Dec. 22, 1936. E. W. RIEGER ET AL 2,064,858

SORTING APPARATUS

Filed Jan. 16, 1935 5 Sheets-Sheet 1

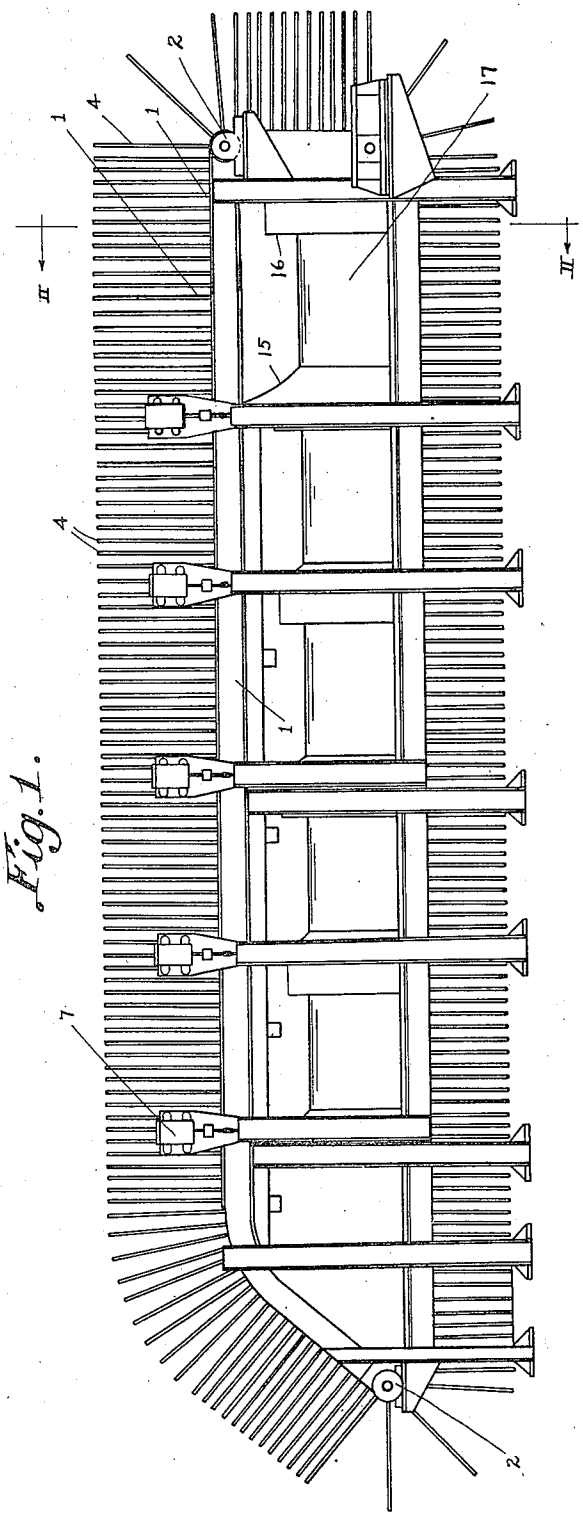


Fig. 1.

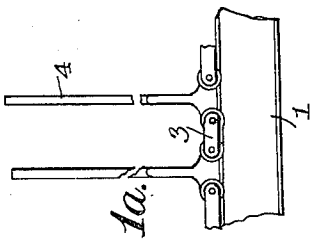


Fig. 1a.

INVENTORS

Ernest W. Rieger
Clinton H. Hehr
by Christy and Wharton
their attorneys

Dec. 22, 1936. E. W. RIEGER ET AL 2,064,858

SORTING APPARATUS

Filed Jan. 16, 1935 5 Sheets-Sheet 2

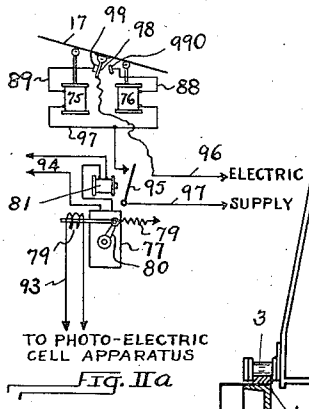


Fig. IIa

Fig. II

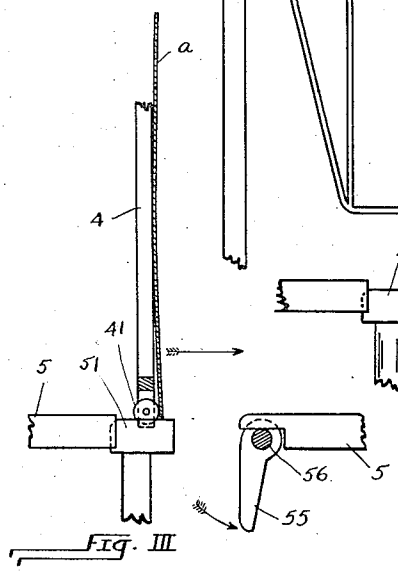


Fig. III

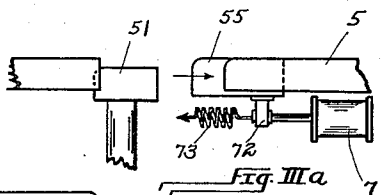


Fig. IIIa

INVENTORS

Ernest W. Rieger.
Clinton H. Hecht
by O'Brien and Wharton
their attorneys

Dec. 22, 1936. E. W. RIEGER ET AL 2,064,858

SORTING APPARATUS

Filed Jan. 16, 1935 5 Sheets-Sheet 3

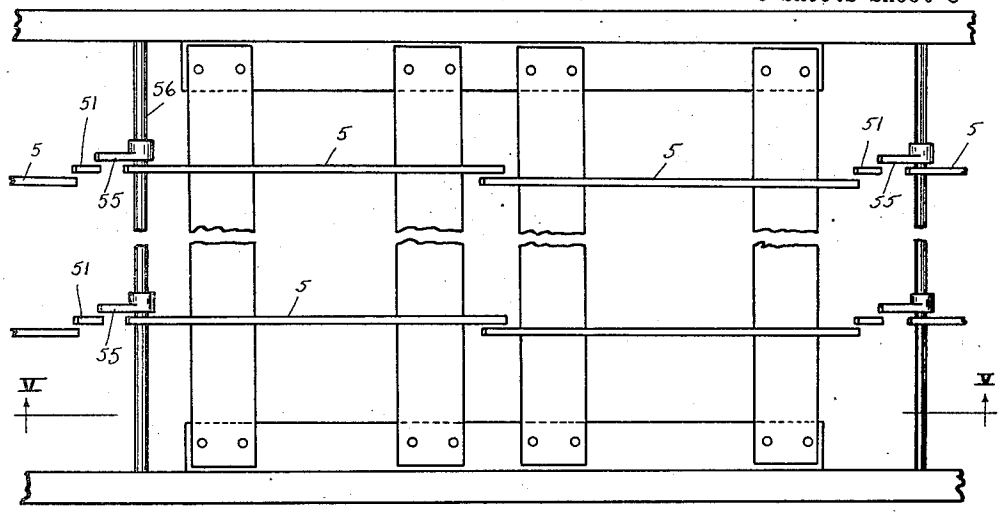


Fig. IV.

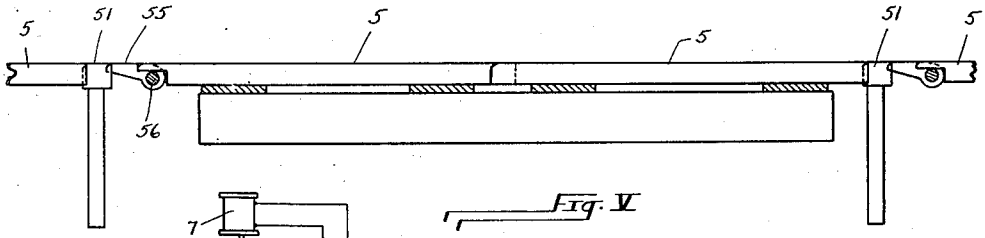


Fig. V.

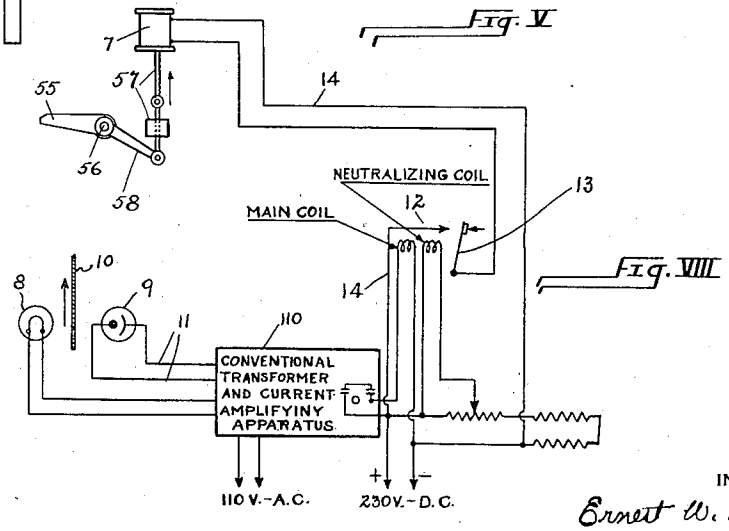


Fig. VIII.

INVENTORS

Ernest W. Rieger

Clinton H. Heubt

by Christy and Wharton

their attorneys

Dec. 22, 1936. E. W. RIEGER ET AL 2,064,858

SORTING APPARATUS

Filed Jan. 16, 1935 5 Sheets-Sheet 4

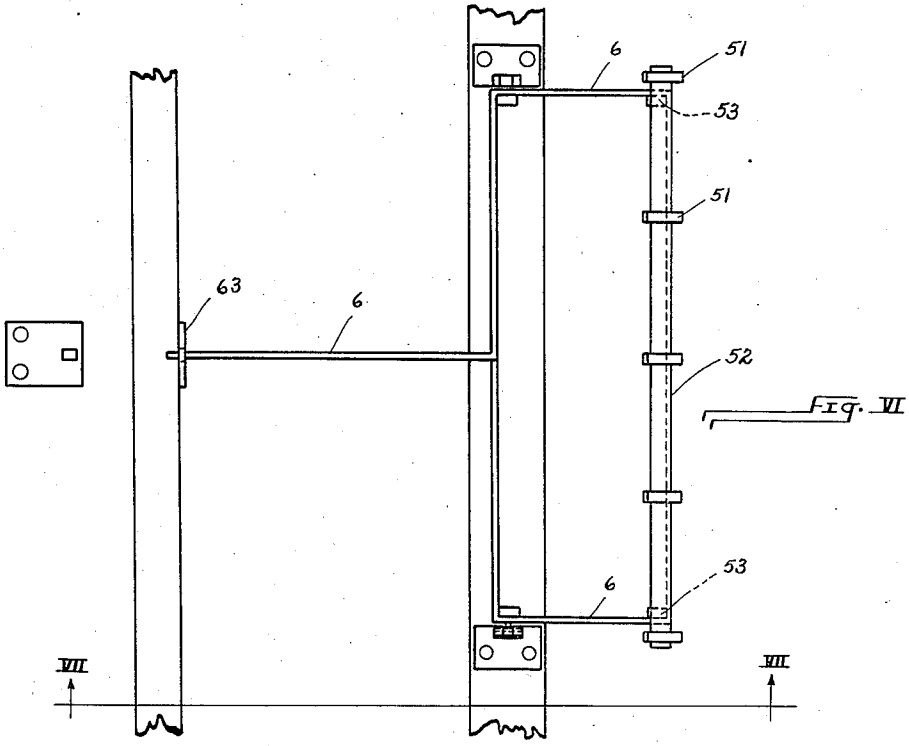


Fig. VI

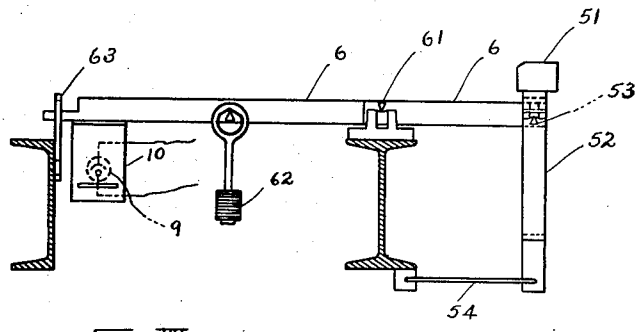


Fig. VII

INVENTORS

Ernest W. Rieger

Clenton H. Hulet

by Christy and Wharton

their attorneys

Dec. 22, 1936. E. W. RIEGER ET AL 2,064,858

SORTING APPARATUS

Filed Jan. 16, 1935 5 Sheets-Sheet 5

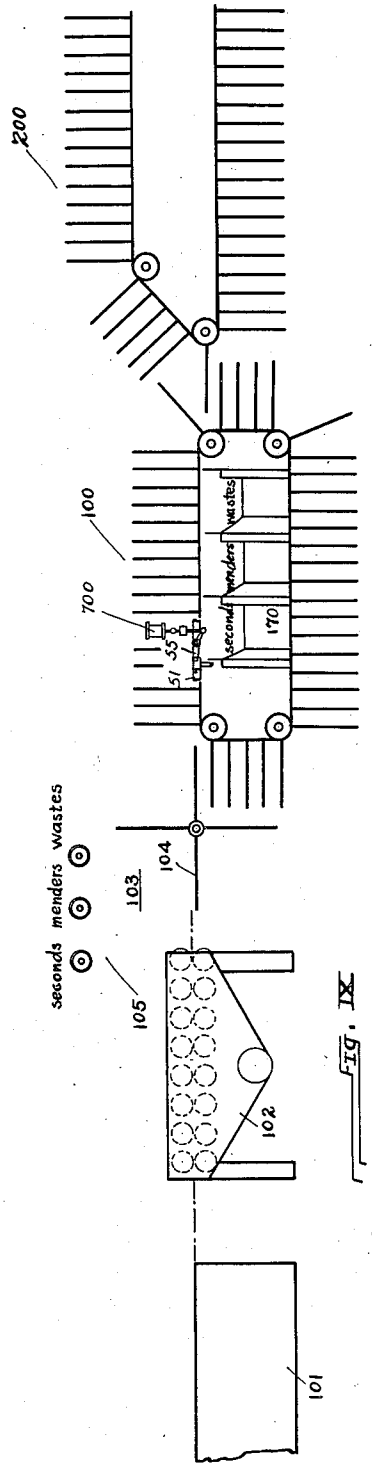


Fig. XI

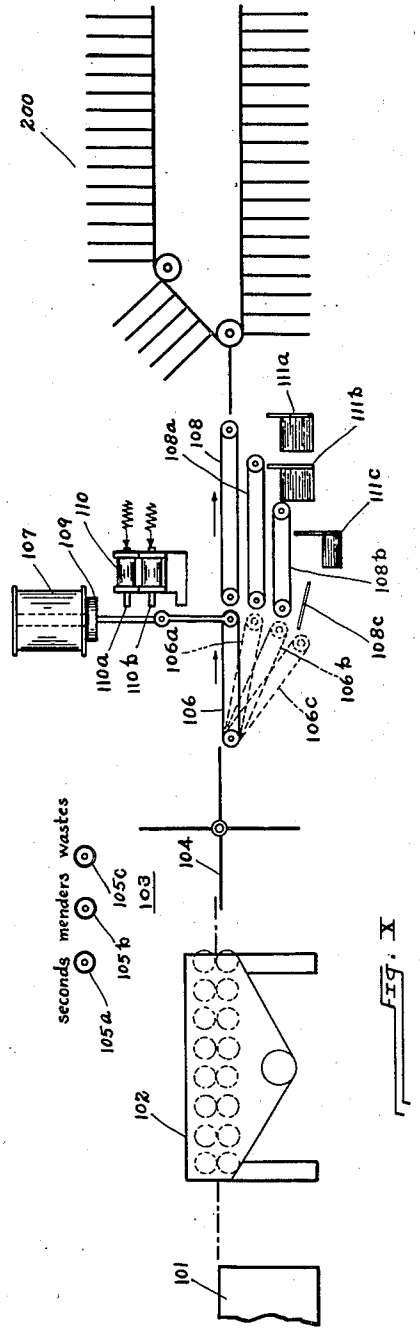


Fig. X

INVENTORS

Ernest W. Rieger
Clinton H. Hunt
by Christy and Wharton
their attorneys

Patented Dec. 22, 1936 2,064,858

UNITED STATES PATENT OFFICE

2,064,858

SORTING APPARATUS

Ernest W. Rieger and Clinton H. Hunt,
Steubenville, Ohio

Application January 16, 1935, Serial No. 2,008

4 Claims. (Cl. 209—121)

This invention relates to sorting apparatus, and consists, specifically, in apparatus for sorting sheet material by weight. It finds practical application in the sorting of sheets of rolled steel. It will be apparent that the apparatus is of wide and general applicability.

In the accompanying drawings Fig. I is a view in side elevation of apparatus for sorting sheets of steel in which the invention is embodied. Fig. Ia is a fragmentary view in side elevation, in which a detail of structure is illustrated diagrammatically to larger scale. Fig. II is a view of the apparatus in cross-section and to larger scale, on the plane indicated by the broken line II—II, Fig. I. Fig. II illustrates the organization of electrically operated mechanism for automatically stacking the sheets in successive packs of predetermined number. Fig. IIa is a wiring diagram. Fig. III is a fragmentary sectional view to yet larger scale, on the plane indicated at III—III, Fig. II. Fig. IIIa is a view comparable with Fig. III, and illustrating a modification in detail. Fig. IV is a fragmentary view, showing a portion of the apparatus in plan from above. Fig. V is a view in vertical and longitudinal section; on the plane indicated at V—V, Fig. IV. Figs. III and V, when brought into comparison, illustrate alternate positions of certain movable parts. Figs. VI and VII are other fragmentary views (in plan and in longitudinal and vertical section) illustrating particularly the structure and organization of a balance that forms part of the apparatus. Fig. VIII is a diagrammatic view of a photo-electric cell and associated apparatus, organized with a movable member of the sheet-conveying apparatus. Fig. IX is a diagrammatic view of the sorting apparatus of Fig. I in organization with manually controlled apparatus for preliminarily grading the run of sheets from the tinning operation. Fig. X is a view similar to Fig. IX, illustrating a modification in the grading apparatus.

In the rolling of sheet-steel under prevailing conditions of mill structure and operation, it is not possible to obtain perfect uniformity in the thickness of the rolled sheet. In the production of tin plate, for example, the steel sheets are rolled and sheared to size. They then are coated with tin, cleaned and polished, graded, sorted by weight, and packed. Heretofore the sorting has been done by girls who, inspecting the sheets singly, "heft" them one by one. These girls, through practice, learn to segregate light from heavy sheets. Such hand sorting is in the nature of skilled labor; the personal equation is a factor upon which accuracy depends; and, manifestly, it is not possible thus to make exceedingly nice selection and segration according to weight. This invention displaces skilled labor in hefting, dispenses with the personal equation, and substitutes for approximation a high degree of precision, so that in a run of sheets of varying weight segregation may be made into an indefinite number of groups, the sheets in each group distinguished from those of adjacent groups by small but constant inequality in weight. In association with means for effecting the ends indicated, additional means may be employed for preliminarily grading a run of sheets, according to visual inspection.

Tin plate is boxed for the market and graded according to box weight—that is to say, as of so many pounds per base box. A "base box" may be, for example, 112 sheets of 14 x 20 inches. A base box of this specification will contain tin plate of a total surface extent of 31,360 square inches. Tin plate is made in various box weights as demanded by the trade, and usually the weight ranges from 70 pounds to 135 pounds per base box. In the operation of rolling it is not always possible to produce uniformly an order of exact gauge or box weight; so that, while it is the aim to roll an order having a box weight of 107 pounds, for example, this order is likely to contain some sheets that are too heavy and beyond the range of permissible variation in that order, and other sheets that are too light. These light and heavy sheets, however, may fall well within the ranges of other box weights. By the practice of this invention the sheets may be sorted, so that they will severally and automatically fall into stations of particular and predetermined box weights, and thus be properly classified by weight. The light and heavy sheets may be set aside and later be fitted into orders of proper box weight.

Provision is also made that as the sheets are discharged in their respective stations, of which there may be as many as desired, they are automatically reckoned or counted as they fall into the pile; and provision is made that when a number of sheets in the pile reaches 112 (for example) or any fraction or a multiple thereof, as may be predetermined, the further sheets may be diverted to another piling station and there commence the building up of another package. In this way the machine is capable of doing the reckoning which under the present practice is now done by men who are known as "reckoners."

In the apparatus of the invention the sheets are caused to rest in substantially vertical po-

sition edgewise upon horizontally-extending skids, and they are pushed singly in broadside advance along the skids. The continuity of the skids is interrupted at one or more points in their extent—and if at more points than one, then at properly spaced points—by two particular members. One of these two members consists of lengths of skid rail borne by and forming part of a balance; so that, when an advancing sheet of weight exceeding a predetermined critical value comes upon them and rests upon them the balance swings. The other of the two said members consists of lengths of skid rail immediately sequent in the direction of sheet advance to those lengths just mentioned. These lengths of skid rail that form the second member are movable from their normal positions of skid-continuity. As illustrated in Fig. III, these rail-lengths are pivoted to swing in vertical plane from their normal position of horizontal continuity with the other portions of the skid rails to a position in which the continuity of support is broken. In such swing the rail-lengths recede in the direction of the length of the skid rails from the portions with which they had maintained continuity, and a gap is opened in the skid rails, through which gap the advancing sheet falls by gravity.

Referring to Figs. I and II of the drawings, a conveyor structure is shown that consists of a frame including a pair of horizontally-extending, spaced-apart, parallel sill beams 1, sprocket wheels 2, a pair of sprocket chains 3, vanes 4 borne by the chains at intervals, and skid rails 5. The sprocket chains are endless, and, interconnected by the vanes 4, travel in continuous courses. The chains, the sill beams, and the vanes are constructed in familiar manner, illustrated in the fragmentary large-scale detail in Fig. I, so that tension exerted by the turning sprocket wheels holds the links of the chain flat upon the horizontal faces of the sill beams and the vanes in vertical position. The direction of travel of the upper reach of the sprocket chain structure as seen in Fig. I is from left to right. At the left-hand end the vanes, in rounding the sprocket wheels, spread angularly apart, and at that point the sheets to be sorted are introduced one by one, and rested singly upon succeeding vanes. The vanes are conveniently formed of steel and are of the skeleton structure shown. They carry the sheets laid upon them and, advancing and coming to vertical position, they bring the sheets to vertical position, resting upon rails 5, and they push the sheets forward, as the sheets rest edgewise upon the rails. The positions of particular sheets of different size are in Fig. II indicated in broken outline at *a* and *b*.

The number of rails 5 that, extending side by side, constitute the skid-way for the sheets is variable, and will be such as in the particular situation is found desirable. In Fig. II five such rails are shown. The continuity of the rails 5 is interrupted at one or more points in their extent by short sections 5*f*, one in each rail. These sections 5*f* (Fig. IV) are aligned transversely of the skid-way, so that the sheet advancing upon the rails 5 comes at once to position, resting upon the transverse line of rail sections 5*f*.

Turning to Figs. VI and VII, the transversely aligned rail sections 5*f* will be seen to rest upon and to be borne by a beam 6 that is delicately fulcrumed in a vertically extending portion of the frame of the apparatus, as upon the knife-edge bearings indicated at 6*f*. The beam is counterweighted, as indicated at 62, and its range of swing is limited by means of a keeper 63; the keeper is also mounted in the framework, and includes a slot through which the beam at its end extends. The value of the weight 62 is such that a sheet of a weight exceeding a critical minimum is effective to swing the beam. Thus a sorting device is provided. Light sheets pass over rail sections 5*f* and on in continuous course, while heavy sheets, swinging the beam 6, take another course, as presently will appear. The mass of the weight 62 is manifestly variable and adjustable, to afford precisely the critical value desired. The beam at one end (the right-hand end, as seen in Fig. VI) is of loop shape, to afford a properly disposed support for the alignment of rail sections 5*f*. Provision is made for the maintenance of the rail sections 5*f* in precisely their normal position of horizontal extent, even as they make their slight descent with the swinging of the beam 6. The sections 5*f* are mounted upon a loop-shaped member 52. Member 52 rests immediately upon the beam 6 on knife-edge bearings, indicated at 53, and is as its lower end articulated to the framework by links 54. Fig. VII shows a parallelogram comprising a rigid vertical frame member, the vertical member 52 and the horizontal members 6 and 54, all pivotally connected; and it is manifest that, in consequence of such organization, the loop continues in its vertical position and the work-sustaining faces of the rail sections 5*f* continue aligned in horizontal position, as beam 6 swings.

Adjacent the rail sections 5*f* and immediately succeeding them in the direction of advance of material upon the skid-way are other rail sections 55, that also constitute a set in alignment transversely of the skid-way. These rail sections 55 may be arms borne in parallelism upon a shaft 56; and the shaft 56 is organized, by rotation to maintain the arms alternatively in the work-sustaining position shown in Figs. IV and V, where the rail sections 55 are seen to constitute part of a continuous skid-way, and in the swung-aside position shown in Fig. III, where, being swung aside, a gap is opened in the continuity of the skid-way. The movement of the rail sections 55 is in the direction of the longitudinal extent of the skid-way and away from the plane of extent of a descending sheet; and, in consequence, when these rail sections 55 are swung to the position of discontinuity, shown in Fig. III. a gap is opened in the skid-way, through which gap a sheet may freely fall. The rail sections 55 are thus seen to be gates in the skid-way. A normally de-energized solenoid 7 (cf. Fig. I) is organized with the shaft 56, and, as shown in Fig. VIII, the weighted armature 57 of the solenoid, acting upon an arm 58, is effective to hold the shaft in such position in its range of permissible rotation that the rail sections 55 extend in their normal, skid-affording position (Figs. IV and V). When the solenoid is energized, the arm 58, to which the armature is pivoted, swings upward (Fig. VIII), the shaft turns, and the rail sections 55 come to their gap-opening position (Fig. III). From this position the de-energizing of the solenoid allows the parts to fall away under gravity, and thus the rail sections again are brought to the position of Figs. IV and V.

Alternately, the rail sections 55 may be adapted to slide horizontally between gap-opening and closing positions. As shown in Fig. III*a*, the rail sections 55 may be secured to a cross-bar 72. A tension spring 73, acting upon the cross bar, is

adapted normally to hold the rail sections 55 in gap-closing position, and a solenoid 7, arranged in opposition to the spring, is adapted to shift the rail sections 55 as a unit longitudinally of the rails 5. Normally the solenoid 7 is de-energized, and the rail sections 55 lie in gap-closing position. When a sheet of critical weight or greater advances, and the rail sections 51 give downward, the solenoid is energized and the rail sections 55 are drawn in the direction of the arrow, Fig. IIIa, into gap-opening position. Upon the passage through of the sheet, the rail sections 51 rise, the solenoid is de-energized, and the spring 73 restores the rail sections 55 into their normal, gap-closing position. Purposeful delay in the sequence of the steps described is considered below.

These various specific ways of opening a gap in the skid-way, to permit the falling through of the sheet, suffice to indicate that the invention may be practised with variation in details of structure and operation.

Whether the rail sections 55 swing, as shown in Fig. III, or slide, as shown in Fig. IIIa, their movement is in the direction of the length of the skid-way; thus, with a minimum range of movement of these parts, a gap is opened for the fall of the sheet, and the gap that is opened is not limited laterally by the presence of such movable parts.

When the advancing sheet reaches the edge of member 51 the gap is open before it, and when it passes beyond such edge it falls free, without any obstruction or restraint whatever.

Electrical control is preferably provided for opening the gap in the skid-way. Referring to Fig. VIII, a photo-electric apparatus is shown, including a light source 8, a photo-electric cell 9, and a slotted screen 10. The screen 10 is borne by the beam 6 (cf. Fig. VII), and the parts are so arranged that normally the screen cuts off light from the source; but when, in response to the weight of a heavy sheet, the beam 6 swings, the slot in screen 10 comes to position permitting light from source 8, passing through the slot, to impinge on cell 9. This causes current flow in the cell circuit 11, and, by means of the usual electric equipment (110) organized with the cell and a source of electric supply, a time-limit relay 12 is brought into play. Through the relay a normally open make-and-break device 13 in the circuit 14 that energizes the solenoid 7 is closed; the solenoid is energized; and the rail sections 55 move to the gap-opening position shown in Figs. III and IIIa. A heavy sheet impelled along the skid-way by a vane 4 and bearing upon the aligned rail sections 51 has brought such operation about. The advance of the sheet continues (cf. Fig. III). Advancing beyond the edge of rail sections 51, the sheet a falls through the gap that has thus automatically been opened before it in the skid-way. When the beam 6 is relieved of the weight of the sheet, it swings back to normal position (incidentally raising rail sections 51 to their normal positions, Fig. V); light is cut off from cell 9; the time-limit relay 12, after a predetermined delay, again opens the make-and-break device 13; the solenoid 7 is de-energized, and the track sections 55 move back under gravity to their normal positions of continuity in the skid-way. The organization is such that the gap will open while the advancing sheet still rests on the rail sections 51 and before it passes beyond the edge of these sections, and the time-limit relay is so designed and adjusted that the solenoid 7 will not be de-energized to permit the rail sections 55 to return to normal gap-bridging position until the sheet shall have fallen through the gap.

Similarly the successive energizing and de-energizing of the solenoid 7 of Fig. IIIa may be delayed.

Figs. II and III show the vanes to be equipped at their bases with slightly outstanding discs 41, which, immediately making contact upon the sheet, facilitate the immediate falling away of the sheet when the gap is reached.

Falling through the gap, the sheet may by a curved guide 15 be brought to horizontal position; and, arrested by a stop 16 (Fig. I), may then slide down an inclined guide 17 to a receptacle prepared for it.

Advantageously, the guide 17 is adjustable between two positions of inclination, whereby it is adapted to direct the discharged sheets alternately into two courses of delivery. Conveniently, the guide is angularly adjustable in such manner that the sheets are delivered alternately into two receptacles located one on each of the opposite sides of the apparatus. A tally and electric mechanism are organized in the apparatus for swinging the guide from one position to the other; upon the delivery of a predetermined number of graded sheets into one receptacle, the guide automatically swings and delivers the sheets into the other receptacle. Accordingly, stacks of sheets of predetermined number and grade are obtained automatically, and it merely remains to pack and bind the stacks for shipment.

As shown in Fig. II, the guide 17 is mounted upon a shaft 74, and, subject to the alternate energizing of two solenoids 75, 76, it is shifted from one to the other of the two positions indicated, whereby the sheets dropping through the gap in the skidway may be discharged, first from one side of the apparatus and then from the other, into waiting receptacles. A tally 77 is conveniently mounted upon the framework of the apparatus, and the operating arm 80 of the tally is organized with a spring 78 and a solenoid 79 in such manner that each time that the solenoid is energized a tally-operating oscillation of the arm is effected. A magnetic switch 81 (Fig. IIa) is arranged with the tally, and, responsive to adjustable means within the tally mechanism, the switch 81 is actuated on that swing only of the tally arm 80 that completes a predetermined number of swings ensuing upon the last preceding actuation. As will presently appear, each actuation of the switch 81 is effective to swing the incline 17 from its one position to the other. It may be remarked that the tally 77 and switch 81 comprise a machine which is obtainable on the open market under the name Productimeter, and for present purposes a diagrammatic illustration of such machine is deemed adequate.

It is manifest that, if found desirable, means may be provided for holding the guide 17 against accidental swing during the time when both of the two solenoids 75, 76 are de-energized. Such means may, for example, take the form of latches of known structure which, subject to electric control, may be effective while the said solenoids are de-energized, but which will become ineffective when either solenoid, being energized, is about to swing the guide. Alternatively, it is manifest that the solenoids themselves or associated magnets may be made effective during such times and to such ends.

On each side of the sorting apparatus, above the path of sheet delivery, a photo-electric cell 90 is mounted, and below each of such paths a light

unit 91 is installed. Each unit 91 throws a beam of light across the path of sheet delivery and upon its associated cell 90, and the electric circuit wires 92 (Fig. II) of the cells are connected through the usual, well-known transformer and amplifying apparatus to a source of electric energy, whereby, when the beam of the light playing upon either of the cells is interrupted by the passage of a sheet, the circuit wires 93 (Fig. IIa) of the tally-operating solenoid 79 are energized. Thus, the delivery of a sheet from either side of the apparatus is instrumental in producing a tallying swing of the arm 80.

The tally mechanism in this case is so adjusted that, every time the arm 80 completes 112 swings, the controlling circuit 94 of the magnetic switch 81 is energized. In other words, the switch 81 is operated upon the delivery of 112 sheets from either side of the apparatus, that is, the delivery of 112 sheets subsequent to the last preceding operation of the switch. It is manifest that the mechanism may be so adjusted that the switch 81 will operate upon the delivery of any predetermined number of sheets. If, for instance, the practice is to make up, not one, but ten boxes of 112 sheets to the package, the switch will operate only after the delivery of 1120 sheets, to swing the guide to alternate position.

When the switch 81 operates, it swings a make-and-break device 95, and closes the energizing circuit 96, 97 of the solenoids 75, 76. The solenoid circuit includes a contact arm 98 that swings between two contact blocks 99 and 990 as the guide 17 is swung between its alternate positions. The contact block 99 is connected by a wire 89 to one terminal of solenoid 75; and block 990 in like manner is connected by a wire 88 to one terminal of the solenoid 76; the opposite terminals of the solenoids are connected in common to the circuit wire 97, while the circuit wire 96 is connected to the contact arm 98. When the guide 17 lies in the position shown in full lines, the arm 98 is in contact with the block 99. The closing of the magnetic switch 81 then effects the energizing of solenoid 75 through the circuit wires 97, 89, 96. The armature of solenoid 75 is drawn downward, and the inclined guide 17 is swung into its alternate position, indicated in dotted lines in Fig. II. In such alternate position the contact arm 98 engages the contact block 990, whereby, when 112 sheets have been discharged from the left side of the apparatus (Fig. II) and when thereupon the switch 81 again closes, the solenoid 76 is energized through circuit wires 97, 88, 96. Thereupon, the guide 17 is swung to the initial position first mentioned—the full-line position, Fig. II. Accordingly, the apparatus is adapted automatically to count and to register the number of sheets as they are delivered and to deliver the sheets in piles of predetermined number at one and another point of delivery.

In Fig. I the positions of five such sorting and delivering devices are indicated in the course of the travel of the conveyor through its upper horizontal reach. One or more of them may be made effective, as desired. The weights 62 (Fig. VII) of the several devices may be nicely adjusted to such relative magnitudes that the first device will remove from an advancing sequence of sheets those that exceed a certain critical weight; the second device will remove from the remainder all that exceed another and smaller critical weight; and so on. As many such particular sorting devices as are desired may be provided to act upon a single run of sheets. Thus the run of sheets may be segregated by weight automatically, and with niceness and precision.

Sheet material of any sort and for any purpose may thus be sorted and graded.

Tin plate as it comes from the tinning machine and through the branning box and bran cleaner must be inspected, and, by inspection, the sheets are classified into four categories, termed in mill parlance "primes," "seconds," "menders," and "wastes."

It is contemplated that two conveyors, such as shown in Fig. I, may be provided. Such an arrangement is shown in Fig. IX. The first conveyor, indicated at 100, may be equipped with one or more (in this case three) sorting devices operated severally by push-buttons 105 under the control of an inspector. The sorting devices may include, in association with a skid-way upon which the sheets rest edgewise and along which they advance, swinging gates such as the gate 55 of Fig. V; so that, when the gate is open, the advancing sheet will fall from the skid-way. By such means the "seconds," "menders," and "wastes" may be sorted out and the sheets of these three categories severally segregated, and only the "primes" may go to the second conveyor, indicated at 200, which in the manner already described automatically sorts them according to weight.

The sheets coming from the tinning machine 101 are passed through the bran cleaner 102, whence they proceed to the inspection station 103. At the station 103 the sheets advance one-by-one to position in the usual turn-over device 104; the opposite faces of each sheet are in the turn-over device carefully inspected, and classification of the sheet is determined. The sheet then enters the conveyor 100. If the sheet is a "prime," it is permitted to proceed through the conveyor 100 and is automatically fed to the conveyor 200 of the described apparatus for sorting by weight. If the sheet is a "second," a "mender," or a "waste," the inspector presses the appropriate one of the three push-buttons 105; thus a gap-controlling solenoid 700 is energized, and a gap is opened in the skid-way above the corresponding delivery incline 170. The push-button is held depressed until the advancing sheet reaches and falls through the gap. Then the push-button is released, and the continuity of the skid-way is restored. It will be manifest that the apparatus 100 is effectively, subject to the control of the inspector, to discharge the imperfect sheets selectively into three paths of delivery whereby they are segregated according to the result of inspection.

Fig. X illustrates modified apparatus for handling the sheets between the inspection station 103 and the sorting apparatus 200. Such modified apparatus comprises a tiltable belt conveyor 106 which is normally held in horizontal position by means of a normally energized solenoid 107. In such horizontal position the conveyor 106 feeds the "primes" from the inspection station to a conveyor 108 which in turn feeds them to the sorting apparatus 200. When a "second" comes to place on the conveyor 106, the inspector presses push-button 105a, and thereby de-energizes the solenoid 107. In consequence, the armature of the solenoid drops to a position in which a collar 109, integrated with the armature, is engaged from below by a supporting stop 110a. Thus the conveyor 106 is supported in inclined position 106a, and the "second" advances to a con-

veyor 108a, which discharges it into receptacle 111a. Upon releasing the button 105a, the solenoid 107 is again energized, and the conveyor 106 is restored to horizontal position.

Upon pressing the push-button 105b, the solenoid 107 is de-energized, and simultaneously a normally de-energized solenoid 110 is energized, shifting the stop 110a into retracted position. Thereupon, the conveyor tilts to the position 106b, in which position it is supported by engagement of the collar 109 with a stop 110b. A conveyor 108b receives the sheet from the conveyor 106 and delivers it into a receptacle 111b. Thus, the inspector is able to effect the segregation of "menders." In like manner "wastes" are delivered into a receptacle 111c. That is to say, by pressing button 105c, the attendant de-energizes the solenoid 107, retracts the two upper stops 110a, 110b, and causes the conveyor 106 to tilt into position 106c. The sheet is discharged upon a skid-way 108c, whence it passes into the receptacle for "wastes."

It will be manifest that the practice of this invention admits of advantages of the nature indicated. Sheet steel or sheets of other material may readily be classified and segregated according to their mechanical perfection, and the sheets of first class may thereafter be accurately sorted according to weight.

We claim as our invention:

1. In apparatus for sorting rigid sheets by weight, the combination of a horizontally extending skid-way consisting of a plurality of parallel rails, the continuity of each rail being interrupted by a gap and the gaps in the associated rails being aligned transversely, whereby a continuous gap is formed throughout the width of the skid-way, means for advancing a succession of sheets that rest edgewise upon them one by one longitudinally along said rails and toward the so constituted gap, each rail including a section movable between a position bridging the gap and a position of withdrawal from the gap in the direction of the longitudinal extent of the rail, each rail additionally including a downwardly movable section, such downwardly movable sections of the associated rails being arranged in alignment transversely of the skid-way adjacent to and on the side of approach of the sheets to the gap, the said downwardly movable sections being responsive in downward movement in unison to the weight of a sheet in excess of a predetermined critical value resting upon them, and means responsive to such downward movement of the rail sections last named for shifting the first-named rail sections simultaneously from their positions of gap-bridging to withdrawn and gap-opening positions.

2. In sorting apparatus for sheet material, two conveyors arranged in succession, the second conveyor adapted to receive a sheet advancing from the first, each conveyor including a skid rail with a gap in it and means for causing the sheets to advance one by one resting edgewise upon said rail, two gates normally bridging the gaps in the two skid rails, one of the said gates being subject to the control of an attendant whereby it may be swung at will from closed to open position, and the other of the said gates being subject to automatic control, such automatic control including a member movable in response to the weight of a sheet exceeding a predetermined critical value that in the course along the conveyor comes to position upon it, together with means for swinging the automatically controlled gate in response to movement of such movable member.

3. In sorting apparatus for sheet material two conveyors arranged in succession, the second conveyor adapted to receive a sheet advancing from the first, each conveyor including a skid rail with a gap in it and means for causing the sheets to advance one by one resting edgewise upon said rail, two gates normally bridging the gaps in the two skid rails and adapted to be swung from such positions, two solenoids, one associated with each gate and adapted when energized to swing each its associated gate from gap-bridging position, means for energizing manually and at will the solenoid associated with the gate in the first conveyor, and means for energizing the solenoid associated with the gate in the second conveyor, the last named means including a section of skid rail movable under an imposed weight of predetermined value.

4. In sorting apparatus for sheet material, a horizontally extending skid-way including a vertically movable section, means for advancing a succession of sheets resting edgewise upon it one by one along said skid-way, a stationary vertically extending supporting member, a counterweighted beam fulcrumed on said member, the movable section of the skid-way being fulcrumed on said beam and being provided with an integral downward extension, a link arranged between such extension and the vertically extending support, and forming with the extension the support and the beam a parallelogram of interlinked parts, whereby as the beam swings the said skid-way section is maintained in horizontal position, and means responsive to the swinging of the beam for allowing an advancing sheet to fall from the skid-way.

ERNEST W. RIEGER.
CLINTON H. HUNT.