

Jan. 10, 1939.

G. A. KAUFMAN

2,143,779

APPARATUS FOR STAGGER PILING METAL SHEETS

Original Filed Nov. 12, 1934 4 Sheets-Sheet 1

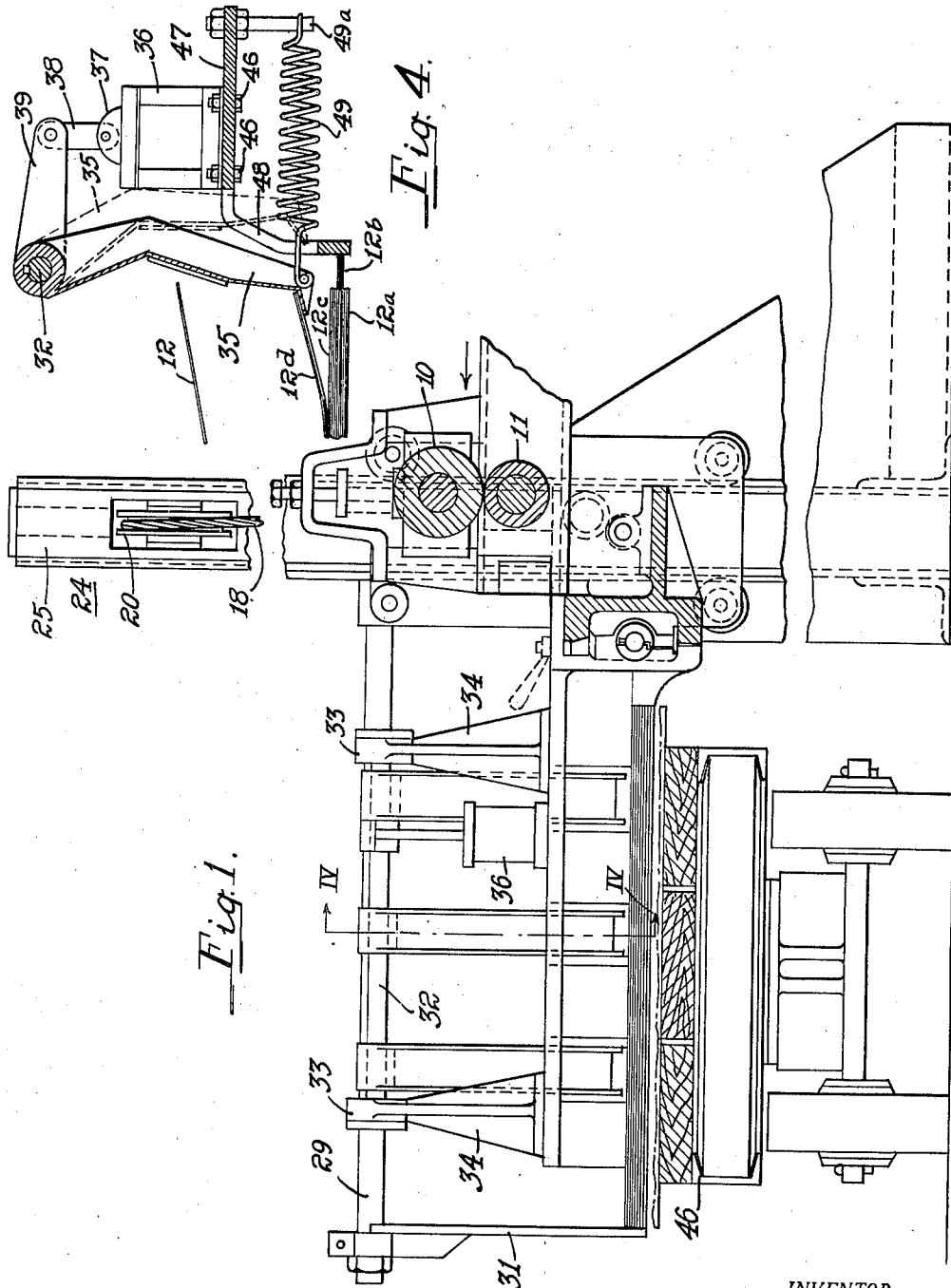


Fig. 1.

Fig. 4.

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Jan. 10, 1939.

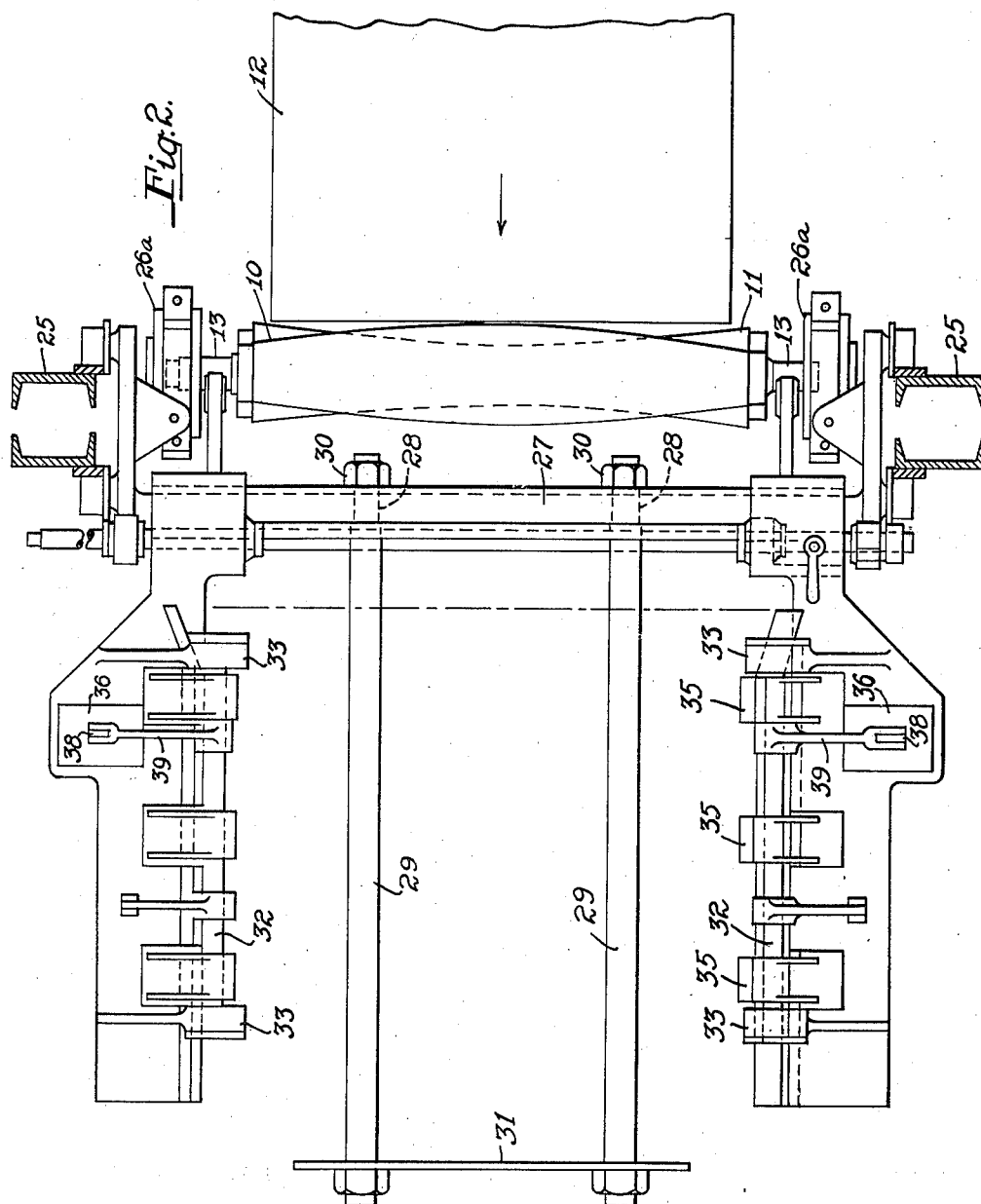
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APPARATUS FOR STAGGER PILING METAL SHEETS

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4 Sheets-Sheet 2



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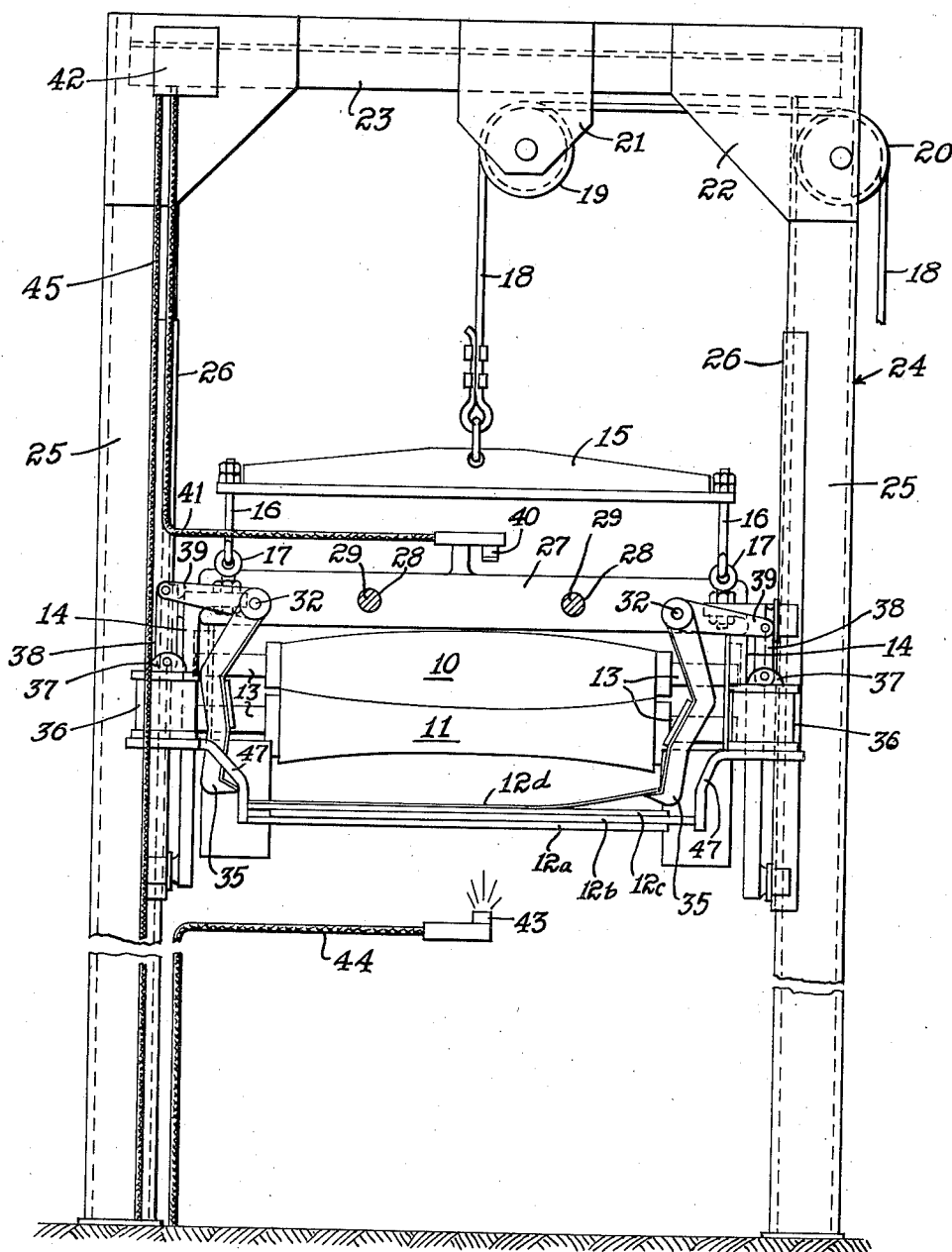
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APPARATUS FOR STAGGER PILING METAL SHEETS

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Fig. 3.



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4 Sheets-Sheet 4

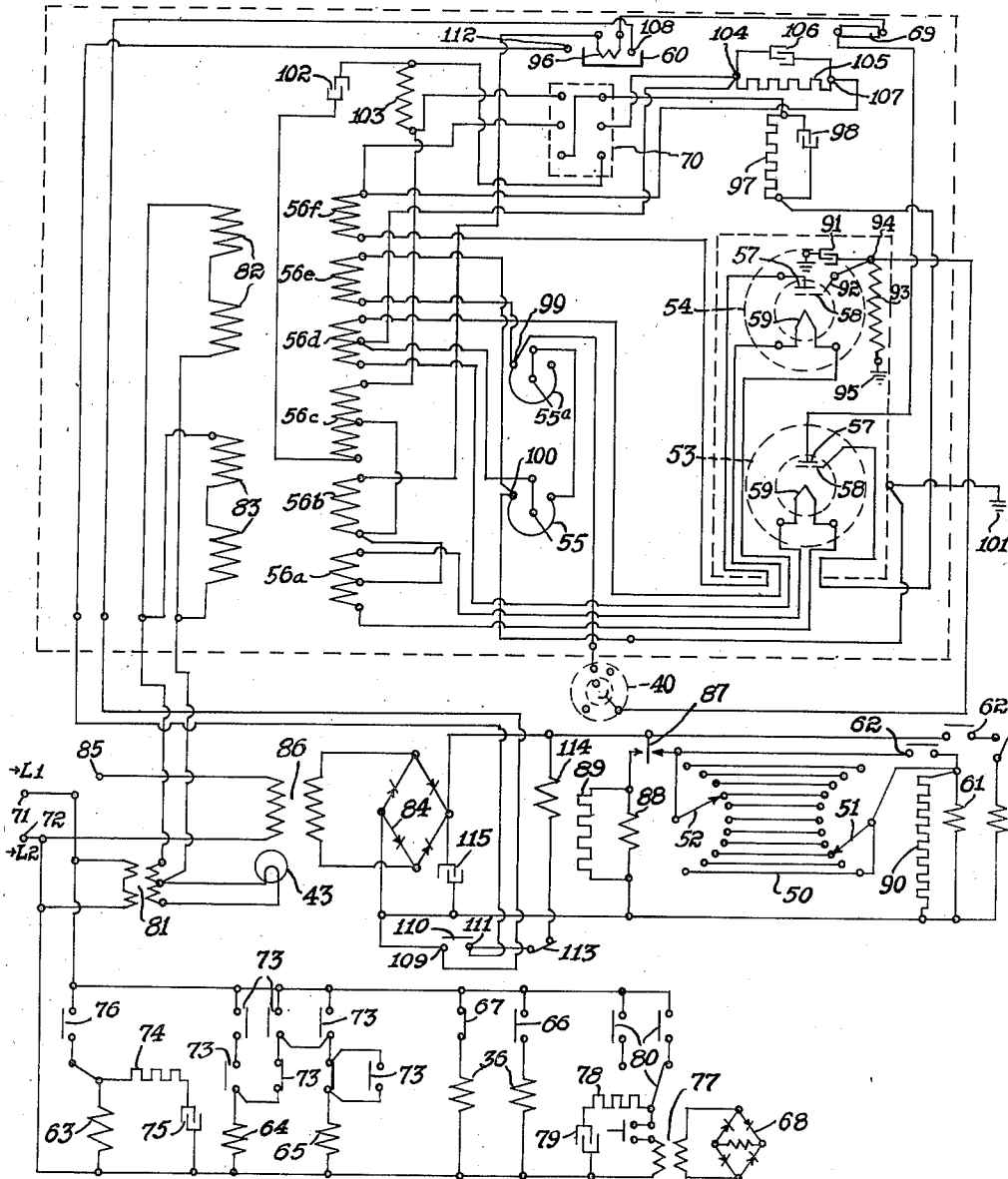


Fig. 5.

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UNITED STATES PATENT OFFICE

2,143,779

APPARATUS FOR STAGGER PILING METAL SHEETS

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Original application November 12, 1934, Serial No.
752,792. Divided and this application Novem-
ber 20, 1935, Serial No. 50,798

11 Claims. (Cl. 214-6)

My present invention relates to the handling of metal sheets and to the grouping of such sheets preparatory to heat treatment or other purpose; more especially, it concerns the piling of such sheets in staggered groups.

In accordance with known practice metal sheets are usually normalized in groups of eight. Since no particular care has heretofore been exercised in forming stacks or piles of such sheets it has been necessary to have unskilled workmen manually arrange them into groups of eight for the purpose of accommodating present normalizing furnace equipment. This means that the process of producing the final sheets is interrupted by the necessity for this manual counting and handling. Due to human limitations workmen counting out groups of eight sheets eventually reach a point where they become slow and inaccurate. This has the disadvantage of slowing up the entire process because the workmen are unable to separate stacks of sheets into groups of eight sufficiently rapidly to maintain the normalizing equipment at its practical maximum capacity. The workmen at present employed upon such work could more advantageously be employed elsewhere in the plant and due to the nature of the work it has also been necessary to change these men frequently because they are inefficient for any great length of time. This manual counting and grouping is, moreover, heavy work and taxes the strength of the workmen even for relatively short periods.

One of the objects of my invention is to eliminate this manual counting and grouping of sheets and simultaneously to speed up the production of finished sheets.

Another object is to count and group the sheets rapidly and automatically.

A further and more specific object resides in automatically segregating the sheets into groups of which each such group contains a predetermined number of sheets and in depositing such on a common pile or stack in such a manner that the groups can be readily taken therefrom without any manual counting operations and without slowing down the production of sheets as a whole.

Another object resides in the provision of suitable apparatus for effecting the automatic counting and piling of these sheets.

A still further object includes electrical control means for actuating the apparatus and effecting the operations aforesaid.

Other and further objects and advantages reside in the details of construction hereinafter pointed out.

In the accompanying drawings, I have illustrated an exemplary form of apparatus together with a control system therefor embodying the present invention and wherein:

Figure 1 is a side elevational view of the apparatus with certain associated equipment, part of which, is for clarity, shown in section;

Fig. 2 is a plan view of the apparatus shown in Fig. 1;

Fig. 3 is an end view in elevation looking from the left of Fig. 1;

Fig. 4 is a detail view, somewhat enlarged, taken on line IV-IV of Fig. 2; and

Fig. 5 is an electrical wiring diagram which illustrates the control system.

Similar numerals designate corresponding parts in the various views.

For the purposes of the present description I will explain my present invention in connection with the manufacture of tinplate which has been previously classified, but I am not limited in either respect since the invention is applicable to any sheet or plate material whether it has been previously classified or not so long as it bears such relation to the other operations on the particular material that my invention receives sheets or plates of material one by one from any suitable previous apparatus or process. Nor is the invention limited to the grouping of such sheets for normalizing purposes, although I have found it to be particularly advantageous in this connection. The invention is applicable to any material in sheet or plate form in which it is desired to pile or stack the same in groups each of which contains a predetermined number of such sheets or plates for any purpose whatever.

Referring now to the drawings in detail and describing the invention in connection with the previous classification of tin-plate, as will be understood and appreciated from an application filed by me on Nov. 12, 1934, bearing Serial No. 752,792 and of which this application is a division, sheets are fed to the stagger piler one at a time in a relatively rapid stream by a pair of pinch rolls 10 and 11. One such sheet 12 is illustrated in Fig. 2 as just about to enter the pinch rolls 10, 11. The reduced necks 13 of these rolls are journaled in suitable slidable bearings 14 which in turn are connected to crosshead 15 by any suitable couplings such as metal hook and eye bolts 16, 17. This crosshead 15 has centrally attached thereto, as shown, one end of a cable 18 which passes over sheaves 19 and 20 mounted in hangers 21 and 22, respectively, which depend from the cross beam 23 forming a part of a gal-

lows construction designated as a whole by the numeral 24.

The vertical uprights 25 of the gallows construction are provided on their inner surfaces with slideways 26 in which the bearings 14 are adapted for up and down vertical movement in response to tightening or slackening of the cable 18 by a suitable associated drum or worm gear (not shown) on which the cable 18 is wound or unwound. These details are referred to for the purpose of clarifying those parts of the drawings relating to the associated apparatus and are not a part of the present invention which relates only to the stagger piler apparatus, the method of stagger piling and the associated electrical control system. Numeral 26a indicates the chucks for rolls 10 and 11.

A suitable cross bar 27 is rigidly mounted in the framework of the stagger piler adjacent but forward of the gallows construction and is provided with two transverse holes 28 therethrough for the reception of the rear ends of rods 29 which extend horizontally forwardly therefrom. These rods 29 are held in place in cross bar 27 by means of suitable nuts 30 and at their forward ends these rods are provided with a depending vertical plate 31 which acts as a stop. This stop plate 31 arrests forward motion of the sheets delivered to the apparatus and also ensures that the forward edges of the sheets are vertically aligned. It will be understood that the sheets are delivered to the stagger piler at a considerable speed and with their lateral marginal edges curved slightly upwardly due to the configuration of pinch rolls 10 and 11. This further serves to facilitate reception of the sheets by the mechanical fingers in proper position for rapid and accurate handling. Suitable means is shown schematically in Fig. 1 for adjusting the pressure between the pinch rolls in known manner.

Disposed along the sides of the stagger piler are the shafts 32 which are rotatably mounted, parallel to the rods 29, in bearings 33 provided at each end of such shafts. These bearings themselves are appropriately supported by and mounted on supports 34 which are of a generally triangular shape to give maximum strength and rigidity with minimum weight. Depending from these shafts 32 and spaced therealong are mechanical fingers 35. Three such mechanical fingers are shown depending from each shaft 32, but I am not limited to this number since I can provide either less or more mechanical fingers or I can vary the spacing therebetween depending upon the size and other considerations of the particular material being handled which must be taken into account.

Mounted adjacent to each of the shafts 32 is a solenoid 36. Each solenoid is provided with a suitable solenoid core 37 extending upwardly within a casing and which is suitably electrically wound in known manner. Each solenoid core is connected to a short vertical link 38 which in turn is connected to one (bifurcated) end of a lever 39, the other end of which is connected to and adapted to partially rotate shaft 32. It is thus apparent that when the solenoid is energized it causes partial rotation of shaft 32 and thus causes a predetermined movement of the mechanical fingers. These mechanical fingers have two positions; a forward or advanced position and a retracted position. When the mechanical fingers on one side are in operation, that is, when they are in their advanced position and receiving sheets as shown at the right-hand

side of Fig. 3, the mechanical fingers on the other side are in retracted or inoperative position. The arrangement is such that when one set of mechanical fingers is retracted for the purpose of depositing its groups of sheets in a predetermined position the other set of mechanical fingers moves to a forward or advanced position ready to receive the next group of sheets.

Fig. 4 illustrates on a somewhat enlarged scale the relationship between and the construction of the mechanical fingers 35 and solenoid 36. The solenoid, or rather its casing 36, is suitably secured as by bolts 46 to side plate 47 of the stagger piler as shown. The side plate is slotted out as at 48 to permit retractive movement of fingers 35 under the urging of spring 49, one end of which is suitably secured to fingers 35 and the other end of which is suitably secured to a fixed frame portion, such as the rod 49a depending from plate member 47. It will be clear from Fig. 4 that the normal position of fingers 35 is the retracted position and that energization of solenoid 36 causes the fingers to move into advanced position. When the solenoid is de-energized spring 49 and/or the change of position of the solenoid core 37 causes the retraction of the fingers and the depositing of the group of sheets received by such fingers in staggered position on the common pile as is shown on Fig. 4.

An incoming sheet 12 is shown in Fig. 4 in a position where it is dropping down to be received by fingers 35. This sheet has been discharged from pinch rolls 10 and 11 and is traveling forwardly and downwardly. Its forward movement will be arrested by stop plate 31 and its downward movement ceases when it is received on fingers 35. Figs. 3 and 4 also show three previously formed and stagger-piled groups of sheets at 12a, 12b and 12c, as well as group 12d in process of formation and which will be deposited as per group 12b.

Suitably located in the stagger piler is an electric eye installation—in this case, a photo-tube—designated by the numeral 40 and this is most conveniently mounted on cross bar 27. The electric eye installation is connected to the control system by suitable wiring within cable 41 running to a control box 42 mounted on the gallows construction 24. There is also provided a source of light diagrammatically indicated by the numeral 43 which is so mounted that its beam of light is normally received by the electric eye 40. This source of light is also connected by suitable wiring in cable 44 to the control system to be hereinafter described. Cable 45 carries wires or connections which electrically connect control box 42 into the electrical system. Electric eye 40 and light source 43 are so relatively disposed that sheets of material delivered to the stagger piler pass therebetween and hence interrupt the beam of light, advantage of which fact is taken for counting the sheets and for controlling their disposition in staggered relationship upon the common pile of sheets. Both member 40 and member 43 are shown diagrammatically, it being understood that in constructional details they may be of any desired or suitable nature.

In Fig. 5 I have illustrated a preferred form of electrical actuating and control system for operating the stagger-piler and carrying out the method therein involved. The numeral 50 represents a notched switch. This switch may have any suitable number of notches but is usually provided with ten notches as shown. This makes it possible to count—and hence to stagger pile—

the sheets in groups containing from 1 to 10 sheets as may be desired or as may be preselected.

Switch 50 is provided with switch element 51 which is manually preset at the desired notch. In Fig. 5 it is apparent that this switch element has been preset on notch (contact) No. 8 and hence the apparatus is set to operate upon groups of 8 sheets. As each sheet passes between light source 43 and the electric eye installation 40, which in this case is a photo-tube, the photo-tube is energized and sets up a feeble electrical current of microvolt proportions. This current (when amplified) is utilized to actuate switch element 52 which advances one notch or contact each time a sheet passes between the source of light and the photo-tube and hence each time the photo-tube 40 is energized. When switch element 52 reaches notch No. 8 it is then electrically connected to preset switch element 51, i. e., 51 and 52 are then in the same circuit. Thereupon switch element 52 immediately snaps back to zero position ready to start another eight (8) notching movements. When switch elements 52 and 51 are electrically connected as above pointed out, that one of the solenoids 36 is energized whose mechanical fingers have been in retracted position, the retracted position being maintained by a spring as already explained. As above explained, the energization of that solenoid turns shaft 32 and thus moves the corresponding mechanical fingers into advanced position. As they move into advanced position, the other set of mechanical fingers move into retracted position and carry with them for a short distance the group of eight sheets deposited thereon due to their weight and friction and the angle of the faces of the fingers. Near the end of their retracting movement the retracting mechanical fingers drop the group of eight sheets and they thus go onto the common pile with their outer lateral edges projecting beyond the normal plane of the pile. The advancing set of mechanical fingers receives the next group of eight (8) sheets and when they retract they deposit the group of eight (8) sheets in such manner that they laterally project from the opposite side of the pile. This continues as long as desired. The sheets in staggered groups are received by a truck 46 which, when full, is removed and replaced by an empty truck.

Since the current set-up by the energization of photo-tube 40 is of microvolt proportions, as stated, it is too weak in and of itself to effect the desired or recited electrical operations. For this reason, we amplify the current to suitable and useful proportions by means of the Thyatron tube 53 and the Pilotron tube 54, which are three-element amplifying tubes. The feeble current is passed through potentiometers 55, 55a which control the sensitivity of the tubes 53 and 54. Thence the current passes through any one or more of secondary transformers 56a-f which furnish sufficient potential for the plates 57 and grids 58 of the tubes 53 and 54 and to heat the filaments 59 thereof. This amplified current then passes through relay 60 and it is the actuation of the relay 60 which causes switch element 52 to advance notch by notch each time the relay operates. When switch elements 52 and 51 are electrically connected, as above explained, relay 61 is energized and sealed in around the switch by contactors 62. In turn, relay 61 picks up relay 63 which picks up relay 64 provided relay 65 is deenergized. After relay 64 is picked up relays 61 and 63 are dropped out and relay 65 is

picked up and sealed in, breaking one seal in the circuit of relay 64 so that when relay 63 is again picked up relay 64 is dropped out and then when relay 63 is dropped out relay 65 drops out also. This results in resetting the electrical equipment for another cycle and it is apparent that the counting of the next group of sheets is already taking place during these electrical operations and it is apparent that they must be effected rapidly in order to be ready to repeat the cycle when the next group of sheets has been counted.

The solenoids 36 shown on Fig. 3 are electrically designated by the same numerals in Fig. 5 and it will be observed from the electrical connections that these solenoids are alternately energized through the normally open contactor 66 and the normally closed contactor 67, respectively. The numeral 68 on Fig. 5 indicates a magnetic counting device which may or may not be used as desired or required. A suitable switch is provided for rendering the same either operative or inoperative. This magnetic counter when in operation merely counts the total number of sheets which have been received by the stagger pile so that the number of sheets on the pile is always known and so that any given number of sheets can be stagger piled if it is desired to have a definite total number of sheets in the pile.

It is thus apparent that the current set up by the energization of photo-tube 40 is first amplified by the Pilotron tube 54 and this current is then applied to the grid of Thyatron tube 53. The amplified current trips the Thyatron tube and starts current flowing to the coil of control relay 60 passing through a fuse 69. The potentiometers 55, 55a can be so adjusted that the circuits are provided with the proper sensitivity values for the range of illumination change on which operation is desired or necessitated. The operations can be effected either from increase of light received by photo-tube 40 or decrease of light received by photo-tube 40 and for this purpose we provided changeover switch 70 which enables either type of change to effect the operation as above outlined.

Referring again to Fig. 5, alternating current of 110 volts and 60 cycles enters the control system at contacts 71 and 72, the current carrying lines being designated for convenience as L₁ and L₂. One branch of lines L₁ and L₂ forms a circuit for solenoids 36 and their switches 66 and 67. This constitutes the lower portion of Fig. 5. The solenoids and their switches just referred to are connected across the circuit in parallel as shown. The relays 64 and 65, together with suitable magnetic switches 73 adapted to open and close in response to relay changes are also connected across this circuit. Relay 63 is connected into the circuit directly and also through resistor 74 and condenser 75 and is provided with a magnetic switch 76 operable in response to changes in relay 63. At the terminus of the circuit, as shown in the lower righthand corner of Fig. 5, magnetic counting switch 68 (a copper oxide rectifier) is provided which, by means of a transformer 77 is suitably connected into the circuit via resistor 78 and condenser 79. Switches 80 serve to control counter 68.

Primary coil of transformer 81 is connected across lines L₁ and L₂ and the secondary coil thereof has two branch lines. One branch includes source of light 43 which is connected to the secondary coil as shown at the center and lower contacts thereof. The other branch leads from the center and upper contacts to primary 75

transformer coils 82. Coils 83 are connected into the same branch line as 82.

Copper oxide rectifier 84 is connected to L₂ and to contact 85 through a transformer 86. Connections lead from rectifier 84 to provide a circuit in which switch 50 is connected as shown. This circuit includes relays 61 and contactors 62 with their associated switches. Switch element 52 is actuated by the alternate closing and opening of switch 87, controlled by relay 88 with its resistor 89. Resistor 90 is connected around relay 61 to switch element 51. One terminal of photo-tube 40 is grounded at tube 54 through a condenser 91. Grid 58 of tube 54 is connected into this line between condenser 91 and the photo-tube 40. At the common contact 94, a resistance 93 is connected to ground as shown at 95. Plate 57 of tube 54 is connected to the lower contact of secondary transformer coil 56f. Filament 59 of tube 54 is connected to the upper and lower contacts of secondary transformer coil 56d. The filament 59 of tube 53 is connected to the upper and lower terminals of secondary transformer coils 56a. Plate 57 of tube 53 is connected to one side of the coil 96 of relay 60 through a fuse 69. The grid 58 of tube 53 is connected to changeover switch 70, between which is resistor 97 and condenser 98.

The other terminal of photo-tube 40 is connected to contact 99 of potentiometer 55a. Potentiometer 55a is interconnected to potentiometer 55 as shown. Contact 99 of potentiometer 55a is also connected to the lower contact of secondary transformer coil 56e. Contact 100 of potentiometer 55 is connected to ground at 101 and leading from this same contact is a connection to the upper contact of secondary transformer coil 56e. Center contact of potentiometer 55 is connected to the central contact of secondary transformer coil 56d.

The center connection of secondary transformer coil 56a is interconnected into the lower contact of secondary transformer coil 56b and the latter is also interconnected to the center connection of secondary transformer coil 56c. The upper contact of secondary transformer coil 56b is connected to the other side of the coil 96 of relay 60. The lower contact of secondary transformer coil 56c is connected to changeover switch 70 through a condenser 102 and the upper contact of secondary transformer coil 56c is also connected to changeover switch 70. A suitable resistance 103 is provided between the stated connections between changeover switch 70 and secondary transformer coil 56c.

The center contact of secondary transformer coil 56d, besides being connected to potentiometer 55, is connected to contact 104 of resistor 105 and condenser 106. This same contact is also connected to changeover switch 70. The lower contact of secondary transformer coil 56e is connected to contact 99 of potentiometer 55a. The upper contact of this same coil is connected to contact 100 of potentiometer 55. The upper contact of secondary transformer coil 56f is connected to changeover switch 70 and also to the other side of resistor 105 and condenser 106 at contact 107.

Contact 108 of relay 60 is connected to terminal 109 of a switch 110, the other terminal 111 of which is connected to contact 112 adjacent relay 60. Switch contact 109 is also connected to rectifier 84. Terminal 111 is connected through

switch 113 and relay 114 to rectifier 84. Condenser 115 is connected in around rectifier 84.

The sequence of operations occurring in the system of Fig. 5 will be clear from the foregoing description and explanation.

I wish it further understood that while I have shown the light source 43 and photo-tube 40 to be so relatively disposed that the sheets pass therebetween I could also have both elements on the same side of the sheets so that the operations result from reflected light rather than from a direct beam of light. This can be resorted to chiefly in those cases where space limitations require such as I find that ordinarily the arrangement shown provides better and more dependable results, but this arrangement also depends to some extent upon the nature of the material being handled, that is, if it is lustrous sufficient light can be reflected from the metal surface to operate the system, but if the metal has surfaces which absorb or disperse considerable light, then the arrangement shown is better and also results in more rapid actuation of the system because a given amount of light is received by the photo-tube in a shorter period of time and the sensitivity of the system need not be so great.

I believe that it will be clear from the foregoing that metal sheets are received one by one preferably in a continuous stream by the stagger piler and that in accordance with the presetting of the switch 50 these sheets can be formed into groups each containing a given number of sheets and so deposited on a common pile that alternate groups project laterally from opposite sides of the pile. Thus all that has to be done manually is to pick off each group of eight sheets and put it on a conveyor or other apparatus which delivers it to the annealing equipment which is most frequently adapted to handle eight sheets at a time. It will further be apparent that this method and apparatus of stagger piling sheets does not result in a "slow point" in the complete processing and handling of the sheets. I find that the stagger piler will handle sheets as rapidly as they can be fed thereto and there is no difficulty in handling hundreds of sheets per minute with this invention.

I have, moreover, decreased the ultimate cost of the sheets not only by speeding up the process as a whole but by the elimination of a certain amount of unskilled labor which has been found to be comparatively undependable particularly due to the monotonous or tedious nature of the work. My process and apparatus has other advantages which will be appreciated by those skilled in this art and although I have described my method and apparatus in connection with just previously classified tin-plate, I can equally well handle by the present invention sheets of any metal or even composition sheets with equal facility and effectiveness. I, therefore, deem that my invention includes tinplate, electrical sheet steel such as silicon steel as well as sheets of any material having such characteristics that stagger piling thereof is desirable or necessary.

What I claim as new and desire to secure by Letters Patent is:

1. In a stagger piler apparatus of the kind described, a pair of shafts, retractable mechanical fingers depending from each of the pair of shafts, solenoid means associated with each such shaft, an actuating circuit for each solenoid means, linkage between said shafts and solenoid means, automatic means to impart rotary movement to

said shafts and hence to actuate said mechanical fingers upon predetermined electrical conditions being set up in the solenoid circuit and light-responsive means for energizing and deenergizing such solenoid circuit.

2. An apparatus for stagger-piling metal sheets comprising means for delivering a stream of such sheets one-by-one, optical-electrical means traversed by each sheet and energized by the movement of such sheets therepast, means for amplifying the current set up by said optical-electrical means, opposed sets of mechanical fingers for receiving a pre-selected number of sheets and for depositing them in oppositely offset position, a solenoid controlling each set of such mechanical fingers and means, actuated by said amplified current, for alternately energizing said solenoids and actuating said sets of mechanical fingers, whereby groups of sheets are formed and alternate groups deposited in staggered position on a common pile.

3. A stagger-piler for metal sheets comprising partially rotatable shafts, mechanical fingers depending from each shaft and adapted to move back and forth through an arcuate path in response to partial shaft rotations, a solenoid for each shaft, a solenoid core in each solenoid movable upwardly and downwardly when the solenoid is energized and deenergized, linkages between said solenoid cores and said shafts whereby linear movements of said cores are translated into partial shaft rotations, a control system to which said solenoids are connected, a source of light and a photo-tube between which each sheet delivered to the stagger-piler passes, connections between said light source and photo-tube and said control system, the construction and arrangement being such that the mechanical fingers on the shafts aforesaid alternately receive a preselected number of sheets and deposit those sheets in staggered relationship on a pile.

4. A stagger-piler for metal sheets comprising partially rotatable shafts, mechanical fingers depending from each shaft and adapted to move back and forth through an arcuate path in response to partial shaft rotations, a solenoid for each shaft, a solenoid core in each solenoid movable upwardly and downwardly when the solenoid is energized and deenergized, linkages between said solenoid cores and said shafts whereby linear movements of said cores are translated into partial shaft rotations, a control system to which said solenoids are connected, a source of light and a photo-tube between which each sheet delivered to the stagger-piler passes, connections between said light source and photo-tube and said control system, the construction and arrangement being such that the mechanical fingers on the shafts aforesaid alternately receive a preselected number of sheets and deposit those sheets in staggered relationship on a pile, a pair of pinch rolls for delivering sheets to said fingers in a slightly bowed condition and spring means for urging said mechanical fingers to a retracted position.

5. An apparatus for stagger-piling metal sheets as they are delivered from a classifying device comprising means for discharging such sheets in slightly bowed condition from said classifying device to said stagger-piler, a source of light and a photocell between which said sheets pass upon their discharge, opposed sets of mechanical fingers so disposed and actuated as to alternately receive groups of sheets and to place them in laterally offset position in a common pile, solenoids linked to and actuating said mechanical

fingers and an electrical control system, in which said photocell and solenoids are included, having means for causing predetermined numbers of sheets to be alternately received by said sets of mechanical fingers and deposited in laterally displaced position relative to the center line of such pile.

6. An apparatus for stagger piling metal sheets as they are delivered from an associated classifier comprising a source of light and a photocell between which said sheets pass upon their discharge, means for discharging such sheets from the classifier to the stagger-piler in slightly bowed condition between said source of light and photocell, means controlled by the passage of sheets as aforesaid for causing only a predetermined number of sheets to be collected as a group, a set of mechanical fingers adapted when advanced to receive such group and, when retracted, to deposit the same in offset position relative to the center line of the resultant pile, means controlled by the photocell to effect advance and retraction of such mechanical fingers, a second set of mechanical fingers which advances to receive the next group of sheets when said first set of fingers retracts and which retracts to deposit the received sheets in oppositely offset position in the pile when the first set of fingers advances, means also controlled by said photocell to effect such movements of said second set of fingers and means for varying the number of sheets per group.

7. Stagger piling apparatus for forming metal sheets into separate groups of sheets each containing the same number of sheets and for piling said groups in staggered formation which comprises means for feeding such sheets one by one, a first means adapted to receive a predetermined number of such sheets and disposed in sheet-receiving position, a second means out of sheet-receiving position and adapted to be moved into sheet-receiving position and means for causing said first means to move out of sheet-receiving position and said second means to move into sheet-receiving position and to alternately effect such movement so long as sheets are being fed thereto.

8. Stagger piling apparatus for forming metal sheets into separate groups of sheets each containing the same number of sheets and for piling such groups in staggered formation which comprises means for feeding such sheets one by one, a first means adapted to receive a predetermined number of such sheets and disposed in sheet-receiving position, a second means out of sheet-receiving position and adapted to be moved into sheet-receiving position and means for causing said first means to move out of sheet-receiving position and said second means to move into sheet-receiving position and to alternately effect such movement so long as sheets are being fed thereto, said first and second means being actuated and controlled by said sheets when the same are intermediate the feeding means and either sheet-receiving means.

9. Apparatus for stagger piling sheets to form the same into groups each of which contains a predetermined number of sheets and for piling such groups in staggered formation which comprises means for feeding such sheets one by one, a first set of fingers initially in sheet-receiving position, a second set of fingers initially out of sheet-receiving position, means actuated and controlled by the sheets when they are intermediate

the feeding means and either of the sets of fingers aforesaid for causing the first set of fingers to retract and to deposit the sheets received by it as an offset group after a predetermined number of sheets has been deposited thereon, for causing the second set of fingers to advance into sheet-receiving position to receive the next group of sheets and for continuing alternately to retract and advance said sets of fingers and means for predetermining the number of sheets per group so received and deposited.

10. Apparatus for stagger piling metal sheets which comprises means for feeding such sheets one by one, a set of fingers disposed adjacent each end of the feeding means on the delivery side thereof, a light source-photocell system disposed between said sets of fingers and electromagnetic means connecting said light source-photocell system and said sets of fingers, whereby the feeding of the sheets actuates and controls said light source-photocell system and hence said sets of

fingers in such manner that the sheets are formed into successive groups each containing the same number of sheets and the groups are alternately deposited in laterally offset position on a common pile.

11. In an apparatus of the kind described, means for delivering metal sheets to be piled, piling means for automatically depositing the sheets in staggered groups and pre-selecting means for determining the number of sheets in each group, said piling means including solenoid-controlled, sheet-receiving supporting fingers having an advanced and a retracted position and an operatively associated electrical circuit, said pre-selecting means including an electric eye installation connected in such circuit and which, after the passage of the pre-selected number of sheets, energizes said electrical circuit for actuating said fingers.

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