

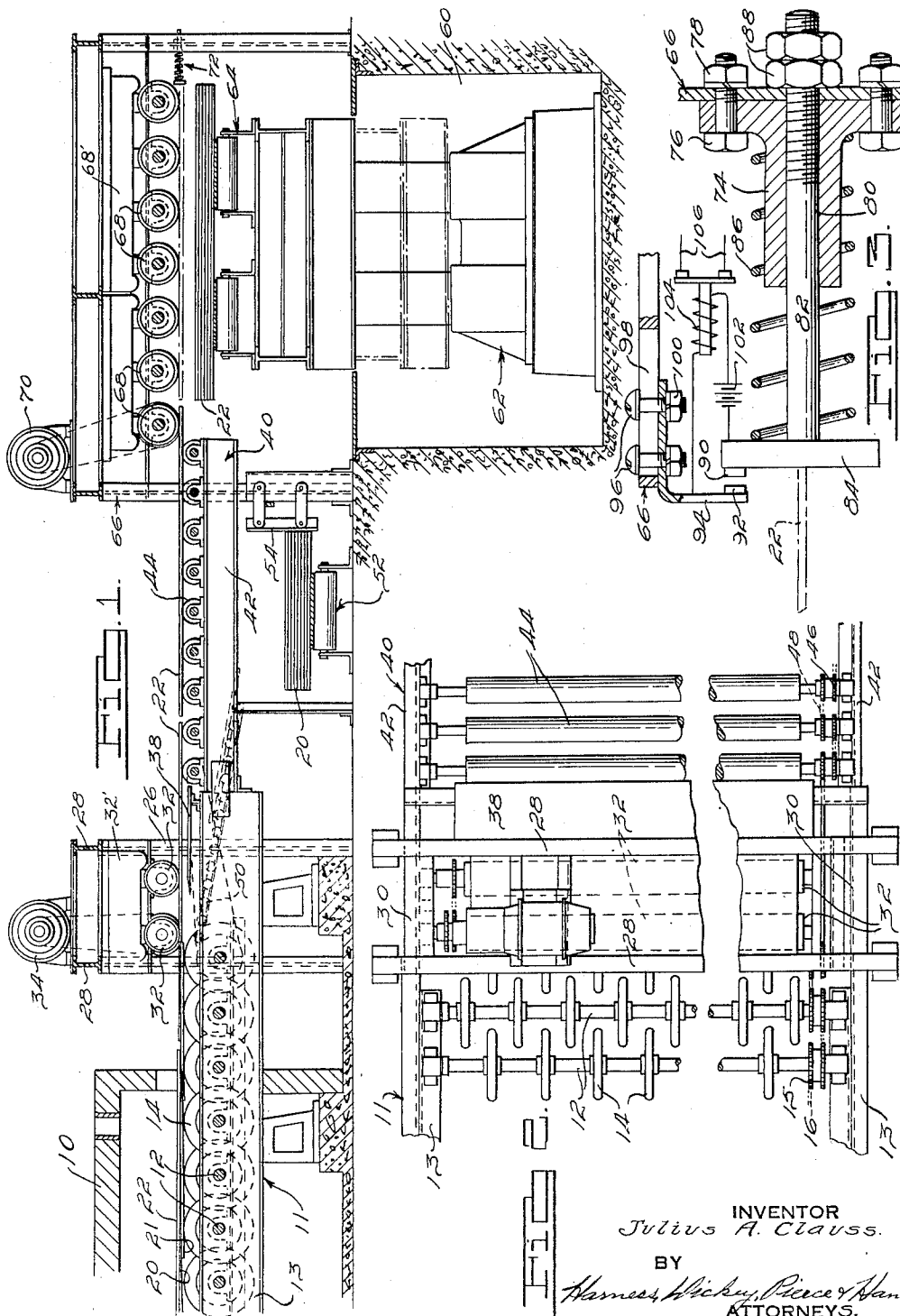
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APPARATUS FOR HANDLING SHEET STEEL

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APPARATUS FOR HANDLING SHEET STEEL

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2 Claims. (Cl. 198—41)

This invention relates to apparatus for handling sheet steel and is particularly adaptable for use in mills where such sheets are produced, the principal object being the provision of a simple and efficient means which may be advantageously employed in connection with various operations on steel sheets.

Another object of the invention is the provision of means for supporting and conveying metallic sheets of paramagnetic character.

Another object is the provision of a means for supporting and conveying paramagnetic sheets and means cooperating therewith controlling the operativeness of the supporting means whereby to enable the sheets being conveyed to be deposited at a desired point.

Another object is the provision of a means for conveying paramagnetic sheets including suitably arranged magnetic rolls adapted to hold the sheets against their lower surface due to the magnetic characteristics of the rolls and to convey the sheets due to rotation of the rolls.

Another object is the provision of a means for automatically causing the rolls to release the sheets including a stop in the path of movement of the sheets carried by the rolls and means operated by the stop for controlling the magnetism of the rolls.

Another object is the provision of a novel means in combination with a normalizing furnace for steel sheets for automatically separating the prime steel sheets from the waster sheets.

Another object is the provision of novel means for separating prime sheets from waster sheets as such sheets are delivered from a normalizing furnace, and for depositing the respective types of sheets in separate piles.

The above being among the objects of the present invention the same consists in novel features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawing and then claimed, having the above and other objects in view.

In the accompanying drawing which illustrates a suitable embodiment of the present invention and in which like numerals refer to like parts throughout the several different views,

Fig. 1 is a vertical, longitudinal sectional view through a portion of a normalizing furnace and apparatus for conveying, separating and piling the prime sheets and waster sheets delivered therefrom.

Fig. 2 is a fragmentary plan view of the apparatus shown in Fig. 1 at and adjacent to that por-

tion thereof employed for separating the waster sheets from the prime sheets.

Fig. 3 is an enlarged partially broken, partially sectioned and more or less diagrammatic view illustrating the stop means for the prime sheet piling mechanism.

The present invention deals with a means for conveying paramagnetic sheets by means of magnetic rolls or rollers which may be suitably driven in any conventional manner and which hold the sheets in suspension against their lower surface due to their magnetic attraction. A further feature of the invention is the provision of means for automatically de-magnetizing the roll whereby to permit the sheets to be piled in proper order at a desired point. Obviously, this invention has a relatively wide application wherever paramagnetic sheets are to be conveyed, particularly in steel mills where such sheets are made and, as will be more fully apparent from the specific application of the invention to be hereinafter described, it is particularly adaptable for use in connection with roller levellers, oiling machines, pilers, shears, normalizing furnaces and other uses. Because of the fact that it is particularly adaptable for use in connection with the separation of prime sheets from waster sheets as such sheets come from normalizing furnaces the present invention is illustrated herein in connection with a normalizing furnace, it being understood that in the broader aspects of the present invention, its use is not to be thus limited, but in certain narrower aspects of the present invention its application to a normalizing furnace involves certain additional features of the present invention. The application of the present invention to a normalizing furnace follows somewhat the principle illustrated in the U. S. Patent No. 1,838,529, issued December 29, 1931, to R. S. Cochrane and A. S. Larson, and it will be apparent in the following description that its application to such an apparatus constitutes a material advance in the art.

In order to prevent the marring of the surface of the steel sheets being produced (usually known as the "work" or as "prime sheets") by the conveying mechanism in a normalizing furnace, and more particularly where such conveying mechanism comprises a bed of power driven discs, the practice is to support the sheets on carrier sheets known in the art as "wasters" or "waster sheets". After the prime sheets supported on the waster sheets leave the furnace, it is necessary to separate the prime sheets from the waster sheets and to form these sheets in separate piles. Great care

must be exercised in handling such sheets as they come from a normalizing furnace so as to prevent scratches from appearing on their surface and also to prevent the scale thereon from breaking or chipping off as such occurrence would cause the sheets where the scale has been removed to be etched to a greater extent in the subsequent pickling bath than the remainder of the sheets, and thereby mar the desired smooth finish of the same.

Referring to the drawing the numeral 10 illustrates the discharge end of a normalizing furnace, it being provided with a conveyor indicated generally as at 11 including a plurality of transverse shafts 12 suitably supported for rotatable movement between side rails 13 and supporting a plurality of axially spaced discs 14 which combine to form a bed or table for the reception and movement of the work. The shafts 12 may be driven in unison by any suitable means such as sprockets 15 and chain 16. Supported on the discs 14 within the furnace 10 are waster sheets 20, preferably having their ends overlapped as at 21 in Fig. 1, and supported on the waster sheets 20 is the work or prime sheets 22 which have been put through the furnace 10 for the purpose of normalizing the same. The waster sheets 20 are conventionally formed of non-magnetic material such as austenitic steel, it being understood that the work or prime sheets are paramagnetic, or subject to magnetic attraction.

Immediately beyond the last row of discs 14 at the discharge end of the conveyor 11 an upwardly extending frame work 26 is provided having cross bars 28 bridging the side rails 13. Transverse rails 30 bridging the rails 28 at either end of the frame work 26 rotatably support between them a pair of horizontally extending magnetic rolls 32 which extend transversely with respect to the line of travel of the sheets. Such rolls are of conventional construction and accordingly it is not believed that a detailed description is necessary, it being understood that their magnetism may be induced by suitable electric current energizing coils within them, or the rollers can be magnetized by a magnetic unit 32' positioned above or outside the rolls. The lower surfaces of the rolls 32 are positioned a slight distance above the plane of the upper surfaces of the work sheets 22 as they travel along over the discs 14, and the rolls 32 are suitably driven as by means of a motor 34 in unison with each other and so that their peripheral speed is greater than the peripheral speed of the discs 14.

The side rails 13 project at the discharge end of the conveyor 11 beyond the last of the discs 14 and to beyond the discharge side of the magnetic rolls 32, and on such ends support an apron member 38 whose upper surface is slightly below the upper surface of the discs 14 and whose advanced edge terminates under the right hand roll 32 (as viewed in Fig. 1) and in suitably spaced relation with respect to the last row of discs 14.

A second roller conveyor indicated generally as at 40 and including side rails 42 and transverse rolls 44 suitably supported thereon is connected to the right hand end of and extends to the right of, as viewed in the figures, the side rails 13. The upper surface of the rolls 44 lie substantially in the same plane as the upper surfaces of the discs 14 and the first of the rolls 44 lies in proximity to the right hand end of the apron 38. The rolls 44 are all driven at the same speed as by means of sprockets 46

and sprocket chains 48 and so that their peripheral speed is substantially the same as the peripheral speed of the rolls 32.

An inclined roller or gravity conveyor indicated generally as at 50 extends from a point in proximity to the upper surfaces of the last or right hand row of discs 14 downwardly to a point below the rolls 44. The conveyor 50 is of that type generally known as a gravity conveyor and in which the rolls are not driven mechanically but are freely rotatable and simply rotate when a sheet passes over them due to the friction between the rolls and the sheet. Immediately to the right of and below the right hand end of the conveyor 50 is located a suitable horizontal roller conveyor indicated generally as at 52 and which extends in a direction at right angles to the conveyors 11 and 40. This roller conveyor is adapted to receive the waster sheets which are discharged down the roller conveyor 50, as will hereinafter be described more fully, and in order to insure the waster sheets piling evenly upon the conveyor 52 a stop member indicated generally as at 54 is provided for this purpose.

At the discharge end of the conveyor 40 a pit 60 is formed in the floor. Positioned within the pit 60 is a jack or lift indicated generally as at 62, shown as of the hydraulic type, which supports at its upper end a pair of spaced parallel and horizontally extending roller conveyors indicated generally as at 64 and which extend at right angles to the length of the conveyor 40. The hydraulic lift 62 or its equivalent may be of any conventional construction controlled in the conventional manner so that the height of the roller conveyors 64 may be easily and quickly controlled.

A frame work indicated generally as at 66 extends over the pit 60 and is employed for suitably supporting a plurality of magnetic rolls 68 which may be identical to the rolls 32 previously described. These rollers may be energized similarly to rolls 32, as for example by a magnet 68'. The lower surfaces of the rolls 68 are positioned slightly above the upper surfaces of the rolls 44 so that when the prime sheets 22 are delivered by the conveyor 40 to below the rolls 68, the rolls 68 may pick them up and continue to carry them in their direction of travel to a position over the pit 60. It will be understood that the rolls 68 are suitably driven in unison, as by a motor 70, and that their peripheral speed is substantially the same as the peripheral speed of the rolls 32 and rolls 44.

The rolls 68 are employed for carrying the prime sheets 22 over the roller conveyors 64 carried by the hydraulic lift 62, and means are provided for breaking the circuit to the rolls 68 when the sheets 22 have reached their desired position so that the rolls 68 will lose their magnetism and permit the sheets 22 to drop by gravity into the desired position. The mechanism for accomplishing this result is indicated generally as at 72 in Fig. 1 and shown in greater detail in Fig. 3.

Referring to Fig. 3 a supporting bracket such as 74 is secured in the desired position to the frame work 66 by means of bolts 76 and nuts 78. The bracket 74 is provided with a central horizontal bore 80 whose axis is parallel to the path of movement of the sheets 22 on the conveyors heretofore described. The bore 80 slidably receives a shaft 82, to one end of which is secured a strip-like or block-like stop member 84 positioned in the plane of movement of the sheet 22 under the rollers 68. A coil spring 86 surrounding the shaft 82 and part of the bracket 74 is maintained under compression

sion between the bracket 74 and the stop member 84 and accordingly constantly urges the stop member and shaft 82 to the left as viewed in Fig. 3.

3. Nuts 88 adjustably secured to the right hand end of the shaft 82 limit the movement of the shaft 82 and stop member 84 to the left as viewed in Fig. 3. The stop member 84 is provided with a contact 90 which cooperates with another contact member 92 carried by a bracket member 94 secured to a suitable part of the frame work 66 for adjustment in the direction of the path of movement of the sheets 22. The adjustment of the bracket member 94 in the present case is accomplished by the use of bolts 96 passing through a slot 98 in the frame work 66 and extending in the direction of movement of the prime sheets 22. Suitable nuts 100 cooperating with the bolts 96 serve to lock the bracket 94 and its contact 92 in adjusted position.

The contacts 90 and 92 are in series with a source of electrical energy 102 and preferably a relay 104 which in turn controls a circuit indicated generally as at 106 which supplies the electrical energy to the rolls 68. Although the contacts 90 and 92 are shown separated in Fig. 3, it will be understood that normally these contacts are maintained in engagement with each other by the spring 86.

In the operation of the above described apparatus, it will be understood that the waster sheets 20 and the prime sheets 22 supported thereon are delivered by the discs 14 from the furnace 10 to the right, as viewed in the figures, and as these sheets travel to the right they pass under the rolls 32 where the magnetism of the rolls 32 lifts the prime sheets 22 a slight amount and continues to move them to the right. The waster sheets 20 being of non-magnetic material are not affected by the magnetism of the rolls 32 and consequently after they pass over the last row of disc 14 their leading edge tips downwardly below the apron 38 and they are caused to travel by gravity down the roller conveyor 50 and are deposited upon the roller conveyor 52 as previously described. It is to be understood, of course, that as soon as a pile of waster sheets 22 on the conveyor 52 has reached the desired height the pile is pushed to one side and another pile is started.

The prime sheets 22 that are picked up and conveyed by the magnetic rolls 32 are carried over the apron 38 and by the time the last edge of the sheets 22 lose their contact with the right hand roll 32 a sufficient amount of the same will have become supported by the rolls 44 to insure their continued conveyance to the right.

The prime sheets 22 are conveyed by the rolls 44 to beneath the magnetic rolls 68 which pick them up and continue to carry them to the right as viewed in the figures. This movement of the prime sheets 22 under the rolls 68 continues until the sheets being conveyed strike against the block 84 of the stop mechanism 72, as best illustrated in Fig. 3.

As soon as any sheet 22 being conveyed by the rolls 68 strikes the stop member 84 it will urge the stop member 84 to the right and cause the contacts 90 and 92 to be broken, whereupon the relay 104 will break the circuit 106 controlling the supply of electrical energy to the rolls 68. When this happens the rolls 68 immediately become demagnetized with the result that the sheet 22 being supported thereby immediately frees itself of the

rolls 68 and drops by gravity into the roller conveyor 64 therebelow. The moment the sheet 22 drops from the rolls 68 the spring 86 again causes the contacts 90 and 92 to reengage which again causes the rolls 68 to be magnetized so as to pick up and convey the prime sheet 22 next following, and the same operations are repeated.

It will also be understood that the hydraulic lift or jack 62 is controlled during the above described operation so that each sheet 22 dropped from the rolls 68 will have a relatively small distance to drop upon the roller conveyor 64 so that no damage will occur to it when dropping, and as the pile of sheets 22 on the roller conveyor 64 builds in height the lift 62 is operated to lower the roller conveyor 64 so as to maintain suitable clearance between the upper surface of the pile of sheets 22 thereon and the sheets 22 supported by the rolls 68 above it. As soon as a suitable pile of sheets 22 has built up on the roller conveyors 64 the pile is shoved to one side, the lift 62 raised to the proper distance and a new pile started.

It will be apparent from the above that due to the fact that the work comes into direct contact with the magnetized rolls a highly efficient conveyor is provided, and due to the fact that the sheets are held to the underside of the rolls due to the magnetic attraction of the latter, and which magnetism is readily controlled, the apparatus readily adapts itself to any use where paramagnetic sheets need to be conveyed and/or piled.

Formal changes may be made in the specific embodiment of the invention described without departing from the spirit and substance of the broad invention, the scope of which is commensurate with the appended claims.

I claim:

1. In combination, a supporting structure, a plurality of parallel, electrically energized magnetic rolls rotatably supported thereby with the lowermost lines of their surfaces lying substantially in a single plane and substantially unobstructed therebelow for a material distance whereby to enable them to hold a paramagnetic sheet against their under sides, means for driving said rolls at approximately equal peripheral speeds, an electric circuit for supplying the magnetic energy to said rolls, a switch mechanism for said circuit, a stop member in the plane of movement of a sheet suspended by and moved by said rolls, and an operative connection between said stop member and said switch mechanism.

2. The combination with a conveyor adapted to convey flat paramagnetic sheets from a furnace, said conveyor supporting sheets of other than paramagnetic material on which the paramagnetic sheets are supported, said conveyor being provided with a gap, means disposed below said gap for carrying away said other sheets, a plurality of rotatable magnetic rolls positioned with the lowermost lines of their surfaces in a single plane but slightly above said conveyor and over said gap, said rolls being adapted for direct contact with said paramagnetic sheets whereby to support and convey them across said gap without materially bending or distorting the same, and means for operating said magnetic rolls at a greater peripheral speed than that of said conveyor.

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