To all whom it may concern:

Be it known that I, JOHN S. WORTH, a citizen of the United States, and a resident of Coatesville, Pennsylvania, have invented certain Improvements in Roller Transfer-Tables, of which the following is a specification.

My invention relates to certain improvements in tables for transferring metal sheets from the rolling mill to the shearing machines or to cooling tables.

One object of my invention is to provide the transfer table with power driven rolls which traverse the plates over the table.

A further object of the invention is to provide the turn-over apparatus, in which the plates are turned over, also with power driven rolls, as well as the arms that receive the plates from the rolling mill table and deliver the plates onto the shears table.

These objects I attain in the following manner, reference being had to the accompanying drawings, in which:

Fig. 1 is a diagrammatic plan view illustrating my improved transfer table located between the rolling mill table and the shears table.

Fig. 3 is a diagrammatic sectional view on the same scale as Fig. 1, the section being on the line 2—2, Fig. 1;

Fig. 3 is an enlarged plan view illustrating one section of the transfer table;

Fig. 4 is an end view of the same;

Fig. 5 is a plan view of the turnover mechanism;

Fig. 6 is a sectional elevation of the same, the section being on the line 6—6, Fig. 5;

Fig. 7 is a sectional view on the line 7—7, Fig. 5, illustrating the driving mechanism for the rolls of the turnover mechanism;

Fig. 8 is a sectional view on the line 8—8, Fig. 7;

Fig. 9 is a sectional view on the line 9—9, Fig. 10;

Fig. 10 is a plan view illustrating the coupling means of the turnover mechanism;

Fig. 11 is a plan view illustrating one of the transfer arms;

Fig. 12 is a sectional view on the line 12—12, Fig. 11; and

Fig. 13 is a sectional view on the line 13—13, Fig. 11.

1 is a rolling mill, in the present instance, for rolling sheet metal plates. This mill can be of any design desired. 2 is a table on one side of the mill and 2a is a table on the opposite side of the mill. These tables can be manipulated so as to pass the bloom or blank back and forth through the rolls until it has been reduced to the proper thickness, after which the rolls of the table 2a can be manipulated so as to transfer the plate onto a roller table 3, which may be of any length desired. Straightening rolls may be provided for straightening the plates in this section. 3a indicates mechanism for transferring the plates from the table 3 to the table 4. The rolls of the tables are driven in the ordinary manner. 5 is a roller table in which the rolls are driven. This table 70 directs the plate to the shearing machine 5a at one end of the rolls 5. The shearing machine may be of any ordinary type for cutting plates into any shape desired.

Located between the roller table 4 and 75 the roller table 5, are the transfer tables 6, made in four sections, as shown. Each section has a series of rollers 7 mounted on driven shafts 8, the shafts of each section being driven from a centrally located motor 9. The rollers project above the surface of the frame so that a plate placed on the transfer table will be supported by the rollers, and, as these rollers are driven, the plates will be transferred over the surface of the table 6 from the rolling mill table 4 to the shears table 5. By arranging the transfer table in sections and providing each section with an independent motor, the plates on the several sections can be controlled independently when it is desired to allow certain plates to cool a greater length of time than others, and also allows for the manipulation of certain plates rolled after previous plates, so that they can be cut immediately without having to wait for the transfer of plates that have been previously rolled and which can be delayed.

Located between the two sets of tables 6 is the turnover apparatus 10, consisting of 100 shafts 11 having arms 12, on which are rollers 13. These rollers are driven so that when the arms are down, as illustrated in Figs. 1 and 2, the plate can travel directly from the rolling mill table over one section of the transfer table, then over the turnover and onto the outer section of the transfer table and to the shears table. When it is
desired to examine both sides of a plate, as is now the general practice, the plate passes from one section of the transfer table to a series of arms on one side of the turnover apparatus. Then, the two series of arms are raised until they assume the position illustrated in Fig. 6, when the plate is transferred from one series of arms to the other. The number can then lowered to their original position, the plate being turned over and resting on the second series of arms, so that the inspector can examine both sides of the plate. As the arms are provided with driven rollers, the plate immediately passes from the arms onto the second section of the transfer table, and is traversed by the rolls of this transfer section to the shears table 5.

In order that the plates may be transferred from the rolling mill table 4 to the transfer table 6, I provide a shaft 14 with arms 15 having rolls 16. These arms 15 are raised when the plate is in position so as to lift the plate from the rolls of the rolling mill table. As soon as they are resting on the rollers 16 of the arms, these rollers immediately feed the plate onto the transfer table 6. A similar shaft 14 with arms 15a with rollers is provided and is located between the transfer table and the shears table 5 for the purpose of transferring the plates from the transfer table to the rollers of the shears table.

The above description gives a general idea of the arrangement of the transfer table in respect to the rolling mill table and the shears table.

Heresofore, it has been the general practice to use endless chains for moving the plates over the transfer table. The use of chains is not satisfactory, but, by the use of driven rollers, I find that the plates can be readily manipulated, and, when desired, the plate can be manually shifted on the rollers, as there is comparatively little bearing of the plate on each roller. Furthermore, the weight of the plates on the rollers gives the rollers sufficient traction to move the plates properly on the transfer table.

In referring to Figs. 3 and 4, which illustrate a portion of one section of a transfer table, the frame consists of a series of longitudinal beams 17 having boxes 18 for the shafts 8, which are spaced a given distance apart, and on which the rollers are located a given distance apart so that a plate, being transferred, will be supported by a number of rollers.

In the present instance, each pair of shafts 8 has gear wheels 19, which mesh with gear wheels 20 on a short shaft 21. On each short shaft is a bevel gear wheel 22 which meshes with a bevel gear wheel 23 on a longitudinal shaft 24. The shaft 24 drives a number of short shafts 21 and on the shaft 24 is a gear wheel 25 which meshes with a gear wheel 26 on another longitudinal shaft 27. The gear wheel 25 is located about midway between the ends of the shaft 24.

There are two longitudinal shafts 24 to each section and two longitudinal shafts 27, as illustrated in Fig. 3. Each longitudinal shaft 27 has a bevel gear wheel 28, which meshes with a bevel gear wheel 29 on a transverse shaft 30, which is driven from the motor shaft 31 through shafts 32, 33, and 34, having reducing gearing so that the rollers will be driven at the proper speed. This gearing may be changed without departing from the essential features of the invention. By this construction, however, all of the rollers are driven at the same speed.

The turnover apparatus is shown clearly in Figs. 5, 6, 7, 8 and 9. The two shafts 11 are spaced a given distance apart and are adapted to bearings 35 and 36 on suitable foundations. On the shafts is a series of gear wheels 57, which mesh with a pinion 58 on a central shaft 59. The gear wheels 57 mesh with a train of gears 40 on the arms 12, and each alternate gear wheel in the train 40 has flanges which act as a bearing roller 13 for the plates.

Motion is imparted to the shaft 39 through a train of gears 41, 42 and 43, the latter wheel being on a shaft 44. On this shaft is a gear wheel 45 meshing with a pinion 46 on a shaft 47, which is a gear wheel 48, which meshes with a pinion 49 on a shaft 50. On this shaft 50 is a gear wheel 51 which meshes with a pinion 52 on a driven shaft 53 of a motor 54. By this construction the rollers are driven, irrespective of the position of the arms 12, as the rollers of the arms are always in gear with the power mechanism.

In order to raise and lower the arms, I provide hydraulic cylinders 55—one cylinder for each series of arms. Each series of arms is fixed to an independent section of the shaft 11. There are four sections, in the present instance. The cylinders are pivotally mounted at 56 on suitable bearings 57 and plungers 58 of the cylinders are pivotally attached at 59 to a cross head 60, which, in turn, is pivotally connected at 61 to two of the arms 12. As these arms are fast to their shafts 11, any movement imparted to them by the plungers 58 will be imparted to the series of arms on the said shafts.

In some instances, where extra heavy plates are to be turned over, power applied to one section may not be sufficient to lift the plates. I, therefore, provide the adjacent ends of the slining sections of the shaft 11 with couplings 64, which are normally free, so that the two adjoining sections of the turnover will act independently. When it is desired to increase the power, I may couple the two shafts together and use the cylinders of the two sections to lift the
plates. Secured to each section of the shaft are counterbalance arms 62 having adjustable weights 63, which tend to counterbalance the overhang of the arms 12.

The construction of the arms for transferring the plates from the rolling mill table to the transfer table, and from the transfer table to the shears table, is somewhat similar to the construction of the arms of the turnover.

Referring now to Figs. 11 and 12, the arms 15 are mounted on the shaft 14, which is adapted to suitable bearings 68, and has a flanged gear wheel 69, which meshes with a pinion 70 on a driving shaft 71 extending parallel with the shaft 68 and has a bevel gear wheel 72, Fig. 3, which meshes with a bevel gear wheel 74 on one of the shafts 27, so that when the shaft 27 is in motion, motion will also be imparted to the shaft 71.

The gear wheel 69 drives a chain of gear wheels 75 on each arm, and the alternate gear wheels are flanged to form the bearing rollers 16 and project above the upper surface of the arms, as clearly shown in Fig. 11.

It will be noticed on referring to Fig. 1, that the transfer arms are divided into sections corresponding with the sections of the transfer table, and are driven from their respective sections. Extending under the arm is a rock shaft 76 adapted to suitable bearings 77. On this rock shaft is an arm 78 attached to a plunger 79 adapted to a hydraulic cylinder 80, so that when fluid is admitted to this cylinder, the arm 78 will be raised and will rock the shaft 76. 81 are counterbalance arms having adjustable weights 82.

On the shaft 76 are arms 83, one located under each transfer arm 15. Pivotedly connected to the arms 83 are links 84, slotted at their upper ends to receive pins 85 on the transfer arms, so that when the arms 78 are moved upward to rock the shaft 76, the links 84 push the arms 15 up above the rollers of the rolling mill or shears table, and if a plate be on the rolling mill table, it will be elevated clear of the rolls of said table by the arms 15. As the rollers on these arms rotate, they transfer the plate onto the rollers of the transfer table, and when it is desired to transfer a plate from the transfer table to the rollers of the shears table, the arms are raised and the plate is traversed over the arms by the power driven rollers.

When the plate is above the rollers of the shears table, then the arms are lowered, so that the surfaces of their rollers are below the rolls of the shears table, and the plate will rest on the rollers of the shears table and will be fed toward the shears on motion being imparted to said rolls.

By the above construction, it will be seen that chains are entirely dispensed with, and that the entire manipulation of the plate from the rolling mill to the shears is by driven rollers, the movement of the rollers being under the control of an operator. The plates can be turned as they are traveling from the rolling mill table to the shears table without manual labor, but when it is desired to shift any of the plates laterally on the tables, this can be readily accomplished by the rollers.

The entire mechanism, in the present instance, is electrically driven from a series of independent motors under the control of an operator, so that the rollers of any section of the table can be readily stopped, if desired. While I have illustrated electric motors as the power for driving the rolls, other power may be resorted to without departing from the essential features of the invention.

In some instances, I may use a series of supporting rolls arranged on a line extending through the center of each section, as shown at 77, Fig. 1. These rolls are not driven, but simply support the plate and prevent buckling.

While I have shown the transfer table made in four units, the number of units may be increased or diminished, as desired.

I claim:

1. The combination of a rolling mill; a table to receive the plates from the mill; a shears; a roller table for directing the plates to the shears, said tables being spaced apart; a transfer table located between the rolling mill and the shears table, said transfer table comprising a series of rollers for supporting the plates; and means for driving said rollers.

2. The combination in a rolling mill, of a transfer table for transferring plates from one side of the table to the other; a series of transverse shafts mounted in bearings on the table, each shaft having a series of rollers thereon projecting above the table and arranged to support a plate to be traversed; and means for driving the shafts so as to move the plate through the medium of the rollers over the table.

3. The combination of two longitudinal roller tables spaced apart; a transfer table located between the two longitudinal tables, said transfer table being made in sections, said sections being located side by side, each section having driven rollers thereon for supporting and transferring plates from one longitudinal table to the other; and independent means for driving the rollers of each section.

4. The combination of a transfer table of a rolling mill; a set of rolling mill rollers; a shears and shears table, the two tables being spaced apart; a transfer table mounted between the two tables; driven rollers on the transfer table; arms projecting between the rollers of the rolling mill table; arms projecting between the rollers of the shears table; driven rollers on the several
arms; and means for raising and lowering the arms so that a plate on the rolling mill table can be transferred onto the transfer table and from the transfer table onto the shears table.

5. The combination in a transfer table made in sections, each section having a series of transverse shafts; means for driving the shafts; rollers on the shafts projecting above the surface of the table so as to support the plates to be transferred; turnover mechanism consisting of two parallel shafts transversely arranged in respect to the table and each shaft having a series of arms; driven rollers on the arms; means for driving the rollers; and means for raising and lowering the arms so that a plate can be turned over in its passage from one side of the transfer table to the other.

6. The combination in a transfer table made in sections, each section having a series of transverse shafts having rollers spaced apart thereon, the rollers projecting above the table so as to support a plate, the shafts being arranged in pairs and each pair of shafts being geared to a short shaft extending parallel with the other shafts; a bevel gear on each short shaft; a longitudinal shaft at one side of the section and having a series of bevel gear wheels thereon meshing with the bevel gears on the short shafts; and means for imparting movement to the said longitudinal shaft.

7. The combination in a transfer table made in sections, each section having a series of transverse shafts having rollers spaced apart thereon, the rollers projecting above the table so as to support a plate, the shafts being arranged in pairs and each pair of shafts being geared to a short shaft extending parallel with the other shafts; a bevel gear on each short shaft; a longitudinal shaft at one side of the section and having a series of bevel gear wheels thereon meshing with the bevel gears on the short shafts; a second longitudinal shaft geared to the first-mentioned longitudinal shaft; a transverse shaft geared to the second longitudinal shaft; a motor; and a train of gearing between the motor and the last-mentioned transverse shaft.

8. The combination in a transfer table, of a frame; a series of transverse shafts on the frame; rollers on the shafts; a longitudinal shaft for driving said transverse shafts; a series of arms at one end of the table; a train of gears on each arm, the alternate gears having flanges in the form of rollers projecting above the arms; a shaft extending parallel with the shaft carrying the arms and geared to the longitudinal shaft of the table; and means for raising the arms, said arms being located between the driven rolls of a table located at one side of the transfer table so that a plate can be transferred from the last-mentioned rolls to the transfer table or from the transfer table to the rolls.

9. The combination in a transfer table for rolling mills made in sections, each section having a series of independently driven rollers thereon for supporting the plate to be transferred; a turnover device located between the two sections of the table, the turnover device consisting of two parallel shafts each having a series of arms thereon extending in opposite directions; a train of gears on each arm, the alternate gears having flanges in the form of rollers projecting above the arms so as to support a plate; means for driving the train of gears on the arms; and means for raising and lowering the arms so as to engage and turn over the plate in its passage from one side of the transfer table to the other.

10. The combination in a transfer table, of a turnover made in four sections; an operating shaft for each section; power mechanism for each section adapted to turn the shaft; turnover arms on the shaft; and couplings between shafts of adjoining sections so that when extra power is required to turn a plate the two shafts may be connected and two power mechanisms used to lift a single plate.

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