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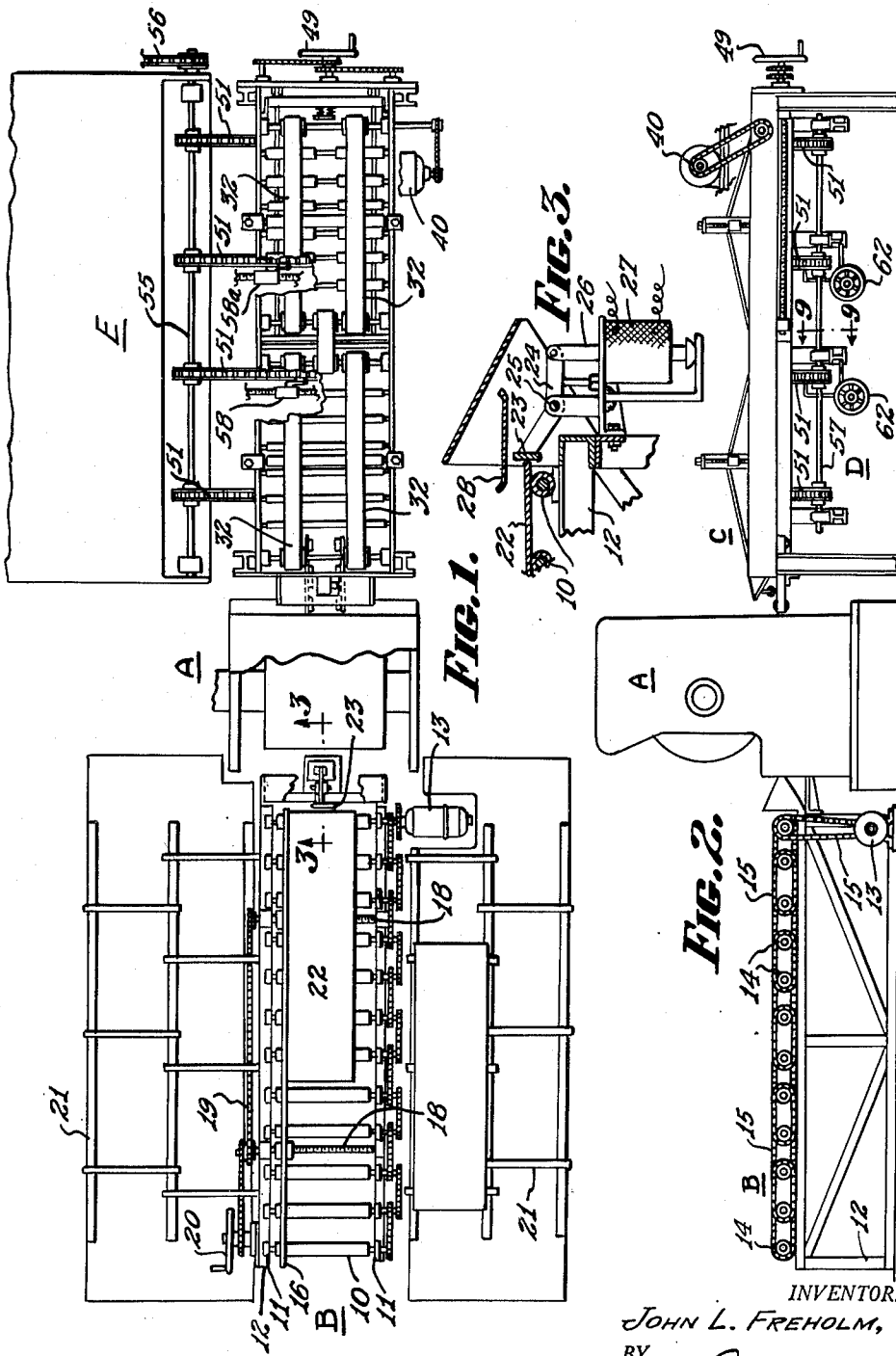
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2,662,630

APPARATUS FOR HANDLING METAL SHEETS

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3 Sheets-Sheet 1



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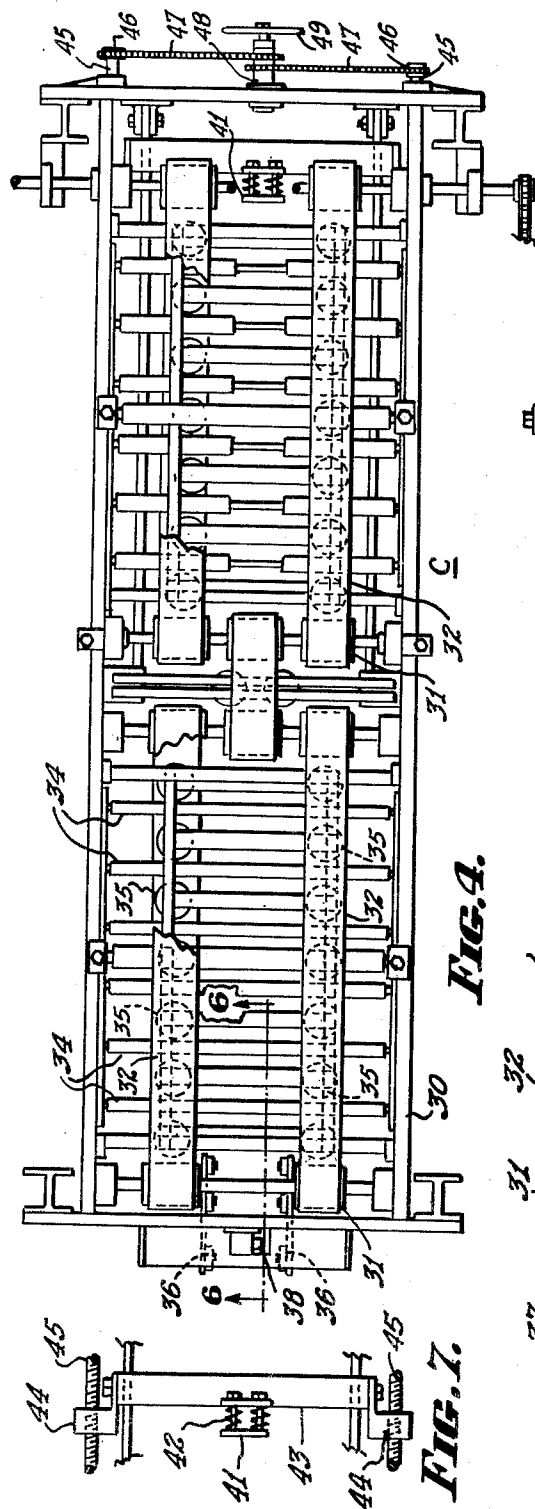
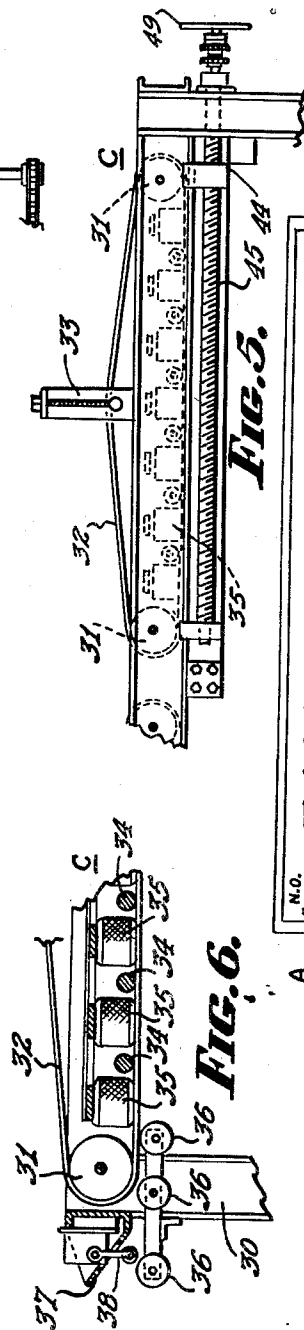
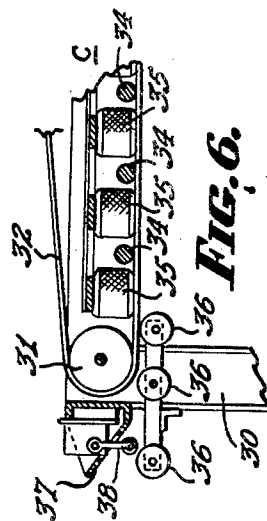
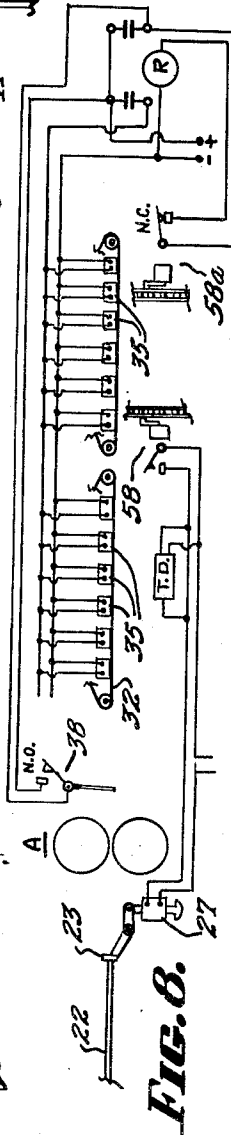
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3 Sheets-Sheet 2



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APPARATUS FOR HANDLING METAL SHEETS

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3 Sheets-Sheet 3



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APPARATUS FOR HANDLING METAL SHEETS

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This invention relates to an apparatus for handling metal sheets. More particularly it has to do with an apparatus for feeding sheets through a treating mechanism and then depositing them upon other feeding means to be fed through a second feeding mechanism, wherein the sheets pass through one of the mechanisms endwise, and through the other mechanism laterally. While the apparatus of the present invention is capable of use in many situations, it will be described particularly in relation to an apparatus for printing metal sheets, and then corrugating them wherein the printing mechanism is of the end feed type through which the sheets are fed endwise, and wherein the corrugating mechanism is of the side feed type through which the sheets are fed broadside.

The corrugating machine is one which is available on the open market and it consists of two rolls mounted in housings and having a suitable drive. Three banks of dies are set into the surface of the rolls to form the corrugations. It is of great importance that the sheets enter the bite of the rolls at a certain time in order that the corrugations be properly placed upon the sheets. In this connection it has been standard practice to provide a sloping feed table sloping upwardly to the bite of the rolls. The sheet is fed upwardly on the feed table by a series of dogs secured to chains spaced over this feed table, and the dogs push the sheets up the feed table into the bite of the rolls at the proper time by virtue of being synchronized with the roll drive.

The printing device discharges the printed sheets over the feed table for the corrugator, and it is necessary that the printed sheets be deposited on the corrugator feed table between the dogs of the feed table chains in proper timing so that one sheet is placed between each set of dogs. Therefore, means must be provided to permit the feed of sheets into the printing apparatus in timed relation to the operation of the corrugating apparatus so that sheets will issue from the printing apparatus in properly timed relation to the operation of the corrugator apparatus.

With the foregoing considerations in mind, it is an object of the present invention to provide an apparatus for the purpose described wherein sheets will be fed to the printing apparatus in timed relation to the operation of the corrugating apparatus. It is another object of the present invention to provide an arrangement whereby the sheets issuing from the printing apparatus will be suspended above the corrugator feed table, and will be deposited upon the corrugator feed table

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so as to be abutted by successive series of lugs on the corrugator feed table.

It is still another object of the invention to provide various adjustments so that the apparatus will function equally well with sheets of different gages, and so that the sheets will be fed properly regardless of their length. It is understood in the art that sheets must be placed in certain positions with respect to the corrugating apparatus in order to wear the corrugating dies evenly. Therefore, sheets of different lengths have to be placed in a different relation with respect to the corrugator feed table.

It is still another object of the invention to provide an apparatus as outlined which will be relatively simple in construction, and will not be likely to get out of order so that maintenance on it will be low. A still further object includes the provision of an apparatus which will require a minimum of operating personnel, and which will not adversely affect the cost of the printing and corrugating operations.

These and other objects of the invention which I shall describe in greater detail hereinafter, or which will be apparent to one skilled in the art upon reading these specifications, I accomplish by that certain construction and arrangement of parts, of which I shall now describe an exemplary embodiment.

Reference is made to the drawings forming a part hereof, and in which:

Figure 1 is a plan view of an apparatus according to my invention;

Figure 2 is a side elevational view of the same;

Figure 3 is a fragmentary cross sectional view on an enlarged scale taken on a line 3—3 of Figure 1;

Figure 4 is a plan view of the feed-out table for the printing apparatus on an enlarged scale;

Figure 5 is a fragmentary elevational view of the right hand end of the same;

Figure 6 is a fragmentary cross sectional view of the same taken on a line 6—6 of Figure 4;

Figure 7 is a fragmentary detailed plan view of the bumper element at the right hand end of Figure 4;

Figure 8 is a wiring diagram;

Figure 9 is a cross sectional view through the corrugator feed table taken on a line 9—9 of Figure 2 on a greatly enlarged scale;

Figure 10 is a cross sectional view taken on the line 10—10 of Figure 9.

Briefly, in the practice of my invention I provide a first treating apparatus which may be a printing device, and indicated generally at A,

through which the sheets are fed endwise. A feed-in table for the first treating instrumentality is shown at B. A feed-out table, for the sheets issuing from the first treating instrumentality, is indicated at C; and a feed-in table for the second treating instrumentality is indicated at D. The second treating instrumentality itself is indicated at E. The apparatus A is being described herein as a printing device for the sheets, although as pointed out above, it could be any treating device through which sheets pass endwise. Similarly, the apparatus at E has been described as a side feed corrugating device, but it could be any other side feed sheet treating apparatus, so that while in the description I shall refer to the printing device and the corrugating device, it will be understood that these are not words of limitation.

Coming now more specifically to the feed table B, this is a powered roller feed table. It is provided with a plurality of steel rolls 10, mounted in pillow blocks 11, on the framework 12, and driven from the motor 13 through the sprockets and chains 14 and 15 respectively. A side guide 16 is provided, which is mounted by means of nuts 17 on the lead screws 18 by means of which the guide can be moved transversely of the feed table. The screws 18 are connected by a means of a belt or chain 19, and both screws together may be operated by means of the hand wheel 20 to move the side guide 16 transversely of the feed table. On each side of the feed table there are racks 21 for sheets to be treated, and as shown in Figure 1, if sheets are piled on the racks at the lower part of the figure, the side guide 16 will be placed as shown. In the meantime, additional sheets will be stacked on the racks at the upper side of the figure, and when the stack at the lower side is completed, the side guide 16 can be moved transversely of the machine, and sheets can then be fed from the other side of the machine.

As the sheets are fed on to the table in the position indicated at 22, they abut against an end stop member 23.

As best seen in Figure 3, the end stop member 23 is mounted on a bell crank 24, which is pivoted at 25, and is actuated by the plunger 26 of the solenoid 27. When the solenoid is energized the end stop 23 is dropped below the lower surface of the sheet 22, so that under the influence of the rolls 10, the sheet 22 will be advanced into the printing machine. As also clearly seen in Figure 3, a bellmouth guide 28 is provided to guide the sheets into the unit A, and also to prevent sheets with up turned ends from jumping over the stop 23 when the latter is in the up position. The stop 23 is free of the solenoid plunger 26 so that release of the solenoid will not interfere with the stop 23. The stop 23 is withdrawn by the solenoid long enough for the leading end of the sheet to pass over it, and then the solenoid may be released and the weight of the sheet will hold the stop 23 down until the entire sheet has passed over it, at which time the stop will again return to the position at Figure 3.

The mechanism A will not be described because it is not a part of the invention, and in the embodiment illustrated it is a standard end feed printer which is available on the open market.

The next element of the apparatus to be described is the feed-out table C for the printer, which receives the sheets as they issue from the printer and holds them until the proper time

for depositing them on the feed table D for the corrugator.

The feed-out table C is best seen in Figures 4-7 inclusive.

The feed-out table C is mounted on a framework indicated generally at 30. It includes the pulleys 31 over which the belts 32 pass. Belt tightening devices, as generally indicated at 33, are provided. Between the rolls 31 there are a series of billy rolls 34, which maintain the bottom run of the belt flat. Between the billy rolls are a series of iron castings shaped to receive coils of wire to form electro-magnets 35. At the entrance end of the machine there are provided a series of rollers 36 arranged to support the sheet from beneath as it issues from the instrumentality A until the leading end of the sheet has been magnetized by the first electro-magnet 35, so that it may be supported from above by the successive electro-magnets. Again a bellmouth guide 37 is provided at the entrance end of the feed-out table C, and adjacent the entrance end there is provided the limit switch 38, by means of which the electro-magnets 35 are energized.

Thus, as a sheet issues from the instrumentality A, the leading end of it passes over the rollers 36 and actuates the limit switch 38 which energizes the electro-magnets 35. As the leading edge of the sheet comes into contact with the belt 32, and under the first electro-magnet 35, the sheet is magnetized and begins to adhere, and from there on the sheet is supported from above by the series of electro-magnet 35. In the particular embodiment shown, there are two successive series of belts 32, but it will be clear that a single pair might in some instances be satisfactory. The belts are driven by means of a motor indicated at 40 in Figure 1, and also in Figure 2.

As best seen in Figures 4 and 7 at the remote end of the feed-out table C, there is provided a bumper stop 41 which is yieldable by virtue of the springs 42. It is mounted on a cross member 43 provided at each end with the nuts 44 engaging the lead screws 45. The lead screws 45 at their ends are provided with sprockets 46 and the sprockets are driven by chains 47 engaging sprockets on the hand wheel shaft 48. Thus, by operating the hand wheel 49 the end stop member 41 may be moved lengthwise of the table for sheets of various lengths to control the position in which they will be deposited upon the corrugator feed table which is immediately below it.

Coming now to the corrugator feed table, as best seen in Figures 9 and 10, this table is sloped upwardly toward the corrugating apparatus which in these figures is assumed to be beyond the right hand end of the figures. This table is mounted upon a framework indicated generally at 50 and includes a number of sprocket chains 51, which pass over lower sprockets 52 and upper sprockets 53. These sprocket chains carry the spaced lugs 54 which engage with the edges of a sheet resting on the chains to advance the sheet into the corrugator. The upper sprockets 53 may all be mounted upon a common shaft 55, which shaft may be driven by a chain 56 from the corrugator drive, not shown. All of the lower sprockets 52 may likewise be mounted upon a common shaft 57. Two limit switches are associated with the corrugator feed table D, and one of these is illustrated in Figures 9 and 10 generally at 58. The switch 58 has an actuating member terminating in a roller at 59, which is positioned to be abutted by one of the lugs 54 as it passes. When

the lug 54 abuts the roller 59 it actuates switch 58. The switch 58, as clearly seen in Figures 9 and 10, is mounted on a member 89 provided with a nut 60, engaging a lead screw 61, which lead screw may be operated by an operating handle 62. Thus, by turning the handle 62, the nut 60, and thereby the limit switch 58, may be adjusted with respect to the table D.

Since the chains 51 will stretch somewhat in use, provision is made for adjustment of the limit switch and its associated parts as follows: a bracket 80, pivotally mounted at 81, rotatably carries one end of two rods or bars 82 as well as the lead screw 61. The other ends of the rods 82 and lead screw 61 are rotatably mounted in a block 83, welded or otherwise suitably secured to a bracket 84. The bracket 84 is bolted at 85 to a part of the machine frame provided with a slot 86. The bracket 84 carries one end of a chain back up channel 87, the other end of which is secured to a bracket 88 mounted on the rods 82. The switch mounting member 89 rides on the rods 82 under the influence of the lead screw 61 and nut 60. It will now be clear that if the chain 51 stretches, the bolt 85 may be loosened and the entire assembly just described will pivot about the pivot 81, whereupon the bolt 85 may be tightened in a new adjusted position. In this way the relationship between the parts is maintained throughout the adjustment, and failure of the dogs to trip the switch is obviated.

While only a single switch 58 is seen in Figures 9 and 10, it will be understood that the structure there shown is duplicated in connection with one of the other chains. In Figure 2 the two corresponding hand wheels 62 are equally visible.

Referring now to the diagram of Figure 8 the reference numerals heretofore used have again been applied. In view of the duplication of the switch 58, and the different functions of the two switches, one of these has been labeled 58a in the figure.

In Figure 8 then, the limit switch 58 is the one which actuates the end stop 23 by energizing the solenoid 27. A time delay device is indicated diagrammatically in the circuit at TD, and it will be clear that when one of the lugs 54 on the chain 51 engages the limit switch 58, it closes a circuit through the time delay device to the solenoid 27 causing the stop 23 to be withdrawn. The time delay device simply maintains the solenoid in energized condition long enough to insure that the leading edge of the sheet is clearly over the end stop 23. As soon as the time delay device functions the circuit is again open and the stop 23 is simply held down by the weight of the sheet passing over it.

As the sheet issues from the device A and engages the limit switch 38, a circuit is energized to the electro-magnets 35, to energize them so that they will support the sheet above the corrugator feed table C. The relay R serves to keep the magnets 35 energized after the switch 38 reopens when the end of a sheet has passed that point, and until the leading end of the sheet is ready for dropping by the action of the switch 58a. The limit switch 58a, which as in the case of the limit switch 58, is energized by one of the lugs 54, operates to open the circuit to the electro-magnets 35 to de-energize them so that the sheets drop from the feed-out table C onto the corrugator feed table D in proper relation to the lugs 54 thereon.

In the description which has gone before it will be clear that the times at which the limit switches

58 and 58a operate, are determined by the operation of the corrugator, and various thicknesses can be accommodated by adjustments of the hand wheels 62. It has also been explained how the position in which the sheet is dropped down to the corrugator feed table may be determined by position of the end stop member 41. To assist in the correct setting of the limit switches 58 and 58a, each of these is provided with a pointer 58b. This may cooperate with a suitable calibrated scale on the member 87. Also, in Figure 9, I have shown the plate 70 which prevents the sheets from sliding off the corrugator feed table, or from sliding over the series of lugs 54 when they are in the position shown at the left-hand end of Figure 9.

In setting up the machine the gap in the rolls of the corrugator is first set. Then the feed of the corrugating machine is set in accordance with the gauge of material being processed. The controlling rheostat is generally marked off to simplify this operation. Then the two limit switches 58 and 58a will next be set in accordance with tables which will be issued to the operator.

To summarize the operation of the apparatus a sheet placed on the feed table B moves up to the sheet stop 23 and remains there until the limit switch 58 is actuated by one of the lugs 54 on the sprocket chain of the corrugator feed table D. When the stop goes down the sheet feeds into the mechanism A and is there treated. The sheet passes out of the instrumentality A and is held under the magnetic table C. As it enters the magnetic table C it trips the limit switch 38 to energize the magnets. It continues on the table C until it abuts against the sheet stop 41. It hangs there until the limit switch 58a is tripped by its next dog 54, whereupon the magnets are de-energized, and the sheet falls onto the sloping corrugator feed table between the series of dogs. Thus, the sheet is positioned to be fed into the corrugating apparatus in correct relationship to the position of the rolls.

While I have described the invention in considerable detail, this has been done by way of example only, and it will be understood that numerous modifications may be made in various details without departing from the spirit of the invention. I, therefore, do not intend to limit myself otherwise than as set forth in the claims which follow.

Having now fully described my invention what I claim as new and desire to secure by Letters Patent is:

1. In an apparatus for treating metal sheets wherein a succession of sheets is fed endwise through a first treating apparatus and then laterally through a second treating apparatus, a feed-in table for said second apparatus, a feed-out table for said first apparatus disposed over said feed-in table and including means for holding a sheet in position over said feed-in table, said feed-in table having a number of chains each carrying a series of lugs for engaging the sheet edges, a switch element associated with one of said chains and having an actuating member positioned to be operated by the lugs on said chain, said switch element being operatively connected to said holding means to release a sheet held thereby so that it may drop onto said feed-in table in timed relation to the operation of said second apparatus.

2. In an apparatus for treating metal sheets wherein a succession of sheets is fed endwise through a first treating apparatus and then lat-

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erally through a second treating apparatus, a feed-in table for said second apparatus, a feed-out table for said first apparatus disposed over said feed-in table and including means for holding a sheet in position over said feed-in table, a feed-in table for said first apparatus including end stop means to stop a sheet on said last named feed-in table from entering said first apparatus, means for operating the feed-in table for said second apparatus in timed relation to said second apparatus, means associated with said feed-in table for said second apparatus for releasing said holding means and said stop means in timed relation to the operation of said second apparatus.

3. The structure of claim 2 wherein said feed-in table for said second apparatus comprises a number of chains each carrying a series of lugs for engaging the sheet edges, switch elements associated with two of said chains and having actuating members positioned to be operated by the lugs on the respective chains, one of said switch elements being operatively connected to said stop means, and the other being operatively connected to said holding means.

4. The structure of claim 3 wherein said holding means on said feed-out table are magnetic and wherein means are provided at the entrance end of said feed-out table for energizing said magnetic holding means, the switch element which is connected to said magnetic holding means being arranged to de-energize said magnetic holding means when said switch element is actuated on one of said lugs.

5. The structure of claim 4 wherein said switch elements are individually adjustable in the direction of travel of said feed-in table so as to accommodate sheets of different gage.

6. The structure of claim 5 wherein said feed-

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out table is provided with an end stop member, said end stop member being adjustable longitudinally of said feed-out table whereby said feed-out table may handle sheets of different lengths.

7. The structure of claim 2 wherein said stop member is maintained in its operative position by gravity and is displaced from said operative position by the action of a solenoid, and wherein a time delay device is provided in the circuit to said stop means to insure that when said stop means are released the leading edge of a sheet will pass over it.

8. An apparatus according to claim 1, wherein said switch element is mounted upon ways, said ways carrying also a back up member for said one chain, and said ways being pivotally mounted at one end and being adjustable at the other end whereby the relationship between said switch element and said one chain is maintained in spite of adjustment to compensate for stretching of said one chain.

9. An apparatus according to claim 8, wherein said switch member is adjustable along said ways by means of a nut on said switch member and a lead screw cooperating therewith, said lead screw being mounted in the same manner as said ways to move as a unit therewith.

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