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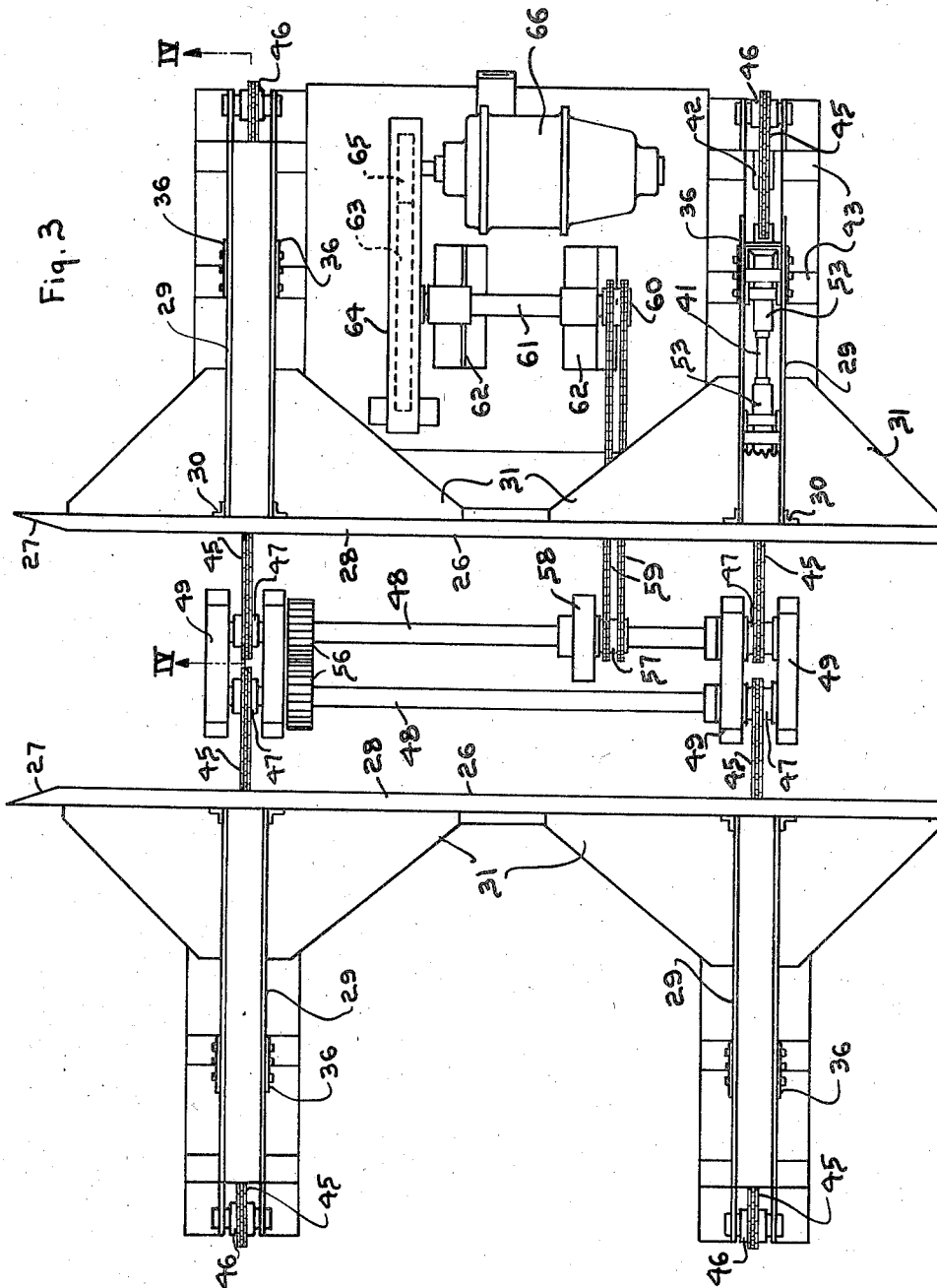
A. G. DELANY

2,137,478

SHEET MILL FILER

Filed April 18, 1936

4 Sheets-Sheet 2



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4 Sheets-Sheet 3

Fig. 5

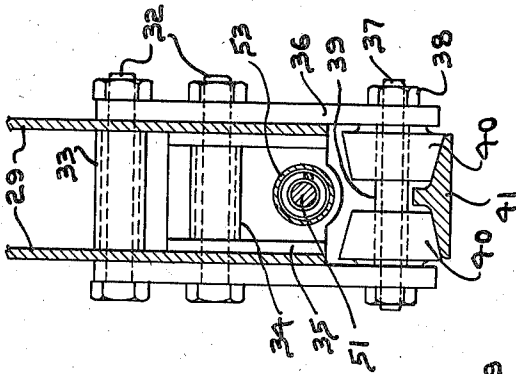
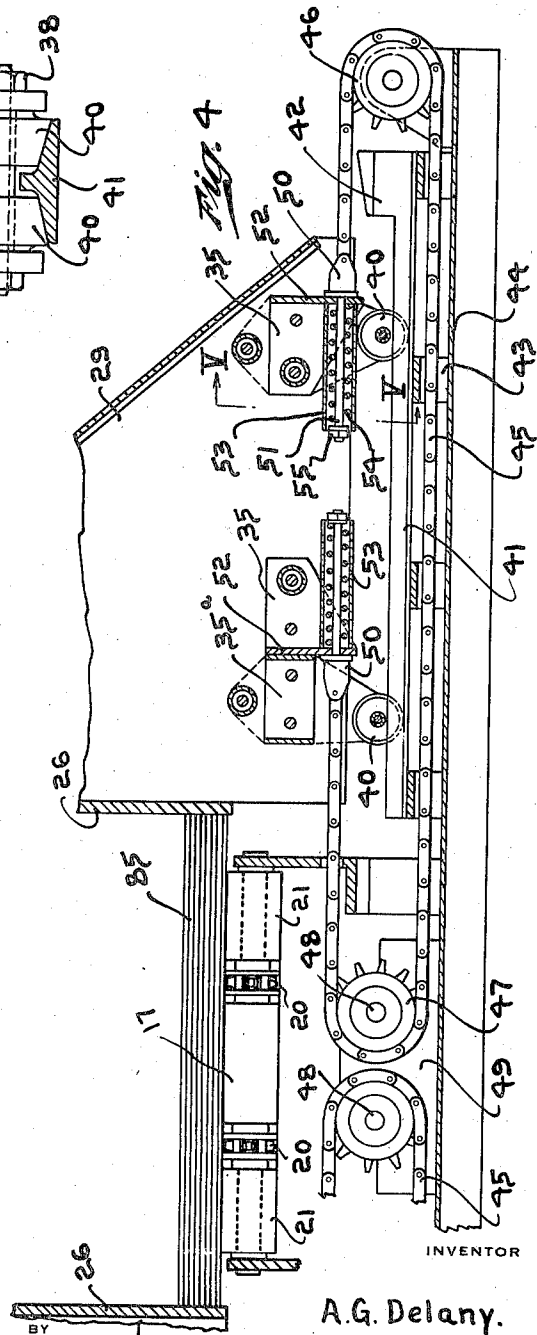


Fig. 4



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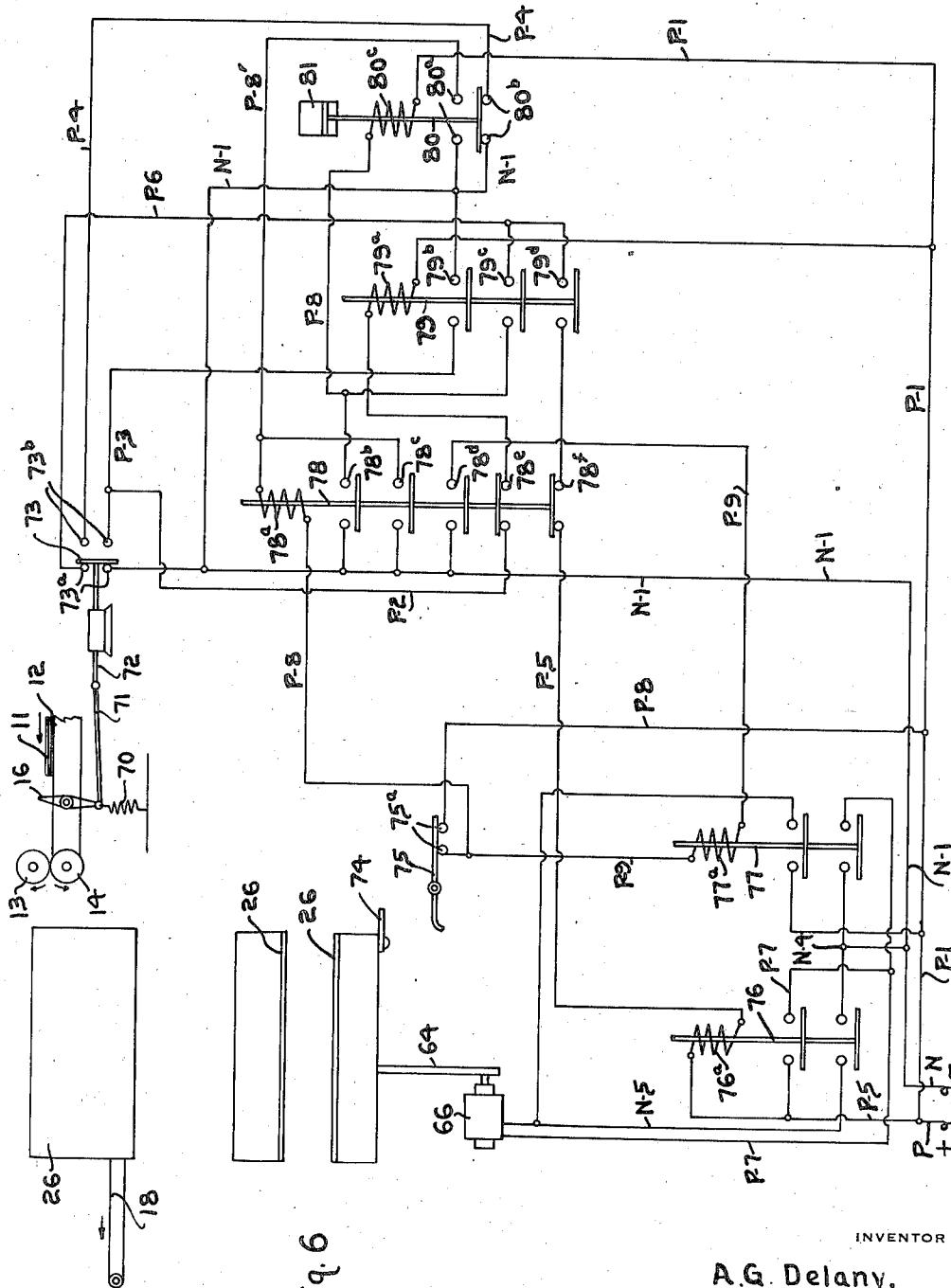


Fig. 6

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UNITED STATES PATENT OFFICE

2,137,478

SHEET MILL PILER

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mesne assignments, to Republic Steel Corpora-
tion, Cleveland, Ohio, a corporation of New
Jersey

Application April 18, 1936, Serial No. 75,094

19 Claims. (Cl. 271—89)

My invention relates to a piler mechanism for sheet mills which is particularly, though not exclusively, adapted to receive packs of sheets from the end cutting shear table and, by engaging them on opposite sides by yieldably driven reciprocable pilers, to bring the sheets into the requisite alignment for the formation of the desired stack on the piler transfer table.

One distinctive feature of my invention is the provision on opposite sides of the receiving bed for the sheets to be stacked of oppositely movable piler heads which are reciprocated back and forth in synchronism by yieldable chain drives.

A further distinctive feature of my invention is to provide an automatic mechanism, responsive to the delivering of the sheet packs to the piler mechanism, and to the movements of the pilers, to control their reciprocation.

A further distinctive feature is the provision, as a part of the circuit controller mechanism for the pilers, of a delayed or slow acting circuit closing switch which prevents the reciprocation of the pilers responsive to the delivery of each pack of sheets, as they normally come too rapidly from the shears to permit of the pilers reciprocating once for each pack, it being quite sufficient if they are reciprocated automatically at suitably timed intervals during the delivery of the sheet packs, or if one is thus caused to reciprocate and have relative movement to the other.

My invention further comprises a novel arrangement of the piler guides and of the reversible drive for reciprocating the pilers in synchronism with a compression spring interposed in the drive to provide a yielding and shock absorbing drive for the pilers effective for both directions of travel.

More particularly, my invention comprises receiving the sheet stacks from pinch rolls on the shear table onto a lower table in position between a pair of laterally reciprocable pilers which have roller bearings and, near each end, are connected to reversibly driven chains through compression or cushioning springs so interposed as to absorb the shock of the pilers when they engage the stacked stock and, if desired, when they are stopped at the end of their return or idle stroke, suitable switch means being provided under control of the stock and of the pilers themselves to effect their automatic operation at suitably timed intervals while stock is being fed between them.

The objects of my invention and the novel features of its construction are hereinafter more

particularly described and claimed, reference being had to the accompanying drawings which form a part of this specification, and in which—

Fig. 1 is a side elevation showing an end cutting shear and its table for delivering packs of sheets to the piler shown in outline only, and a table to carry off the piled stock.

Fig. 2 is an enlarged cross sectional view of the piler mechanism taken on the line III—III of Fig. 1.

Fig. 3 is a plan view of Fig. 2 omitting any showing of the transfer table for carrying away the stacked sheets from the piler.

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

Fig. 5 is a cross sectional view taken on the line V—V of Fig. 4.

Fig. 6 is a diagrammatic layout of the wiring circuits and switches for the control of the piler.

Similar reference numerals refer to similar parts throughout the drawings.

I have shown my invention associated with an adjustable end shear 10 for sheet packs 11 which are delivered from the shear rolls onto a suitable chain table 12 by means of which they are conducted to a pair of pinch rolls 13 and 14 having a suitable motor driven chain drive generally designated by the numeral 15. The sheet packs in their passage to the said pinch rolls engage and throw the trip 16 for a flag switch, the trip only being shown in Fig. 1. The pinch rolls deliver the sheet packs successively onto the chain transfer table of the piler mechanism, which table may be of any suitable design but is shown as comprising rolls 17, driving chains 18 for the rolls, and spaced side angle bearings 19 for the rolls, and suitable roll driving sprockets 20.

The rolls comprise removable end sleeves 21 to permit the mounting of the sprockets 20 which are engaged by the chains 18 thereby to drive the rolls. The chains have driving sprockets 22 driven through the chains 23 by the drive mechanism 24 comprising the motor 25. It is understood that any suitable transfer table may be used for delivering the sheared sheets to the piler and for carrying away the stacked sheets from the piler.

The level of the piler table rolls 17 is substantially below that of the pinch rolls 13 and the requisite number of stacks of sheets can be readily delivered by these pinch rolls into stacked relation on the piler table. The piler mechanism acts on the sheet packs that are pushed onto the rolls 17 and comprises a pair of duplicate transversely reciprocable pilers 26 which will now be

described by reference particularly to Figs. 2 and 3, the description of one applying to both.

The vertical piler face plate has its sheet receiving end edge flared outwardly at 27 and its upper edge similarly flared at 28. I connect to each plate on its outer side two parallel housings, each comprising a pair of spaced triangular shaped vertical plates 29 disposed normal to the face plate and suitably bolted together with interposed spacer sleeves. Each housing is connected to its respective piler face plate in any suitable manner, such as by the provision of vertical angles 30 along their junction with the piler plate and with horizontal gusset plates or braces 31.

As shown in Fig. 5, the lower ends of the side plates 29 of each housing are connected together by bolts 32, the upper bolts carrying spacer sleeves 33 engaging the side plates and the lower bolts carrying shorter sleeves 34 interposed between the side flanges of a bracket 35. The outer ends of the several bolts near each end of the housing pass through an opposed pair of bearing plates 36 and bolt them to the housing with their lower ends depending below the housing and slotted so as to be slipped down over the ends of an axle 37. Nuts 38 are screwed on the ends of each axle 37 and clamp it to the lower end of the bearing plates, an interposed spacer bearing sleeve 39 being mounted on each axle 37 and having mounted thereon a pair of oppositely bevelled rollers 40. By removing either of the nuts 38, the roller mountings can be readily detached from the several housings for repair or replacement.

The rollers 40 have their inwardly tapering treads engaging the base 41 of a track rail, the web of which is cut away except at the outer track end 42 where the web and tread present a stop for the housing by engaging an axle bearing 39 between its rollers. Track and roller supports, such as described, are provided for each housing of each piler plate and the tracks are suitably supported by chairs 43 elevated above the base platform 44 of the piler. These chairs, shown more clearly in Fig. 4, raise the track into position for the lower flight of a drive chain 45 to pass along thereunder and about an idler sprocket 46, suitably journaled at the outer edge of the frame, and about a driving sprocket 47 fast on a drive shaft 48 journaled in suitable bearings 49 under the roll bed between the pilers.

Each end of each drive chain 45 is secured to a head 50 of a pin 51 which is slidable through the transverse web 52 of its respective bracket 35 and works in a sleeve or housing 53 having a coil spring 54 that bears at one end against the web 52 and at the other end against a nut 55 screwed on the outer end of the rod and movable freely through the housing 53. This arrangement being identical for both ends of the two driving chains for each piler, it follows that for each direction of motion imparted by the chains to the pilers, a shock absorbing unit is provided to take up the jar resulting from their opposed impact against the stacked sheets to be piled on their inner or working stroke and their engagement with the track stops 42 at the completion of their outer or return stroke.

As will be seen more clearly in Fig. 3, one shaft 48 has fast thereon the sprockets 47 for driving the two operating chains 45 for the right hand piler and a similar shaft 48 is provided for the sprockets controlling the two drive chains 45 for the left hand piler. These shafts 48 are journaled in spaced bearings 49 and are geared to rotate in unison reversely by means of the mesh-

ing gears 56. The right hand shaft 48 has a double sprocket 57 mounted fast thereon adjacent to a bearing 58. A double drive chain for this sprocket leads outwardly under the right hand piler plate to the double sprocket 60 fast on a drive shaft 61, that has suitable bearings 62, both mounted on the piler bed and it carries at its end opposite the sprocket 60 a large gear 63 within a housing 64, which gear meshes a small driving gear 65 fast on the shaft of a reversible motor 66.

When the motor is driven in one direction it will, through the driving elements described, cause the several chains 45 to pull the pilers together until they engage the side edges of the piled stock resting on the roll bed 17 between them and align the side edges of the stacked sheet packs. When the motor 66 is reversed, the chains 45 will pull the pilers apart. While the pilers may be thus operated very effectively by manually operated switch control of the motor 66, I contemplate an automatic control for this motor which will now be described.

Referring to Fig. 6, the diagrammatic layout of the switches and circuits will be best understood by relating the same to the pilers shown both in side elevation and in plan so that the response of the switches both to stock control and piler control may be better understood. The trip 16, which is actuated by the passage of sheet packs 11 to the pinch rolls 13 and 14, is held in upright position by any suitable means, such as a spring 70, and when it is tripped with a counterclockwise motion by the passing stock, it acts through the links 71 and 72 to move a single blade switch 73 to open contacts 73a and close contacts 73b. One of the pilers 26 carries a trip element 74 which, when the pilers are fully retracted, engages a pivoted switch arm 75 and opens contacts 75a.

The power leads P and N to the piler control circuits are given a plus and minus mark and, under control of the double blade forwarding switch 76 and the double blade reversing switch 77, pass current to the motor 66 to reversibly drive same and reciprocate the pilers 26. These switches 76 and 77 are actuated by their respective control magnets 76a and 77a and the circuits which they control will be described in connection with the operation of the apparatus.

I provide a five blade switch 78 controlled by its respective magnet 78a, also a three blade switch 79 controlled by its respective magnet 79a. The switches 76 to 79 are what may be termed quick action electrically operated switches and they may be of any suitable design.

I provide a slow-acting single blade switch 80 adapted to alternately close the contacts 80a or 80b responsive to the action of its respective magnet 80c as modified by the effect of a dash pot 81 which is adapted to produce the desired slow or retarded action for this switch.

The diagrammatic layout shows the circuit connections between the contacts controlled by the several switches and the motor 66, and the circuits as they are closed will now be traced throughout a complete cycle of operation of the pilers.

With the trip 16 standing in the idle position shown, switches 76, 77 and 79 stand with all contacts open; switch 80 stands with contacts 80b closed; switch 73 stands with the contacts 73a closed; switch 78 stands with contacts 78b, 78c and 78d open and contacts 78e and 78f closed; and switch 75 stands with contacts 75a

closed. When a pack of sheets 11 engages and throws the trip 16, contacts 73a are opened and 73b are closed, thereupon the following circuit is established: P—1, magnet 79a, contacts 78e, P—2, P—3, contacts 73b, P—4 across contacts 80b to line N—1. The energization of magnet coils 79a will close the three sets of contacts controlled by switch 79. The closing of contacts 79b holds the magnet 79a energized. When the flag switch trip 16 is released by the passing pack of sheets, it opens contacts 73b and closes contacts 73a and will establish a circuit to energize the motor 66 and drive the pilers on their inward or working stroke, as follows: P—5, magnet 76a, across closed contacts 78f and 79d, P—6, contacts 73a, to N—1. The completion of this circuit closes all contacts controlled by switch 76 so that current then flows from P—5 across the upper contacts controlled by switch 76 and line P—7 to the motor 66, returning by line N—5 across the lower contacts controlled by switch 76 and line N—4 to line N—1. The motor will respond, driving the pilers on their working or inward travel. At the same time magnet 80c becomes energized by the circuit P—1, magnet 80c, P—8', contacts 79c, P—6, contact 73a to N—1.

The switch 80, being of the hesitating or slow-action type will open contacts 80b and move slowly towards position to close the contacts 80a. This slow action allows ample time for motor 66 to drive the pilers through their full working stroke. When contacts 80a close, the following circuit is established:—P—1, P—8, contacts 75a, magnet 78a, contacts 80a to line N—1, thereby raising switch 78, closing its contacts 78b, 78c and 78d and opening its contacts 78e and 78f. This switch 78 forms its own holding circuit P—8', 78a, and closed contacts 78c to line N—1. When contacts 78f open the magnet 76a is de-energized, opening the forward driving switch 76 and contacts 78d are closed so that current flows through the circuit P—1, P—8, contacts 75a, P—9, magnet 77a, contacts 78d to the line N—1. This closes reversing switch 77 and passes current in a reverse direction through motor 66 so as to move the pilers outwardly on their return stroke. At the same time switch 79 drops due to the breaking of the circuit to its magnet 79a by the opening of contacts 78e. The motor 66 continues to run in reverse until the pilers open fully when the trip 74 will strike switch 75 and open contacts 75a, de-energizing magnets 77a and 78a and dropping switches 77 and 78 which cuts out the motor and opens contacts 78b to de-energize magnet 80c and start the switch 80 to drop slowly towards its position for closing contacts 80b. During the time switch 80 is dropping and switches 78 and 79 stand open, the pilers remain inactive. When switch 80 finally closes contacts 80b the apparatus is reset for the same cycle to commence as soon as a pack of sheets 11 moves the trip 16 to close contacts 73b and lock switch 79 closed.

During each cycle of switch control operations, it is contemplated that a number of packs 11 may pass over the trip 16, the number being largely determined by the rate of delivery of the packs to the table 12 and the time required for the switch 80 to operate. Thus I obtain automatic switch control which always starts the cycle in timed relation to a passing pack without reciprocating the pilers more rapidly or frequently than good practice may indicate.

As the packs are pushed by the pinch rolls 13,

14 between the pilers they fall more or less naturally into a pile or stack 85 resting on the rolls 17 of the piler table which at the time are not being driven. As the sheets accumulate, the pilers from time to time reciprocate and even up the pile as it builds up until it contains the desired number of sheets, when a switch is thrown to energize motor 25 and drive the piler table rolls 17 by the chains 18 in a direction to carry off the pile of sheets for further treatment.

The yielding nature of the chain and spring drive for the pilers will avoid damaging the sheets and yet will have the power to adjust them to proper position.

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. The combination with a piler transfer table, of delivery means to feed sheared sheets onto the piler table, opposed pilers oppositely reciprocable in synchronism toward and from sheets piled on said table, a yieldable drive for actuating said pilers, means responsive to the delivery of sheets for inaugurating the working stroke of the pilers automatically, means to reverse the pilers' drive, and means responsive to the return travel of the pilers to stop them at the completion of a reciprocating cycle.

2. A piler mechanism according to claim 1, in combination with means to control the elapsed time in each cycle independently of the delivery of sheets to said table.

3. A piler mechanism comprising means for delivering a sequence of sheet packs, a table to receive the sheet packs, a motor control element responsive to the passage of sheet packs to the piler table, oppositely reciprocable pilers on each side of said piler table, a motor drive for reciprocating the pilers oppositely in synchronism through a working cycle, means to start the pilers on a cycle responsive to the operation of said motor control element, means to stop the pilers at the completion of a cycle, and means to render the passage of sheet packs ineffective to influence the operation of the pilers during a working cycle.

4. A piler mechanism comprising means for delivering a sequence of sheet packs, a piler table to receive the sheet packs, a motor control element responsive to the passage of sheet packs to the piler table, oppositely reciprocable pilers on each side of said piler table, a motor drive for reciprocating the pilers in synchronism through a working cycle, means to start the pilers on a cycle responsive to the operation of said motor control element, means to stop the pilers at the completion of a working cycle, means to render the passage of sheet packs ineffective to influence the pilers during a working cycle, and means to control the duration of the working cycle independently of the operation of said motor control element by the passage of sheet packs.

5. The combination of a piler table, means to deliver the sheet packs onto the piler table, a motor control element responsive to the passage of sheet packs to the piler table, oppositely reciprocable pilers on each side of said piler table, a motor drive for reciprocating pilers in synchro-

nism through a working cycle, means to start the pilers on a cycle responsive to the passing of a sheet pack, means to stop the pilers at the completion of a working cycle, means to render the passage of sheet packs ineffective to influence the pilers during a working cycle, and means effective in each working cycle of the pilers to control the time intervals elapsing between the start of their working stroke, the start of their return stroke and the completion of the working cycle.

6. The combination with a piler having a transfer table adapted to receive sheet packs, of means to feed the sheet packs thereto, a reciprocable piler, means to drive it inwardly to engage and shape the sheet pile, means to return the piler to initial position, means responsive to the passage of a sheet pack to start the piler on its working stroke, and means independent of the passage of sheet packs to time the reversal of the piler and its restoration to the control of the sheet packs.

7. In a piler, the combination with a sheet support, means to feed sheets onto the support, oppositely reciprocable pilers movable in synchronism into engagement with the sheets stacked on said support, a reversible electric motor drive comprising yieldable connections to actuate the pilers on their working stroke, means responsive to the delivery of sheets to the piler to start said motor to moving the pilers on their working stroke, and means adapted to interpose a time delay in the reversal of the motor drive to return the pilers to initial position, said means being adapted to interpose a time delay in the restoring of the motor drive to the control of the sheets for inauguration of another cycle of operation.

8. In a piler, the combination with a sheet support, means to feed sheets onto the support, oppositely reciprocable pilers movable in synchronism into engagement with the sheets stacked on said support, a reversible electric motor drive comprising yieldable connections to actuate the pilers on their working and return strokes, stop means to arrest the return stroke of the pilers, means responsive to the delivery of sheets to the piler to start said motor to moving the pilers on their working stroke, and means adapted to interpose a time delay in the reversal of the motor drive to return the pilers to initial position, said means being adapted to interpose a time delay in the restoring of the motor drive to the control of the sheets for inauguration of another working cycle.

9. In combination, means to convey sheet packs to a piler receiving table, a switch adapted to be thrown and released by the passing packs, oppositely reciprocable pilers movable into and out of engagement with the sheets piled on said table, a reversible motor for driving said pilers, circuit connections closable by said switch to start the pilers only from initial position on a working stroke, automatic switch means for selectively closing and holding closed said circuits for a predetermined time interval during the working and return strokes of the pilers, and means to stop the motor and restore it to the control of the first mentioned switch and to hold said switch ineffective during the working cycle of the pilers.

10. A piler mechanism according to claim 9, in which the support for the sheet stack is a transfer table having a drive means to adapt it to carry off the finished piles of sheets from the piler.

11. A piler mechanism comprising a sheet support, pilers on opposite sides of said table, piler

supports and guides therefor upon which the pilers are reciprocable, drive chains for the pilers having yieldable connections at each end to the piler supports, a common reversible drive means for said chains adapted to move the pilers oppositely in synchronism through a working cycle, and means to control the elapsed time involved in such work cycle.

12. A piler mechanism comprising a sheet support, pilers on opposite sides of said table, piler supports and guides therefor upon which the pilers are reciprocable, drive chains for the pilers having yieldable connections at each end to the piler supports, a reversible electric motor for driving said chains to move the pilers oppositely in synchronism through a working cycle, and means to control the elapsed time involved in such work cycle, comprising a quick action starting switch controlled by the feed of sheets to the piler, a quick action stop switch controlled by the pilers to stop their return drive, a delayed action control switch means operable automatically and adapted to determine the elapsed time for the piler working cycle, and means under control of said switches for supplying current to energize said electric motor.

13. A piler for metallic sheets, comprising a table adapted to receive the sheets to be piled, opposed reciprocable pilers for periodically engaging and shaping the sheets piled on said support, tracks upon which said pilers are movable, a pair of chains for each piler having at each end a spring connection to a piler for yieldably driving it in both directions, means reversibly driven by a motor for moving the pilers oppositely and in synchronism through their work cycle, and means automatically responsive to the feed of sheets and to the return movement of the pilers to effect and control their reciprocation automatically.

14. A piler for metallic sheets comprising a table adapted to receive the sheets to be piled, opposed reciprocable pilers for periodically engaging and shaping the sheets piled on said support, tracks upon which said pilers reciprocate, a pair of chains for each piler having at each end a spring connection to the piler to yieldably drive them in both directions, means reversibly driven by a motor for moving the pilers oppositely and in synchronism through a work cycle, means automatically responsive to the feed of sheets and to the return movement of the pilers to effect their reciprocation automatically, and means to render the pilers unresponsive to the passage of sheets during their work cycle.

15. A piler mechanism comprising a transfer table, oppositely reciprocable pilers at the receiving end of said table, means to feed sheets onto said receiving end of said table, means responsive to the feed of sheets to drive the pilers through a work cycle in which they move oppositely into and out of engagement with the piled sheets, and means to drive said transfer table to carry off the completed pile of sheets.

16. A piler mechanism comprising a sheet support, piler elements on opposite sides of said support, at least one of said pilers being reciprocable, guides for the reciprocable piler, a chain drive for the reciprocable piler having a yieldable connection at each end to the piler, a reversible drive for said chain, and means to control the elapsed time involved in a work cycle of the reciprocable piler.

17. A sheet metal piler, comprising a support adapted to receive the sheets to be piled, conveyor means to deposit the sheets so as to form a pile on said support, reciprocable piler means

on opposed sides of said support, yieldable drive elements for each of said piler means, means by which each of said piler means is caused to engage opposed edges of the piled sheets to arrange
5 them, and means responsive to the passage of sheets to be piled over said conveyor means for producing operating cycles of said piler drives.

18. A sheet metal piler, comprising a support, means to deliver a sequence of sheets to form a
10 pile on said support, coacting reciprocable piler means on opposite sides of said support, means to produce movement of the piler means in opposite directions to yieldably compress the piled sheets between them, and means automatically
15 responsive to the passage of sheets toward the pile to actuate said piler means.

19. A sheet metal piler comprising a support to receive a pile of sheets, conveyor means to deposit the sheets so as to form a pile on said support, coacting piler means on opposed sides of said support, means to reciprocate at least one
5 of said piler means to even up the pile of sheets between them, timing means to control the periodic functioning of said reciprocating means, means to actuate said timing means responsive to
10 the passage of sheets over said conveyor, and means to stop said reciprocating means at the conclusion of an operating cycle.

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