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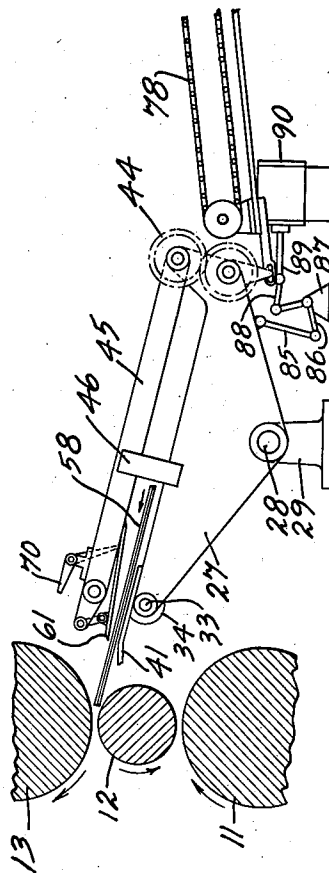
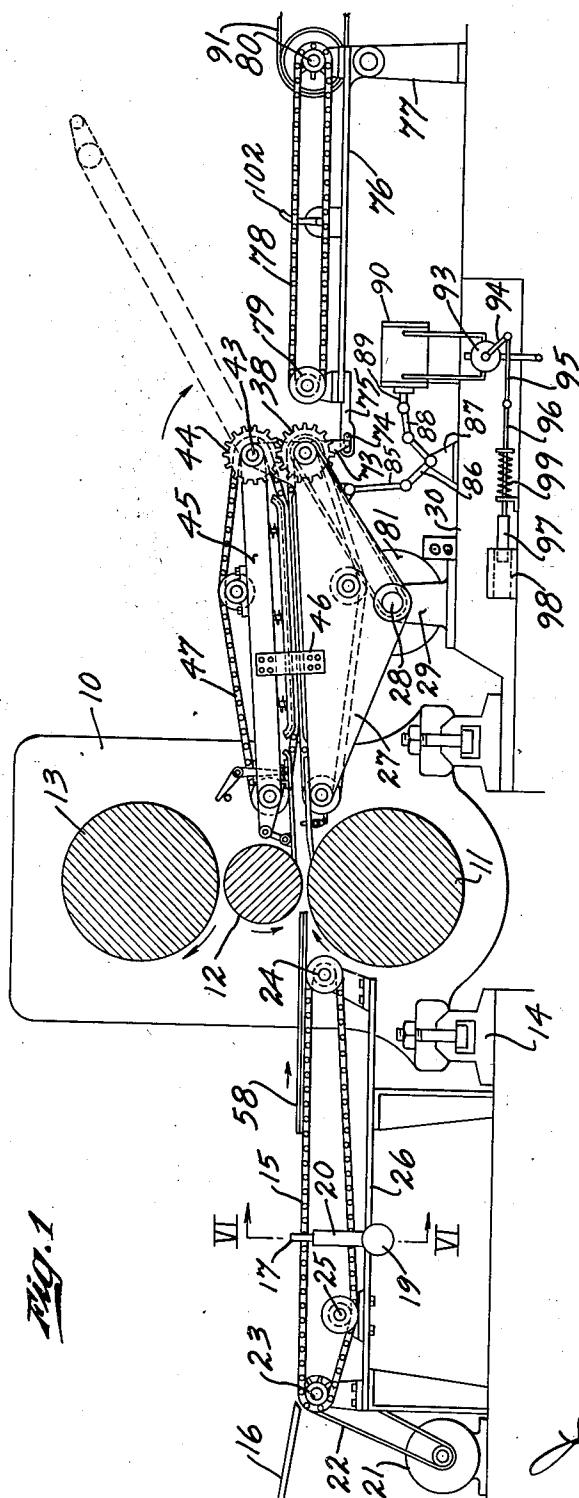
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2,062,297

AUTOMATIC MECHANICAL CATCHER FOR ROLLING MILLS

Filed Oct. 1, 1931

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

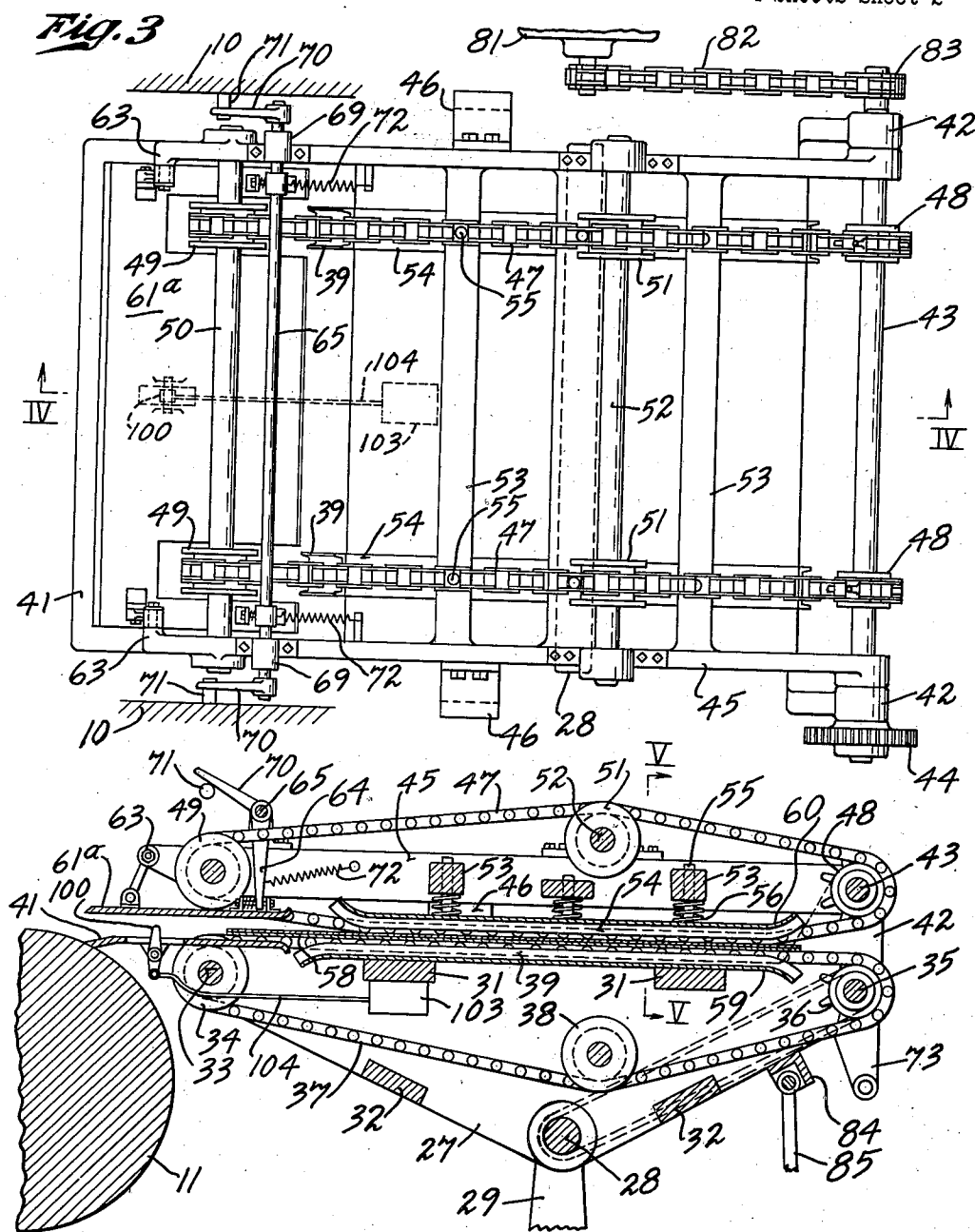


Fig. 4

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4 Sheets-Sheet 3

Fig. 5

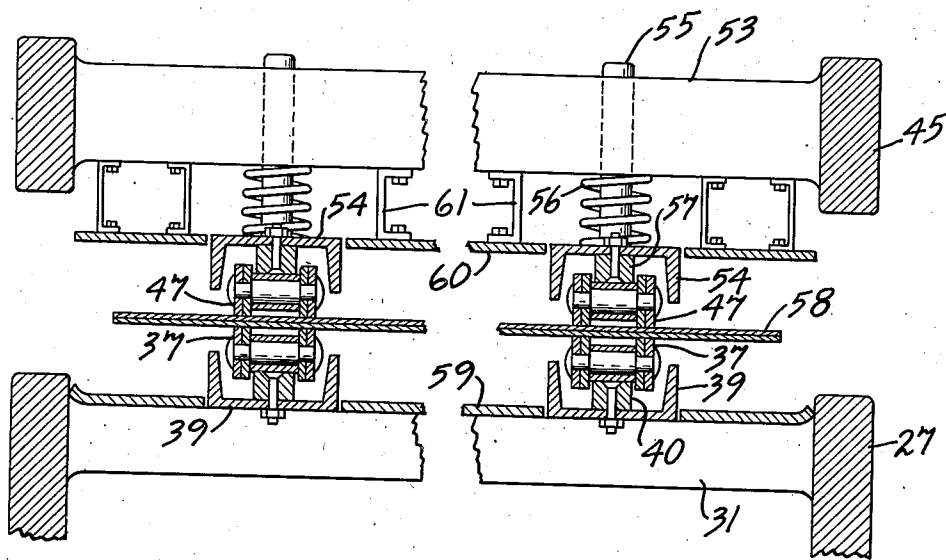
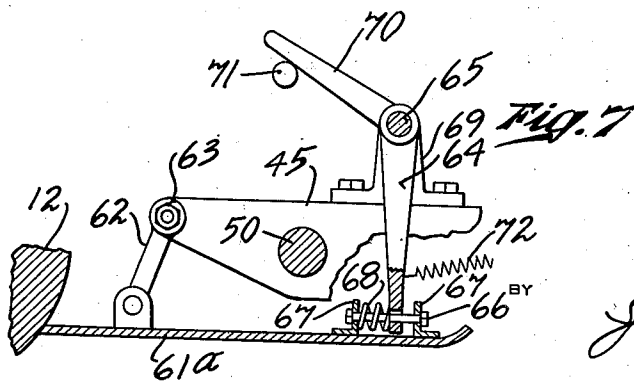
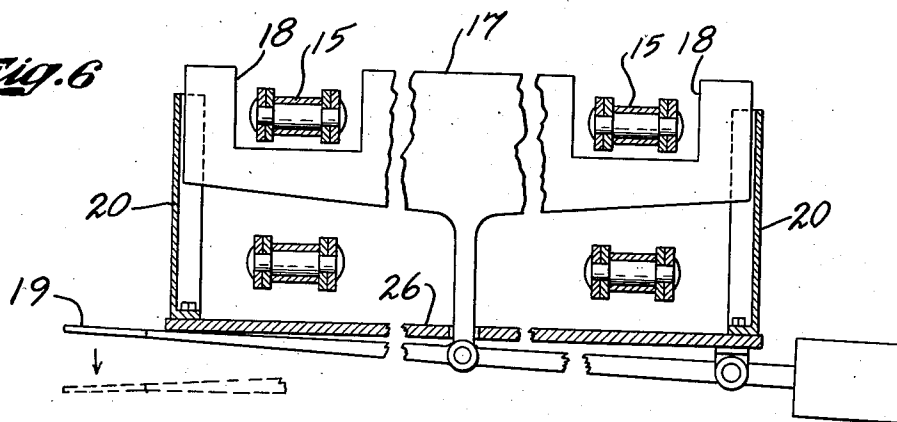


Fig. 6



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4 Sheets-Sheet 4

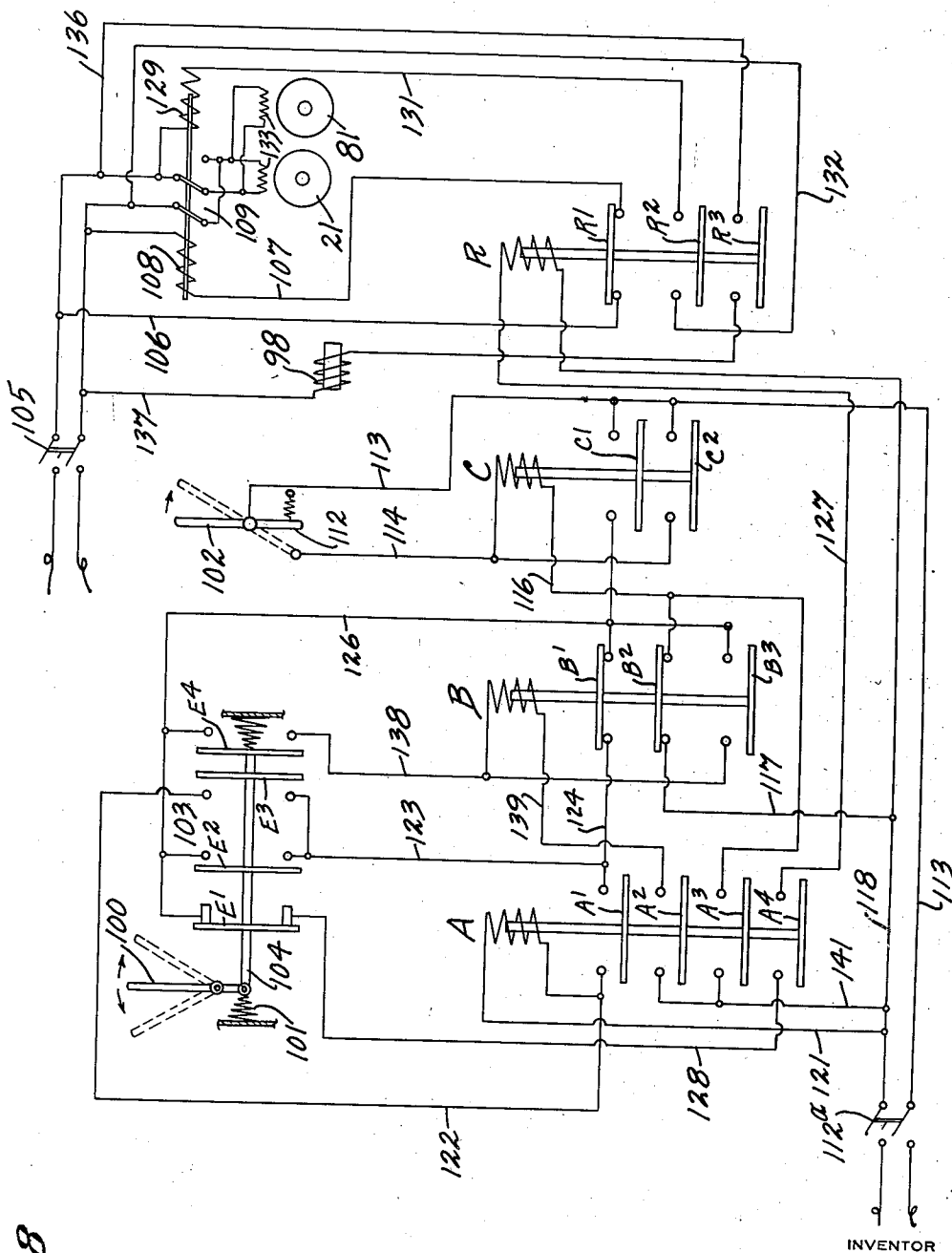


Fig. 8

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UNITED STATES PATENT OFFICE

2,062,297

AUTOMATIC MECHANICAL CATCHER FOR
ROLLING MILLS

Albanus Groome Delany, Gadsden, Ala., assignor,
by mesne assignments, to The American Rolling
Mill Company, Middletown, Ohio, a corporation
of Ohio

Application October 1, 1931, Serial No. 566,230

15 Claims. (Cl. 80—47)

My invention relates to mills for rolling plates and sheets or the like and is concerned with mechanism for catching, automatically returning, and finally discharging the finished rolled product.

My invention is applicable to three-high mills to return the sheets, which term I shall hereinafter use as representative of any rolled product whether single or in packs, through the upper pass to the roller. In the case of two-high mills it will pass the sheets back over the top roll to the roller. In both cases it will automatically discharge the sheets, after completion of the rolling operation, to the piler or other treatment apparatus. Thus the mechanism will replace the operator known as the "catcher", and will permit faster and more uniform operation of the mill with better results due to less loss of heat during the operation.

My invention contemplates providing in a mechanical catcher a tiltable table on which are mounted superimposed endless carriers, such as chains, which are synchronously and reversibly driven at the same speed with their coating flights adapted to grip between them and firmly hold the sheets in proper position after exit from the rolls for re-entry into the upper roll pass or return to the roller upon reversal of the chains and the up tilting of the table.

Other distinctive features of my invention are: the provision of guides for the coating chain or belt flights which act to press said flights together so that they will effectively grip and hold the sheets against displacement between them; the mounting of the upper chains in a frame hinged to the tiltable table so that it may be opened up for ready inspection and repair of both chains; the provision of strippers for the sheets as they emerge from the initial pass, the upper stripper being adapted to be retracted automatically sufficiently to clear the upper roll of the lower pass when the table tilts upwardly, and to be forced into engagement with said upper roll of the initial pass when the table tilts downwardly; the provision of a stop against which the sheets are fed as they approach the mill and by means of which they can be quickly matched so as to bring them into the proper position to enter the mill; the construction of the catcher mechanism in two parts comprising a relatively short balanced tiltable catcher table and a hinged sheet discharge table with its free end connected to the outer end of the catcher; and improvements in electrically controlled mechanism for causing the catcher to perform its various functions auto-

matically and quickly, responsive to the movement of the sheets.

My invention further comprises the novel combination and arrangement of parts which in their preferred embodiment are presented in the accompanying drawings and are hereinafter described in detail by reference thereto.

In the drawings:—

Fig. 1 shows the rolls of a three-high mill in cross section but the sheet handling mechanism in side elevation;

Fig. 2 is a detail view corresponding to Fig. 1 showing the catcher table tilted up and the upper stripper retracted;

Fig. 3 is a detail plan view of the tiltable catcher table;

Fig. 4 is a vertical cross sectional view taken on the line IV—IV of Fig. 3;

Fig. 5 is a fragmental view taken on the line V—V of Fig. 4 and enlarged to show the coating chain flights and their guides;

Fig. 6 is an enlarged fragmental view taken on the line VI—VI of Fig. 1;

Fig. 7 is a detail view of the trip actuated retractable upper stripper; and

Fig. 8 is a wiring diagram illustrating how the sheet operated trip switches control the automatic operation of the mechanism.

Similar reference numerals refer to similar parts throughout the drawings.

I have shown my invention associated with what is termed a three-high mill comprising a frame 10, a lower roll 11, an intermediate roll 12 and an upper roll 13. This mill is mounted in a normal manner upon foundations or supports 14 and there is associated with it on its receiving side a pair of endless chains or belts 15 which receive the sheets as they are delivered down the chute 16 and present them to a transverse stop plate 17 (Fig. 6) which is notched at 18 so that it can project above the top flights of the chains 15 when it will act to stop the sheets and permit the "roller" to square the sheets properly relative to the mill. A counterweighted treadle 19 normally holds the stop plate in raised position. It is in convenient position for the "roller" to depress the treadle with his foot and release the sheets to be fed into the lower pass of the mill. The stop plate works freely in the guides 20.

A motor 21 by means of a chain 22 drives the shaft 23 which carries fast thereon the driving sprockets for the two chains 15. These chains pass about idler sprockets 24 and return under idlers on the shaft 25. A frame 26 carries suitable bearings for the sprocket and idler shafts

and has the plate guides 20 secured thereto. The frame 26 is overhung toward the lower roll 11 so that the chains approach the lower pass sufficiently to guide the sheets thereinto.

5 The catcher mechanism comprises a tilting table having the side plates 27 mounted near their lower center to rock on a bottom cross shaft 28 which is journaled in bearings 29 anchored to the foundations 30 on the delivery side of the mill. These plates are suitably cross connected
10 by transverse frame members 31 and 32.

At one end of the frame is journaled a cross shaft 33 having a pair of grooved idler rollers 34 thereon. At the other end of the frame is journaled a jack shaft 35 bearing the sprockets 36
15 for driving the lower pair of catcher chains 37 which return to the idlers 34 under tension idlers 38.

On the cross supports 31 I mount upturned channels 39. Each channel has a wear strip 40 (Fig. 5) bolted centrally thereto and adapted to form a track support for the upper flight of the chains 37. The ends of the channels are down-
20 turned as seen in Fig. 4, and a bottom stripper plate 41 extends from the sheet receiving end of the tiltable frame to the channels 39, being cut away at its rear end for the chains and their front
25 idlers 34 and at its forward end being downwardly deflected to engage the lower roll 11.

30 The plates 27 carry at their outer ends raised bearing extensions 42 in which I journal the shaft 43 having fast thereon at one end the gear 44, meshing the gear 38.

An upper frame 45 is mounted to swing on this
35 shaft 43 and is secured in spaced relationship to the plates 27 by the side clips 46 that are bolted to both frames.

The upper pair of sheet handling chains 47 are mounted on this upper frame, having driving
40 sprockets 48 on shaft 43, forward idlers 49 on shaft 50 and tension idlers 51 on shaft 52. All shafts are suitably journaled in the upper frame which has the cross brace members 53.

Inverted channels 54 having upturned ends
45 are adjustably mounted by means of pins 55 working vertically through slots in the members 53 and carrying coiled springs 56 which force the channels downwardly and press their wear strips 57 against the upper chains 47 causing the latter
50 to grip sheets 58 (Fig. 5) between them and the chains 37.

Plates 59 are mounted on the members 31 between and on each side of the channels 39. Similar plates 60 are connected by brackets 61 to the
55 members 53 so that the tiltable table encloses the sheets except at their edges and thus conserves their heat.

I provide an upper retractable stripper plate 61a which is suspended by swinging links 62 hung
60 from forward end bearings 63 of the sides of frame 45. Near its rear edge the stripper 61a is supported by crank arms 64 carried by the rocker shaft 65 and each slotted to loosely receive a bolt 66 secured to a pair of spaced angles 67.
65 A coiled spring 68 surrounds each bolt 66 between the crank and forward angle. The shaft 65 is journaled in bearings 69 on the frame 45 and carries at each end a trip arm 70 adapted to engage the pins 71 fast in the roll frame 10.
70 This causes the cranks to thrust the stripper plate yieldably because of springs 68 towards the roll 12.

As the "catcher" tilts upwardly, the trip arms 70 become disengaged from the pins 71 and the
75 stripper plate 61a is pulled away from the roll 11

by springs 72 sufficiently to clear it, see Fig. 2. This plate 61a is notched to clear the chains 47 and the idlers 49 in all operating positions.

An extension 73 on the outer end of each plate 27 loosely engages in the slot 74 of a bracket 75
5 attached to the free end of a frame 76 hinged at its other end to the stand 77. A pair of delivery chains 78 are mounted on this frame aligning with chains 37. I provide idlers 79 and driving sprockets 80 for the chains 78, which receive the
10 finished sheets.

A belt or chain 82 driven by a reversible motor 81 acts to drive a pulley or sprocket 83 fast on the shaft 35 that carries the sprockets 36 and gear 38. Attached under the table 27 is a cross
15 angle 84 (Fig. 4) to the center of which is pivotally connected a link 85 in turn connected to a bell crank 86 journaled on a bearing 87 and in turn connected by a link 88 to the piston rod 89 of a compressed air cylinder 90 having pipe connec-
20 tions to a four-way control valve 93.

The sprockets 80 are driven by any suitable means preferably by a belt 91 which drives a pulley fast on the shaft for the sprockets 80.

The valve 93 is operated by an arm 94 con-
25 nected by a link 95 to the spring-pressed plunger rod 96 operated by the core 97 of the solenoid 98. The spring 99 acts to retract the core from the solenoid and to set the valve to tilt the table to its lowered or sheet receiving position, shown
30 in Fig. 1. When the solenoid is energized, the valve is rocked to cause the air motor to tilt the table upwardly into its sheet discharging position, shown in Fig. 2.

A trigger 100 is pivotally mounted so that its
35 upper end projects up through the lower stripper plate 41 near its free edge so that entering sheets will rock it clockwise from its neutral position and hold it thus until the sheets have moved fully into the table when it is released and is
40 free to move, responsive to spring 101 (Fig. 8) back to neutral position. Upon reversal of the catcher chain drive the sheets will be reversed and as they are returned to the mill, the trigger
45 100 is again engaged and this time is shifted from neutral position counter-clockwise and so held until the sheets have been fully discharged by the catcher.

A trigger 102 is mounted on the delivery frame 76 in position to be tripped by the sheets, as they
50 are moved by the chains 78, and when so tripped will act to reset the automatic mechanism to carry out the cycle of operations in the manner which will now be described by reference to Fig. 8, in which the various switches and triggers are
55 diagrammatically illustrated, it being understood that various types of switches and circuits might be selected to carry out the contemplated operations.

A multiple contact switch box 103 is mount-
60 ed on member 31 of table 27 and has its contacts operable by a rod 104 from the trigger 100.

In the operation of my invention, the passage of the rolled stock through the tiltable catcher frame 27 controls automatically a cycle of oper-
65 ations which may be briefly described as follows: the sheets upon entering the catcher from the lower mill pass trip and throw trigger 100 to the right and hold it in this position until they pass by it, whereupon the trigger resumes its
70 normal upright position. This movement of the trigger, through automatic mechanism which will later be described, acts simultaneously to reverse the air motor to tilt the catcher table upwardly 75

and to reverse the motor drive to its conveyor chains 37 and 47.

The sheets thereupon are moved back toward the mill and they will again engage the trigger 100 which this time is thrown to the left and held in such position until the sheets pass from the catcher, whereupon the trigger again resumes its normal upright position. This movement of the trigger acts to again reverse the air motor to lower the table and to reverse the motor drive for the chains, causing them to move in the direction and at the proper speed to receive the sheets after their second treatment in the lower pass of the mill. When the finished sheets enter the catcher the trigger 100 is tripped for the third time in this cycle, being moved to the right and held until the sheets pass over it when it will return to its normal position. This return movement of the trigger will be without effect on the motors for tilting the catcher and driving the conveyor chains thereon, and hence the latter will continue to be driven in a direction to discharge the finished sheets onto the receiving table where they engage and trip the trigger 102 and will hold the same down until the sheets pass off from the delivery frame, whereupon this trigger will resume its normal position and by this action will reset the automatic mechanism controlled by trigger 100 so that the cycle of operations described will be repeated with the next batch of sheets entering the catcher. The motors 21 and 81 are controlled by the automatic mechanism so that they drive their respective chains 15, 37 and 47 in like direction and at the same speed which is approximately that of the surface speed of the rolls.

By the above means the chains 15 will move to carry the sheets away from the mill while they are being returned through the upper mill pass or over a two-high mill and will then be automatically reversed under control of trigger 100 to feed the sheets back to the mill for the final pass.

A suitable mechanism for carrying out under automatic control the cycles of operations above described is illustrated in Fig. 8, which shows in diagrammatic form the switch and circuit mechanism which operate responsive to the triggers 100 and 102 as follows.

When main line switch 105 is closed and current is directed through leads 106 and 107 and switch R1 to the solenoid 108, this will actuate the reversing switch 109 causing the motor 81 to drive the sheet gripping flights of the chains 37 and 47 in a direction away from the rolls.

To start up the catcher, the trigger 102 is thrown by hand and a switch 112a is closed to energize the relay C by current passing through lead 113, switch 112, lead 114, relay C, lead 116, switch B2, and leads 117 and 118. The relay C acts to close switches C1 and C2. The flag switch 112 is spring-pressed to return to its normal open position when its trigger 102 is released, after which the relay C will be held energized by current passing through the lead 113, switch C2, lead 114, relay C, lead 116, switch B2, and leads 117 and 118.

After the sheets emerge from the bottom rolls and enter the catcher they engage and actuate the trigger 100, moving it clockwise and holding it in position to close the switch E3 in box 103 and permit the current to pass through the leads 118, 121, relay A, leads 122, switch E3, leads 123, 124, switch B1, switch C1 and lead 113. After the relay A has thus been energized, the

switches A1, A2, A3 and A4 are closed. When the sheets have passed beyond and released the trigger 100, it will automatically assume its upright normal position and open the switch E3, the current then passing through the leads 118, 121, and relay A, switch A1 to lead 124, etc. This holds switches A1, A2, A3 and A4 in their closed position.

When the trigger 100 resumes its upright position a circuit is completed through the lead 118, retarded relay R, lead 127, switch A4, lead 128, switch E1 and leads 126, switch C' and 113, which causes the relay R to open the switch R1 breaking the circuit to the solenoid 108, and closing the switches R2 and R3. The switch R2, when closed, completes a circuit to the solenoid 129 through the leads 131 and 132. The solenoid 129 actuates the switch 109 causing the current to flow in a reverse direction through the field coils 133 to reverse the direction of rotation of the motors 81 and 21. The switch R3, when closed, completes a circuit to the solenoid 98 through the leads 136 and 137 and actuates the valve 93 to cause the motors 90 to tilt the table 27.

As the sheets leave the catcher table for the return pass through the upper rolls, they actuate the trigger 100, counterclockwise, to close the switches E2 and E4. The switch E2 closes a circuit leading to the relay A through the lead 113, switch C1, lead 126, switch E2, lead 123, switch A1, relay A, and leads 121 and 118. The switch E4 closes a circuit to the relay B through the lead 113, switch C1, lead 126, switch E4, lead 138, relay B, lead 139, switch A2, and leads 141 and 118. The relay B then opens the switches B1 and B2 and closes the switch B3. When the switch B2 opens, it does not affect the relay C as a holding circuit has been completed through lead 113, switch C2, lead 114, relay C, lead 116, switch A3, and leads 141 and 118. The switch B3 closes a holding circuit to the relay B through the lead 113, switch C1, lead 126, switch B3, relay B, lead 139, switch A2, and leads 141 and 118.

After the sheets have passed over the trigger 100 on their travel through the upper rolls, it will assume its normal position and open the switches E2 and E4. When the switch E2 opens, it breaks the circuit to the relay A which will then open the switches A1, A2, A3 and A4. The switch A2 will break the circuit leading to the relay B which, in turn, will open switch B3 and close switches B1 and B2. The switch A3 in opening breaks the circuit to the relay C. The switch A4 breaks the circuit to the retarded relay R which, after a predetermined time, will open the switches R2 and R3 and close the switch R1. When the switch R3 opens, it breaks the circuit to the solenoid 98 and permits the spring 99 to actuate the valve 93 to cause the catcher table to return to its lowered position. When the switch R2 opens, the circuit is broken leading to the motor reversing solenoid 129. The switch R1 then closes the circuit to the solenoid 108 to actuate the switch 109 to cause the motor and chains to carry the sheets forward through the lower rolls and onto the chains 79 on the delivery table 76.

As the sheets leave the catcher table 27, the relays A, B, C and R are all de-energized. The trigger 102 on the table 76 will however be thrown by the passing sheets to close the circuit to the relay C, after which the operation will be the same as described.

While I prefer to use a tilting table, by such

a term I intend to include any table movable into co-operative relation with passes at different levels in the mill.

While the above mechanism is considered suitable for controlling the operation of the catcher table it can obviously be modified without departure from my invention and it can readily be adapted to give any desired cycle for the sheets.

While I have referred to the sheet gripping and moving elements in the catcher as chains, it will be understood that other conveyor elements may be substituted, provided they will effectively grip and hold the sheets in proper position while moving them back and forth rapidly in the catcher table according to the operating cycle desired.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. An automatic catching table for rolling mills comprising a tiltable frame, superposed sets of endless chains mounted on said table, each set comprising flights which are closely spaced and adapted to receive the rolled sheets between them, spring pressed guides to hold the chains in yieldable engagement with the sheets, and a reversible drive for the chains.

2. An automatic catching table for rolling mills comprising a tiltable frame, lower tracks, endless chains having their upper flights traveling in said tracks, upper tracks, an upper set of chains having their lower flights traveling in said upper tracks, means to yieldably press the superposed pairs of tracks together to cause the chains to grip and convey the rolled stock, and automatic sheet controlled reversible drive means for said chains.

3. A catcher for rolling mills, comprising a tiltable catcher table with sets of superposed conveyers having a common reversible drive and disposed to grip the rolled stock between them, a delivery table pivotally mounted and connected at its free end to the discharge end of the catcher table, a non-reversible conveyor mounted on said delivery table, and trip controlled means automatically responsive to the passage of rolled stock to produce a cycle in which the stock is first received, then returned to the roller, again received and finally discharged onto the delivery table, where it resets the trip controlled means to repeat the cycle.

4. A catcher for rolling mills comprising a tiltable catcher table having reversible stock moving means, a roll engaging stripper plate movably mounted on the table, and means to retract said plate automatically to clear the mill roll which it engaged as the table is tilted past said roll.

5. In combination with a stand of rolls, a catcher table mounted to shift from lower sheet-receiving position to upper sheet-returning position, a stripper plate carried by the table, means to advance said stripper with respect to said table into cooperative relation with a roll when the table is lowered, and means to retract the stripper to clear said roll as the table is raised.

6. In combination with a stand of rolls, a catcher table mounted to shift from sheet-receiving position to sheet-returning position, a stripper stock guide carried by the table, means to advance said stripper into cooperative relation to a roll when the table is in receiving position, and means to retract the stripper to clear said roll as the table is tilted, the stripper advancing means comprising yieldable elements.

7. In combination with a stand of rolls, a catcher table mounted to shift from sheet-receiving position to sheet-returning position, a stripper stock guide carried by the table, means to advance said stripper into cooperative relation to a roll when the table moves to sheet-receiving position, and means to retract the stripper to clear said roll as the table is tilted, the stripper advancing means comprising positively driven elements yieldably connected to the stripper.

8. In combination with a rolling mill, a feeder table comprising releasable stop means disposed to engage superimposed sheet bars as they approach said mill and furnish a guide with respect to which the said stock can be brought into correct position to enter the mill, and mechanical means on the "catcher" side of the mill to grasp and hold the partly rolled stock elements in said correct position until returned for further rolling in said mill.

9. A mechanical catcher for rolling mills, comprising a tiltable frame, superposed pairs of endless chains mounted on said table, channel guides for the adjacent flights of each pair of chains, springs and pins for yieldably mounting the upper guides in said frame, plates to substantially enclose the sheets while engaged by said chains, a reversible motor drive for simultaneously moving said chains at equal speeds, and sheet controlled means to tilt the frame and move the chains through the required cycle of movements to roll the sheets and discharge them.

10. A catcher for rolling mills, comprising a tiltable catcher table having means to receive stock from and return it to the mill rolls, a trip actuated stripper plate on the table adapted to coact with a mill roll to strip the stock therefrom, and spring means to retract said plate responsive to a tilting movement of the table.

11. In a catcher for a three-high mill, comprising large upper and lower rolls and a smaller middle roll, a tiltable table for receiving the stock from one pass and returning it to another pass in the mill, a fixed stripper on the table adapted to coact with a large roll, and a retractable stripper adapted in automatic response to table movements to coact with the small roll and to clear the latter as the table tilts.

12. An automatic catching table for rolling mills comprising a tiltable frame, endless conveyors mounted on said frame to provide juxtaposed flights adapted to receive the rolled stock between them and to travel continuously with said stock, means to adjust one of said flights bodily in continuous parallelism with said other flight whereby said flights may accommodate single sheets or packs of various thicknesses, and a reversible drive means for moving said conveyor flights in exact unison.

13. An automatic catching table for rolling mills comprising a tiltable frame, endless conveyors mounted on said frame to provide juxtaposed flights adapted to receive the rolled stock between them and to travel continuously with said stock, means to adjust one of said flights bodily in continuous parallelism with said other

flight whereby said flights may accommodate single sheets or packs of various thicknesses, yieldable presser means upon said adjustable flight to cause said flight to bear against stock between it and the other flight, and a reversible drive means for moving said conveyor flights in exact unison.

14. An automatic catching table for rolling mills comprising a tiltable table comprising upper and lower frames, means for moving one of said frames in continuous parallelism with said other frame, endless sheet conveyors mounted in each frame and adapted to frictionally engage

the rolled stock between them, guide means supporting said endless conveyors against said stock throughout a substantial length of said conveyors, and means upon said movable frame to urge said guide means toward the rolled stock.

15. A catcher for rolling mills comprising a tiltable catcher table having reversible stock moving means, a roll engaging stripper plate movably mounted on the table, said movable mounting permitting retraction of said plate to clear the mill roll which it engaged as the table is tilted past said roll.

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