectively of the stationary rails, are manipulated by the notches A', B' and C' of the movable rails in the manner above described, and the same reference characters indicate the locations thereof. At the same time, some of the bars R³ from the notches C of the stationary rails are picked up by the notches D' of the movable rails, as indicated at R^{IV} in FIG. 9.

Upon the next downward movement of the movable rails 11, as shown in FIG. 10, the bars R', R'' and R''' from the notches A', B' and C' of the movable rails are redistributed in the manner above described in the notches A, B and C of the stationary rails, in the manner above described in detail, and the positions thereof are indicated by the same reference characters.

At the same time, some of the rods R^{IV} from the notches D' of the movable rails are deposited in the notches D of the stationary rails, as indicated at R⁴ in FIG. 10.

As the movable rails again move upward to the position of FIG. 11, the bars R, R² and R³ in the notches A, B and C respectively of the stationary rails are manipulated by the notches A', B' and C' of the movable rails in the manner above described, and the same reference characters indicate the locations thereof.

At the same, at least a portion of the rods R⁴ from the notches D of the stationary rails are picked up by the notches E' of the movable rails, as indicated at R^V in FIG. 11.

As the movable rails again move downward to the position of FIG. 12, the rods R', R'' and R''' and R^{IV} from the notches A', B', C' and D' respectively of the movable rails are redeposited in the notches A, B, C and D of the stationary rails as indicated at R, R², R³ and R⁴ in the manner above described in detail, while the rods R^{IV} from the notches E' of the movable rails are deposited in the notches E of the stationary rails, as indicated at R⁵ in FIG. 12. It will be seen that at this point there are only two or three rods as indicated at R⁵ in the notches E of the stationary rails.

Upon the next upward movement of the movable rails, as shown in FIG. 13, one of the rods R⁵ from the notches E of the stationary rails is picked up by the notches F' of the movable rails as indicated at R^{VI} in FIG. 13. At the same time, the bars in the preceding notches in the stationary rails are manipulated by the notches in the mov-

able rails, as described above in detail, and the locations thereof are indicated by the same reference characters.

As the movable rails again move down to the position of FIG. 14, the bar R^{VI} from the notches F' of the movable rails is deposited in the notches F of the stationary rails, as indicated at R⁵ in FIG. 14. The remaining bars are redistributed in the preceding notches of the stationary rails in the manner above described in detail and their locations are indicated by the same reference characters.

Upon the next upward movement of the movable rails, as shown in FIG. 2, the single bar R⁶ from the notches F of the stationary rails is picked up by the notches G' of the movable rails, as indicated at R^{VII} in FIG. 2. The manipulation of the bars in the preceding notches is the same as above described.

Then, upon downward movement of the movable rails, the bar R^{VII} from the notch G' of the movable rails is deposited in the notches G of the stationary rails as indicated at R⁷ in FIG. 1. The advancement of the other bars through the notches A through F of the stationary rails is the same as above described.

Upon the next upward movement of the movable rails, it will be seen that the single bar R⁷ will be raised out of the notches G of the stationary rails, by the inclined surfaces 6' of the movable rails, and will be discharged down the inclined surfaces 6 of the stationary rails.

The operation may be continued until all of the bundle of bars R in the stationary notches A at the discharging end of the stationary rails have been unscrambled, separated and advanced through the notches B to G of the stationary rails and discharged one at a time from the apparatus.

Bundles of rods may thus be unscrambled, separated and discharged one at a time from the apparatus as a batch operation, or, if desired, additional bundles of rods may be charged into the largest notches A of the stationary rails, from time to time, during operation of the apparatus, so that the operation may be continuous.

From the above it will be evident that a simple and efficient apparatus is provided for unscrambling and separating bars and advancing them progressively through the series of notches of progressively decreasing size in the stationary rails, by the vertical movement of the movable rails having correspondingly shaped notches for progressively advancing the bars through the notches of the stationary rails.

Although the invention is illustrated as adapted for unscrambling and separating bars of square cross section and discharging them one at a time from the apparatus, it should be understood that the invention is equally applicable for the unscrambling and separating of bars of round or other cross-sectional shape, tubes and the like, and discharging them one at a time in the manner above described.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of example, and the scope of the present invention is not limited to the exact details of construction.

Having now described the invention or discovery, the construction, the operation, and use of preferred embodiments thereof, and the advantageous new and useful results obtained thereby, the new and useful construction, and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.

I claim:

1. Apparatus for unscrambling and separating bars and the like, said apparatus comprising spaced pairs of substantially horizontal rails each having a series of sub-

stantially V-shape notches of progressively decreasing depth and width from the charging end to the discharge end thereof, the notches in one rail of each pair being staggered relative to the notches in the other rail of said pair, and means for moving the rails of each pair up and down only relative to each other for moving bars and the like in progressively decreasing quantities through the notches of progressively decreasing depth and width and discharging them one at a time from the discharge ends of the rails, the bars and the like being moved through the notches and discharged from the rails solely by the relative up and down movement of the rails.

2. Apparatus for unscrambling and separating bars and the like, said apparatus comprising spaced pairs of substantially horizontal stationary rails each having a series of substantially V-shape notches of progressively decreasing depth and width from the charging end to the discharge end thereof, the notches in one rail of each pair being staggered relative to the notches in the other rail of said pair, fixed pivot means pivoting the discharge ends of the rails of each pair together, and means for moving the rails of each pair upon said fixed pivot means up and down relative to each other for moving bars and the like in progressively decreasing quantities through the notches of progressively decreasing depth and width and discharging them one at a time from the discharge ends of the rails, the bars and the like being moved through the notches and discharged from the rails solely by the relative up and down movement of the rails of each pair.

3. Apparatus for unscrambling and separating bars and the like, said apparatus comprising spaced substantially horizontal stationary rails each having a series of substantially V-shape notches of progressively decreasing depth and width from the charging end to the discharge end thereof, spaced movable rails each having a corresponding series of substantially V-shape notches of progressively decreasing depth and width, the notches in the stationary rails being located in advance of the corresponding notches in the movable rails, pivot means fixed relative to the stationary rails, the discharge ends of the

movable rails being pivoted upon said fixed pivot means, and means for moving the movable rails upon said fixed pivots up and down relative to the stationary rails for moving bars and the like in progressively decreasing quantities through the notches of progressively decreasing depth and width and discharging them one at a time from the discharge ends of the rails, the bars and the like being moved through the notches and discharged from the rails solely by the up and down movement of the movable rails.

4. Apparatus for unscrambling and separating bars and the like, said apparatus comprising spaced substantially horizontal stationary rails each having a series of substantially V-shape notches of progressively decreasing depth and width from the charging end to the discharge end thereof, spaced movable rails each having a corresponding series of substantially V-shape notches of progressively decreasing depth and width, the notches in the movable rails being staggered relative to the notches in the stationary rails, pivot means fixed relative to the stationary rails, the discharge ends of the movable rails being pivoted upon said fixed pivot means, and means for moving the movable rails upon said fixed pivots up and down relative to the stationary rails for moving bars and the like in progressively decreasing quantities through the notches of progressively decreasing depth and width and discharging them one at a time from the discharge ends of the rails, the bars and the like being moved through the notches and discharged from the rails solely by the up and down movement of the movable rails.

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