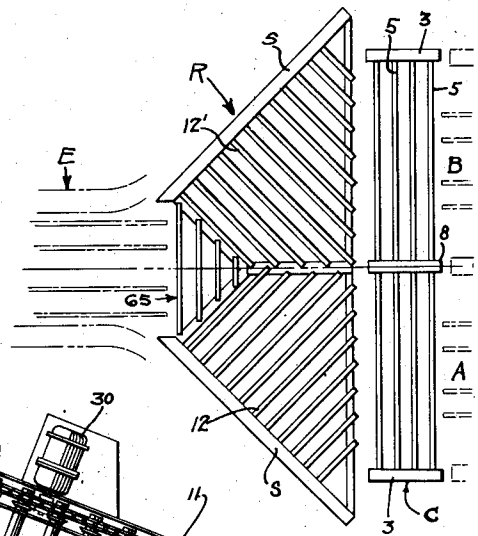
Oct. 17, 1933. C. A. ADAMS 1,931,453

CONVEYING MECHANISM

Filed June 14, 1933 2 Sheets-Sheet 1

FIG. 6



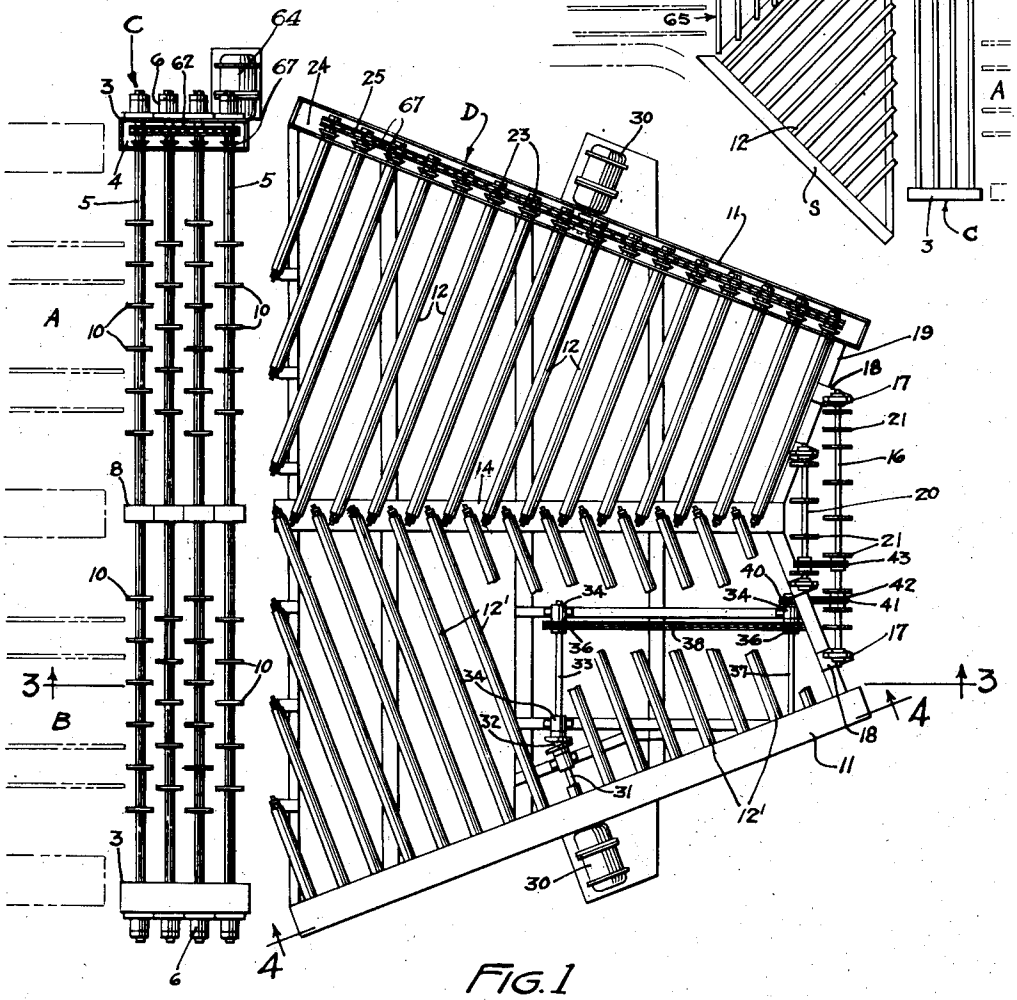


FIG. 1

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CONVEYING MECHANISM

Filed June 14, 1933 2 Sheets-Sheet 2

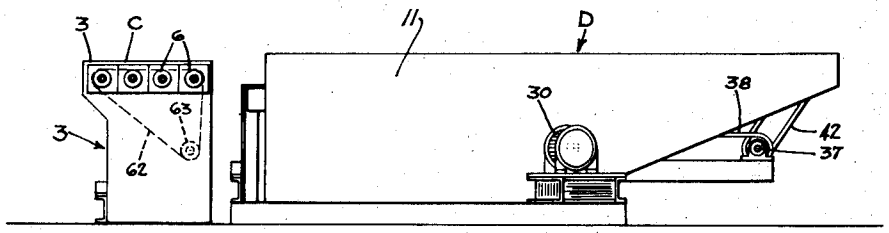


FIG. 2

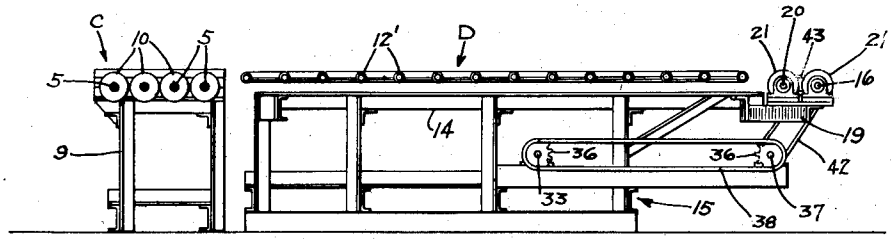


FIG. 3

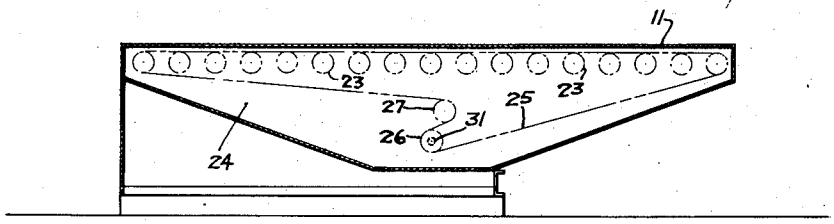


FIG. 4

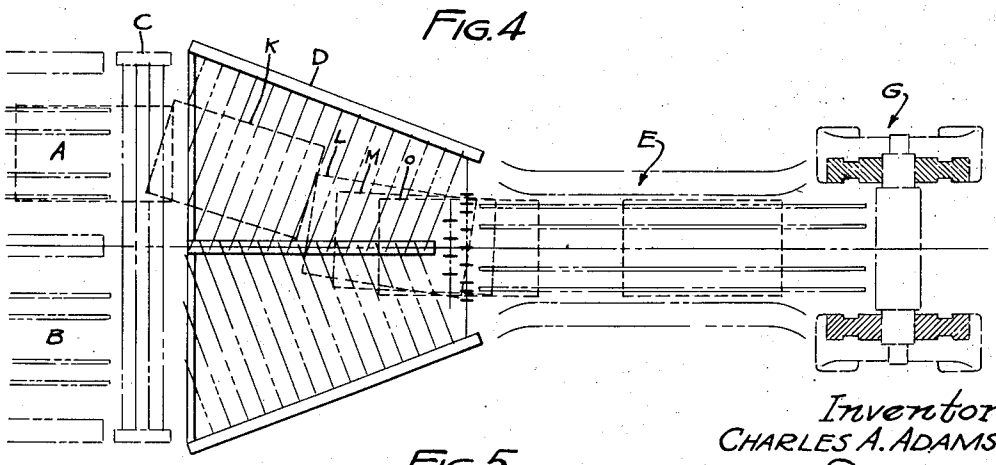


FIG. 5

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UNITED STATES PATENT OFFICE

1,931,453

CONVEYING MECHANISM

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Application June 14, 1933. Serial No. 675,722

8 Claims. (Cl. 198—127)

This invention relates to new and useful improvements in conveying mechanisms, and more particularly to conveyers or runout tables of the herringbone type such as disclosed in the copending application of Martin J. Anderson, filed December 28, 1932, Serial No. 649,202. Tables of this type are particularly adapted for transferring sheets, packs of sheets, bars etc., of various widths and sizes, from the discharge ends of either a double heating furnace or a plurality of heating furnaces, to a means for delivering and feeding the sheets into a rolling mill.

In some mills the furnaces are made of sufficient width to handle very wide sheets, and the same furnaces are also adapted for handling narrow sheets. Rolling mills used in connection with such furnaces may be adapted for rolling sheets of various widths by simply changing the lengths of the mill rolls to correspind to the width of the sheets to be rolled. Such mills comprise the usual mill housings, which are supported upon rails secured to the mill floor or a suitable foundation. The mill housings are bolted to these rails and, by loosening the bolts, the mill housings may be moved laterally. For instance, when rolling wide sheets, both mill housings are moved apart until there is sufficient distance between them to receive rolls of a suitable length for the widest sheets. After being properly positioned to receive the rolls the mill housings are securely bolted to the rails. Each housing is provided with the usual journal boxes or bearings for rotatably supporting the mill rolls. When it is desired to roll narrow sheets the mill housings are moved closer together and shorter rolls, corresponding to the width of the sheets, are used.

To obtain a clearer understanding of the invention, a brief explanation of the present method of manufacturing sheet metal will be given. This method involves certain mechanisms, all of which are well known in the art, and it is therefore thought unnecessary to herein illustrate the same.

In the method of manufacturing sheet metal, for which my table is particularly adapted, the sheets are heated in either a double heating furnace or a plurality of heating furnaces. Each furnace compartment is provided with means for conveying the sheets therethrough. The length of time required to convey the sheets through the furnaces, is determined by the temperature of the furnaces and the required temperature to which the sheets must be raised for rolling. The discharging of the sheets from the furnaces is controlled by an operator or attendant. From the furnaces, the sheets are transferred over a herringbone table to a suitable receiving means, which may be simply a table from which the sheets are transferred manually into a rolling mill; or the receiving means may be the feeder table of a unit commonly known as a feeder catcher table. The feeder table delivers the sheets, one at a time, to the rolling mill, and each sheet is discharged from the rolls of the rolling mill onto an apparatus commonly known as a catcher table. Subsequently, the ends of the feeder and catcher tables adjacent the mill rolls are elevated so that the sheet may be passed back from the catcher table to the feeder table. Then the ends of said tables are lowered and the sheet is again passed through the rolls. This operation continues until the sheet or material has been reduced to the required thickness.

Under the present-day method of manufacturing sheet metal, a single rolling mill is adapted to roll the entire output of two furnaces. The sheets are generally alternately discharged from the furnaces, and are delivered to the rolling mill. Obviously, when the furnace compartments are of sufficient width to handle very wide sheets, and when the distance between the discharge ends of the furnaces and the rolling mill receiving end is relatively short, the receiving end of the herringbone table will be very wide or broad, whereby its sides converge abruptly to the discharge end thereof. In some installations the sides of the herringbone table may have an angle of convergence of 45° or more with respect to the longitudinal centerline of the table. The axes of the load-carrying rollers of each row of rollers of the table are disposed at an angle of approximately 90° to their respective side frame members, which members form the converging sides of the table, and are disposed obliquely to the rollers of the opposite row.

It was found with such tables, designed to transfer sheets at a velocity of from 200 to 250 feet per minute, that momentum would carry the sheets past the centerline of the table at the discharge end thereof, whereby they would not be properly aligned with the receiving means, or feeder table leading to the rolling mill. To overcome this difficulty I have provided a plurality of power operated discharge rollers positioned at an angle of substantially 90° to the longitudinal centerline of the herringbone table, which rollers aid in properly positioning the sheets for delivery onto the table. These rollers act to prevent the sheets from traveling past the longitudinal centerline of the table, and thus cooper-

ate with the skewed rollers of the table to turn each sheet to a position whereby it will be substantially squarely alined with the feeder table, when delivered thereto from the runout table disclosed in this invention.

An important object of this invention, therefore, is to provide in connection with a herringbone type of runout table, a plurality of power operated discharge rollers, disposed at an angle of approximately 90° to the longitudinal centerline of the table, which power operated rollers are situated at the discharge end of the table, and aid in properly positioning the sheets with respect to the longitudinal centerline of the table, whereby the sheets will be accurately delivered onto the feeder table or other receiving means.

A further object of the invention is to provide a plurality of power operated rollers to fill in the V-shaped opening resulting at the discharge end of the herringbone table, as a result of the angular disposition of the load-carrying rollers, whereby a continuous path is provided between the herringbone table and the receiving means.

Other objects of the invention will appear from the following description and accompanying drawings and will be pointed out in the annexed claims.

In the accompanying drawings there has been disclosed an improved construction designed to carry out the various objects of the invention; but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a plan view of a power driven runout table embodying the invention;

Figure 2 is a side elevation of Figure 1;

Figure 3 is a longitudinal sectional view on the line 3—3 of Figure 1, showing the supporting structure and the drive for the power operated rollers at the discharge end of the table;

Figure 4 is a sectional view on the line 4—4 of Figure 1, diagrammatically illustrating the driving means for rotating the load-carrying rollers of the herringbone table;

Figure 5 is a diagrammatic view illustrating my improved runout table interposed between a dual furnace and the feeder table of a rolling mill; and

Figure 6 is a diagrammatic view showing a herringbone table whose receiving end is very wide whereby its sides converge abruptly to the discharge end thereof.

In the selected embodiment of the invention herein disclosed, there is illustrated, for purposes of disclosure, a live roller runout table of the general character disclosed in the pending application hereinbefore referred to. This table, as illustrated in Figures 1 and 5, comprises a stationary live roller receiving section C onto which the sheets or bars are delivered from the furnace A or B. From the section C the sheets are discharged onto a converging live roller section or herringbone table D, over which the sheets or bars are transferred to a single receiving means E, shown interposed between the table D and a rolling mill G. The receiving means indicated at E represents the well-known feeder-catcher unit, commonly employed in connection with rolling mills.

The stationary receiving section C, as shown in Figures 1, 2, and 3, comprises side frame members 3—3, preferably box-shaped in cross-section to provide a chamber 4. A plurality of rollers 5 have their ends rotatably supported in suitable bearings 6, shown secured to the outside plates of the side members 3—3. The intermediate portions of the rollers 5 are supported in suitable bearings 8 secured to a supporting structure, designated generally by the numeral 9 in Figure 3. The rollers 5 are shown consisting of a plurality of tubular members, each having a series of discs 10 welded, or otherwise secured thereto in spaced relation. The discs 10 form the supporting means for the sheets being transferred over the section C, and have the distinct advantage of providing sufficient radiating surface for dissipating heat emanating from the furnaces. If necessary, suitable means, not shown, may be provided for circulating water through the tubular rollers 5 to prevent overheating thereof.

The converging section or herringbone table D, is here shown as comprising side members 11—11, preferably box-shaped in cross-section, as best shown in Figure 4. A plurality of load-carrying rollers 12 and 12′ are arranged in separate rows disposed with their axes at an angle of substantially 90° to their respective side members 11. The two sets or rows of rollers constitute the bed of the table and are angularly disposed with relation to each other. The rollers 12 and 12′ are rotatably supported upon through type, non-rotary axles, the outer ends of which are supported in apertures provided in the outside plates of the side members 11. The inner ends of the said axles are supported by suitable angle clips secured to a center beam 14 which forms part of the supporting structure of the herringbone table D. This supporting structure is indicated generally by the numeral 15, in Figure 3.

An important feature of this invention resides in the means provided at the discharge end of the herringbone table D adapted to cooperate with the load-carrying rollers 12 and 12′ to aline the sheets with the conveyer table or section E, when delivered thereto. The means provided for thus delivering the sheets onto the section E is best shown in Figures 1 and 3, and comprises a plurality of rollers 16 and 20, mounted in suitable bearings 17, shown secured to suitable brackets 18 provided upon the end frame members 19. The rollers 16 and 20 are shown provided with a plurality of spaced discs 21, the upper portions of which are alined with the upper surfaces of the load-carrying rollers 12 and 12′, as shown in Figure 3. The rollers 16 and 20 are arranged at right angles to the longitudinal centerline of the table D, and they are disposed in the V-shaped opening formed in the surface of the herringbone table at its discharge end, as a result of the angular disposition of the load-carrying rollers 12 and 12′. The rollers 16 and 20 will hereinafter be referred to as the discharge rollers.

The rollers 12 and 12′ are positively driven and, as shown in Figure 1, each roller 12 of the upper row has a sprocket wheel 23, which sprockets are located within the chamber 24 defined by the walls of its respective box-like side frame member 11. The sprockets 23 are driven by the upper run of a drive chain 25, diagrammatically shown by Figure 4. The lower run of the chain is supported upon a drive sprocket 26 and a snubbing sprocket 27. The sprocket 27 guides the chain 25 a sufficient distance around the drive sprocket 26 to provide a good driving connection between said drive sprocket and chain.

The sprocket 27 may be secured to a suitable shaft rotatably supported in bearings movably secured to the outside plates of the box-shaped member 11, in a manner to permit adjustment of said bearings for the purpose of adjusting the tension in the chain 25.

The sprockets 23, 26, and 27 and the drive chain 25 are all aligned in the same vertical plane and are disposed within the chamber 24 provided in the side member 11. The sprocket 26 is secured to the slow speed shaft of a combination motor-reducer unit 30. This unit comprises a motor and a speed reducer assembled in a single housing, and may be any one of a number of well-known makes. The slow speed shaft extends into the chamber 24 through a suitable aperture in the outside plate to drive the sprocket 26. Each unit 30 is supported upon a suitable supporting base, shown extending from the side member 11 and forming part of the main supporting structure 15. Obviously, operation of the motor-reducer unit 30, above described, will cause all of the rollers 12 to be rotated simultaneously through sprockets 26, 27, and 23 and the drive chain 25. The drive for the rollers 12' at the opposite side of the table is substantially the same as the drive above described, with the exception that the slow speed shaft of the motor-reducer unit 30, indicated by the numeral 31, has been extended to provide a drive for the discharge rollers 16 and 20, as shown in Figure 1.

The slow speed shaft 31 of the motor-reducer unit 30 which drives the rollers 12', extends through the inner plate of its respective side member 11 and is operatively connected to a shaft 33, by a bevel gear drive 32. The shaft 33 is rotatably supported in suitable bearings 34 secured to the supporting structure 15. The shaft extension 31 has its other end supported in a similar bearing 34, also secured to the main supporting structure. The shaft 33 has secured thereto a sprocket 36, which is operatively connected to a similar sprocket 36 secured to a shaft 37 by a suitable chain 38. The shaft 37 is rotatably mounted in bearings 34 secured to the supporting structure 15. The shaft 37 has secured to one end a sprocket 40. A similar sprocket 41 is secured to the outer roller shaft 16, and the sprockets 40 and 41 are connected by a chain 42. A suitable chain drive 43 operatively connects together the roller shafts 16 and 20 for rotation in the same direction. By extending the slow speed shaft 31 of the motor-reducer unit 30 of the load-carrying rollers 12', so as to connect with the shaft 33 through the bevel gear drive 32, the motor-reducer unit 30 serves the dual purpose of driving both the rollers 12' of the table and the discharge rollers 16 and 20.

The rollers 5 of the stationary section C are shown driven by a chain 62, the upper run of which engages sprockets secured to said rollers adjacent one side of the apparatus, as shown in Figure 1. The lower run of the chain 62 is driven by means of a sprocket 63 secured to the slow speed shaft of a motor-reducer unit 64, so that operation of the motor will cause rotation of all of the rollers 5.

Oil may be introduced into the chambers 24 of the side frame members 11, and also into the chamber 4 of the side member 3, in which the chain 62 is mounted, the oil level being maintained at a height sufficient to cause portions of the lower runs of the chains to pass therethrough, whereby the chains and sprockets will be adequately lubricated. The rollers 5, 12, and 12' are provided at their ends with cup-shaped members 67 to prevent leakage of oil around the rollers through the apertures provided in the inside plates of the side members 11 and 3 for the rollers.

Operation

When the live roller conveyer mechanism or runout table herein disclosed is used for transporting sheets or packs of sheets from two furnaces or furnace compartments, it is interposed between the discharge ends of said furnaces and the feeder table or other receiving means E, leading to the rolling mill G, as shown in Figure 5. During the manufacture of sheet metal, the rollers 12 and 12' of the runout table operate continuously, and are at all times in readiness to receive sheets from either of the furnace discharges and transport them to the rolling mill feeder table E. When a sheet is discharged from furnace A, it is conveyed straight onto load-carrying rollers 12 of the runout table D by the power driven feed rollers 5 of the conveyer section C, until substantially one-half of the weight of the sheet is carried by the rollers 12. Because of the rollers 12 being disposed at an angle with relation to the rollers 5, when the forward half of the sheet initially engages the rollers 12, the sheet will be turned to an angular position as indicated by the dotted lines K, in Figure 5. The rollers 12 will convey the sheet in this angular position toward the discharge end of the runout table until it reaches the position indicated by the dotted lines L, at which time a sufficient portion of the sheet will engage the rollers 12', whereby said rollers will counteract the effort of the rollers 12 to transport the sheet straight ahead on a line at an angle of 90° to the axes of the rollers 12. When the sheet reaches the position indicated by the dotted lines L, the rollers 12' will tend to move the sheet forward in a line at 90° from their axes, with the result that the sheet is acted upon by two component forces. The resultant action is a tendency to swing the rearward end of the sheet inwardly towards the longitudinal centerline of the table, as the sheet is carried forwardly, and as indicated by the dotted line position M. This action continues until by the time the sheet reaches the position indicated at O, it will be substantially alined with the longitudinal centerline of the feeder table E.

As hereinbefore stated, when using a runout table having an abrupt angle of convergence, as illustrated in Figure 6, and particularly when handling wide sheets, difficulty is often experienced in that the sheets being carried have a tendency to run too far across the center of the runout table at its discharge end. The sheets are usually transferred at comparatively high speeds, and upon reaching the rollers 12', the momentum of the sheets overcomes to a great extent the frictional resistance between the bottoms of the sheets and the tops of the rollers 12', with the result that the sheets are frequently carried too far past the centerline of the runout table onto the rollers 12', and therefore out of alinement with the rolling mill feeder table E.

To overcome this difficulty, the power operated discharge rollers 16 and 20 are interposed between the discharge end of the runout table D, and the receiving end of the feeder table E, with their axes disposed at 90° from the longitudinal centerline of the table. The action of the dis-

charge rollers 16 and 20 is to add sufficient frictional resistance between the tops of said rollers and the bottoms of the sheets to prevent the momentum from carrying the sheets beyond the center of the table. While the forward half of the sheet is being carried forward by the discharge rollers 16 and 20, the friction between said rollers and the bottom of the sheet tends to prevent any lateral movement of the forward part of the sheet; or, rather, the forward portion of the sheet seems to pivot on the discharge rollers sufficiently to permit the rollers 12' to influence the movement of the rearward portion of the sheet to aline it with the rolling mill feeder table. It has been found that with the addition of the discharge rollers 16 and 20, the apparatus is rendered capable of successfully handling a wide range of sheets, whereby both narrow and very wide sheets may be quickly transferred from one or more furnaces to a rolling mill without difficulty, and at a relatively high speed, and even in extreme cases where the sides of the converging conveyer table or section D converge at an angle of 45° or more with the longitudinal centerline of the table.

Figure 6 illustrates, diagrammatically, a runout table R, having a very wide receiving end and converging to the discharge end in a relatively short distance, whereby its side members S converge abruptly. A plurality of discharge rollers, indicated generally by the numeral 65, are provided at the discharge end of the table R, and function in a manner similar to the corresponding rollers 16 and 20 of the table D. These rollers 65 are power driven by suitable means, not shown, and serve to assist in alining and squaring the sheets with the longitudinal centerline of the feeder table E, leading to the rolling mill.

In Figures 1 and 5, the discharge rollers 16 and 20 are shown provided with a plurality of discs 21. While it has been found that the operation of the apparatus is very satisfactory with the disced type rollers, it is to be understood that the invention is in no way limited to the use of disced rollers, as straight rollers without discs may in some installations, be used with equal results, and in some cases may be desirable. One of the reasons for using disced rollers is that a portion of the discs may be interposed between the conveyer chains of the feeder table E, thereby reducing the unsupported length of each sheet as the forward edge thereof passes from the discharge rollers 16 and 20 onto said conveyer chains. It is also to be noted that the runout table herein disclosed is of the symmetrical type, but it is to be understood that the invention may be embodied in the construction of the runout tables which are unsymmetrical in design, and that the use of the table is not limited to the transferring of sheet metal in steel mills, as it may be used for various other purposes, where applicable, as for example, for transferring composition boards, plaster sheets, insulating boards, boxes of articles, cartons and various other commodities.

I claim as my invention:

1. In a conveying apparatus, rows of load-carrying rollers, the axes of the rollers of each row being arranged obliquely to the rollers of an adjacent row for the purpose of conveying articles inwardly towards the center of the apparatus as they travel thereover towards the discharge end thereof, the arrangement of said rollers defining a V-shaped discharge opening and means positioned in said V-shaped opening at the discharge end of the apparatus cooperating with said rollers to square each article with the apparatus as it is discharged therefrom.

2. In a conveying apparatus, rows of load-carrying rollers, the axes of the rollers of each row being arranged obliquely to the rollers of an adjacent row for the purpose of conveying articles inwardly towards the center of the apparatus as they travel thereover towards the discharge end thereof, the arrangement of said rollers defining a V-shaped discharge opening, and additional rollers positioned in said V-shaped opening at the discharge end of the apparatus cooperating with the first mentioned rollers to square each article with the longitudinal center-line of the apparatus as it is discharged therefrom.

3. In a conveying apparatus, rows of load-carrying rollers, the axes of the rollers of each row being arranged obliquely to the rollers of an adjacent row whereby articles being conveyed over the apparatus will move inwardly towards the center of the apparatus, as they approach the discharge end thereof, the arrangement of said rollers defining a V-shaped discharge opening and a power driven roller in the V-shaped discharge opening of the apparatus disposed at substantially right angles to the longitudinal centerline thereof and cooperating with said rollers to square each article with the apparatus as it is discharged therefrom.

4. In a herringbone runout table, two sets of load-carrying rollers, the axes of one set of rollers being arranged obliquely to the axes of the rollers of the other set, whereby a V-shaped opening is provided in the surface of the table at its discharge end, and a power driven roller situated in said V-shaped opening and disposed at substantially right angles to the longitudinal centerline of the table and cooperating with said load-carrying rollers to aline each article with the table as it is discharged therefrom.

5. In a herringbone runout table, a plurality of rows of load-carrying rollers, the rollers of one row being arranged obliquely to the rollers of another row whereby a V-shaped opening is provided in the surface of the table at the discharge end thereof, and a plurality of rollers of varying lengths positioned in said V-shaped opening and arranged at right angles to the longitudinal centerline of the table.

6. In a herringbone runout table, a plurality of rows of load-carrying rollers, the rollers of one row being arranged obliquely to the rollers of another row, whereby a V-shaped opening is provided in the surface of the table at the discharge end thereof, a plurality of rollers of varying lengths positioned in said V-shaped opening and arranged at right angles to the longitudinal centerline of the table, and means for driving all of said rollers.

7. In a herringbone runout table, a frame comprising angularly disposed side members and a centrally disposed frame member, rows of load-carrying rollers supported on said frame members, and the rollers of one row being arranged obliquely to the rollers of another row to define a V-shaped discharge opening, and a plurality of discharge rollers of varying lengths journaled in said V-shaped opening, said discharge rollers having their axes disposed at substantially right angles to the longitudinal centerline of the table whereby said rollers will cooperate with said load-carrying rollers to square each article with the table before it is discharged therefrom.

8. In a herringbone runout table, a frame comprising suitable side members, angularly disposed

with respect to each other, two rows of load-carrying rollers supported on said frame members, and each row having its rollers disposed at right angles to one of said frame members, whereby the rollers of one of said rows are disposed obliquely to the rollers of the other row, said rollers defining a V-shaped opening at the discharge end of the table, a plurality of discharge rollers of varying lengths journalled in the V-shaped opening at the discharge end of said table and having their axes disposed at substantially right angles to the longitudinal centerline of the table whereby said rollers will cooperate with said load-carrying rollers to square each article with said table before it is discharged therefrom, and power means for driving said discharge rollers.

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