Sept. 30, 1941. W. M. KEIL 2,257,469

SHEET PILER

Filed May 20, 1939 6 Sheets-Sheet 1

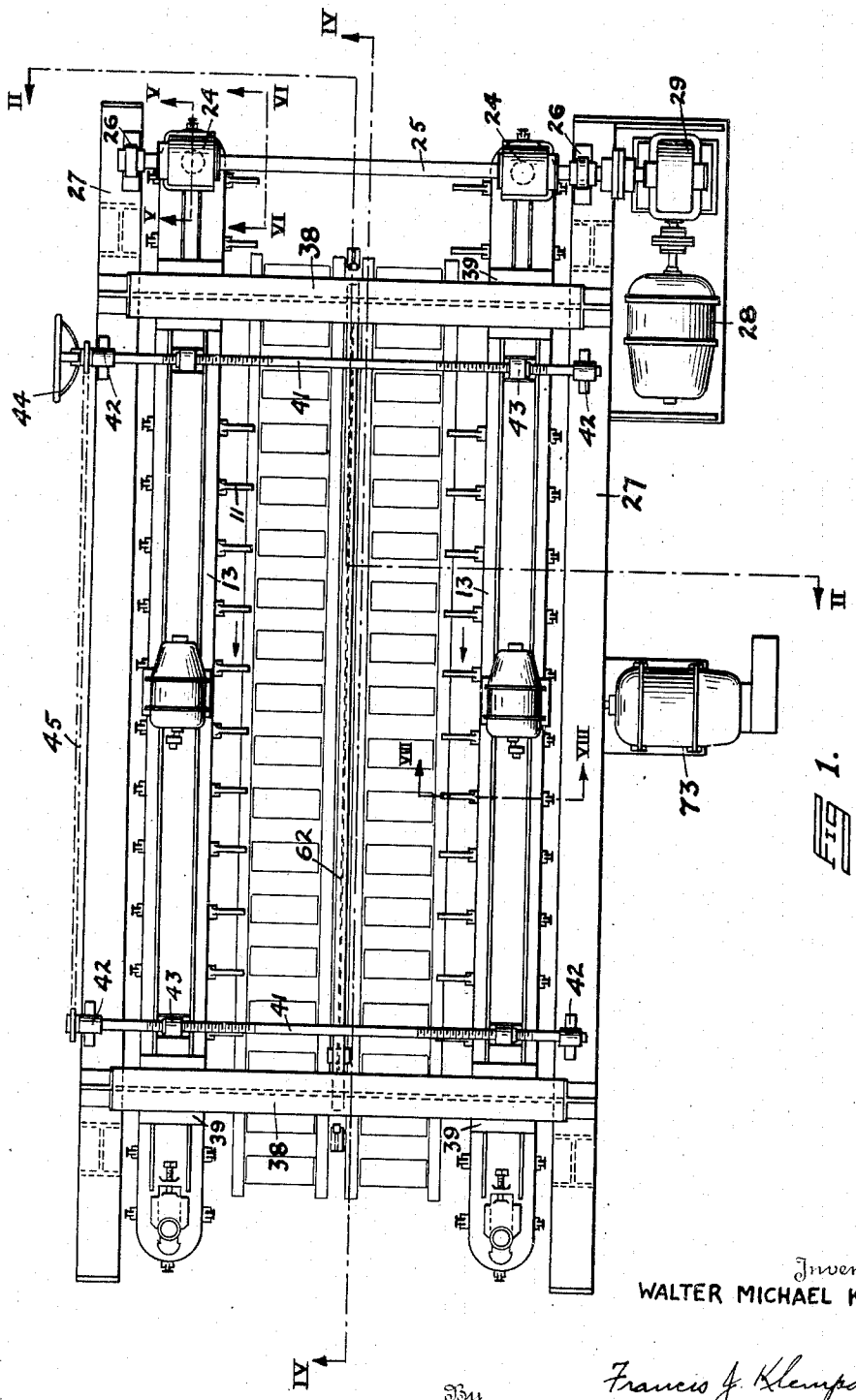


FIG. 1.

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SHEET PILER

Filed May 20, 1939 6 Sheets-Sheet 2

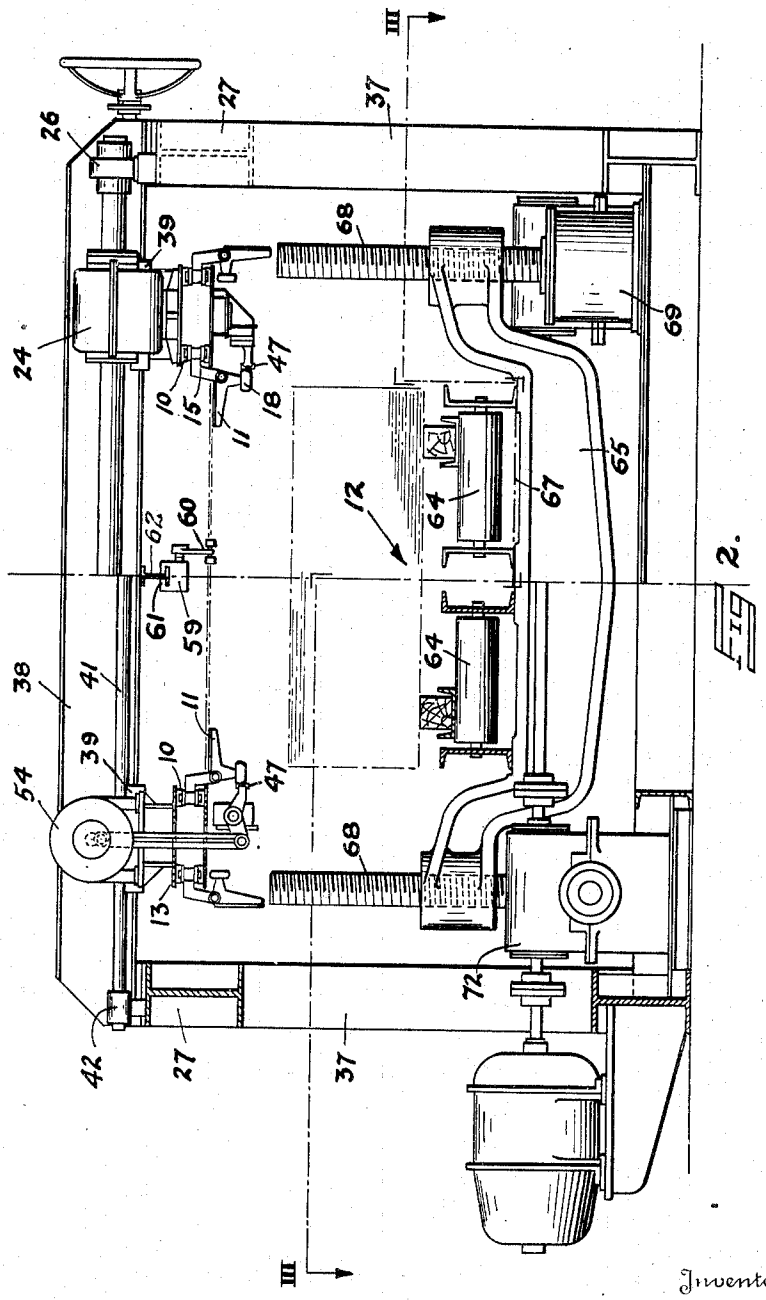


Fig. 2.

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SHEET PILER

Filed May 20, 1939 6 Sheets-Sheet 3

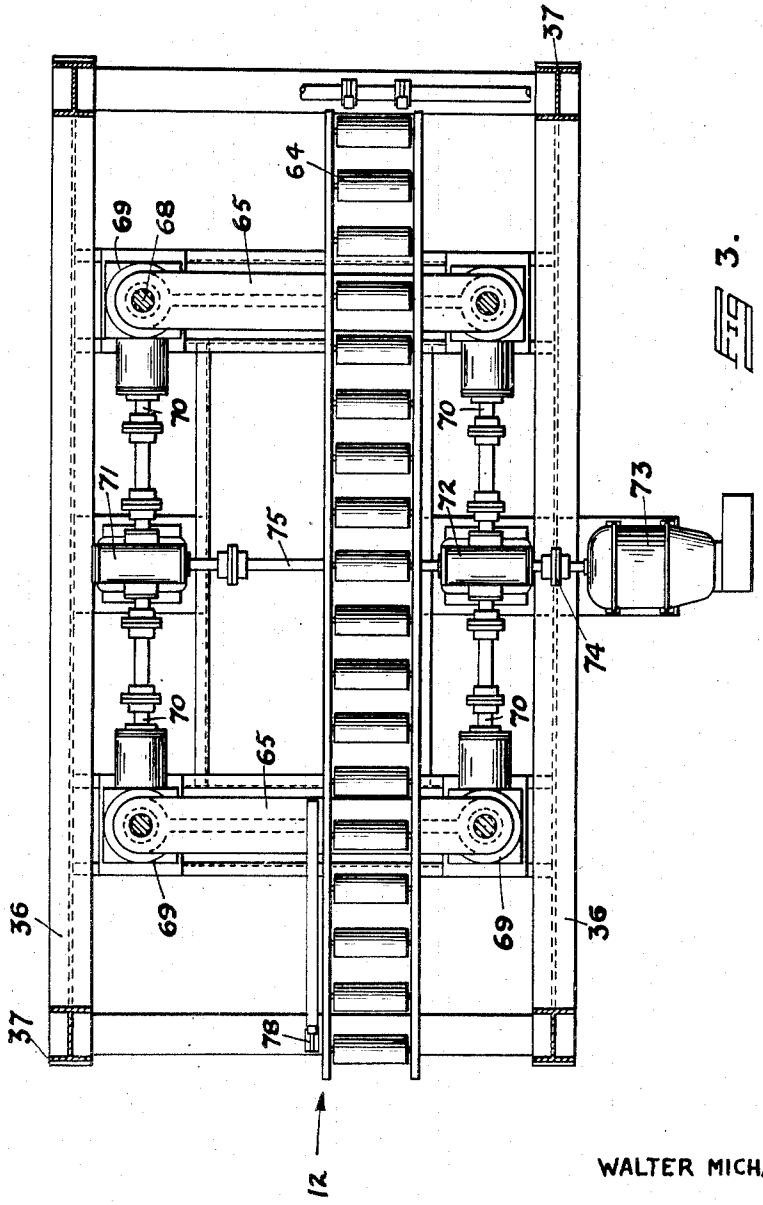


Fig. 3.

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SHEET PILER

Filed May 20, 1939 6 Sheets-Sheet 4

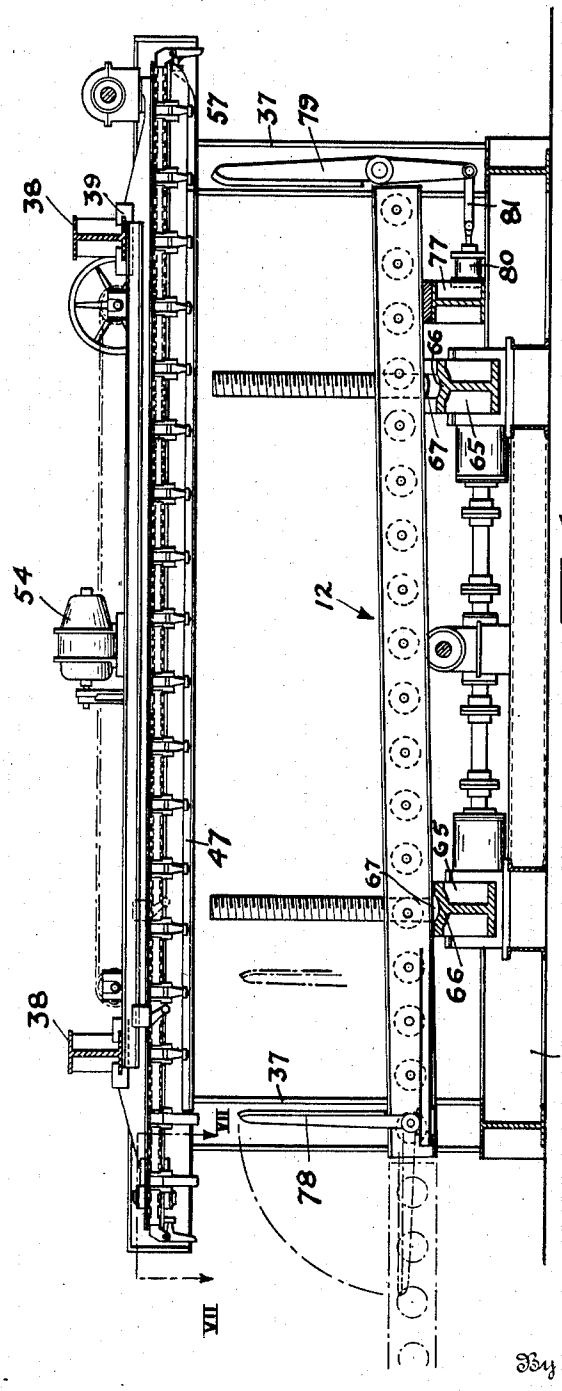


FIG. 4.

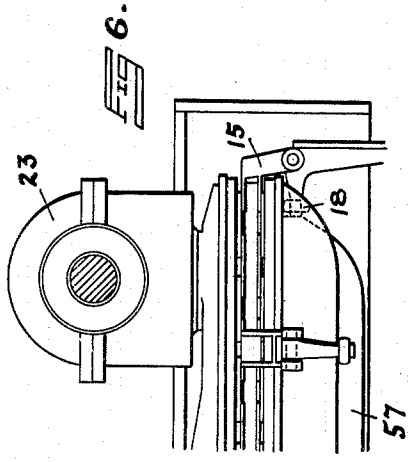


FIG. 6.

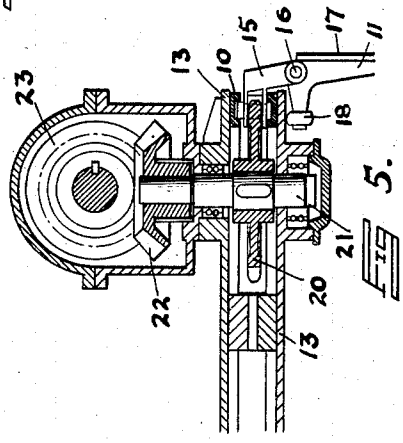


FIG. 5.

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SHEET PILER

Filed May 20, 1939 6 Sheets-Sheet 5

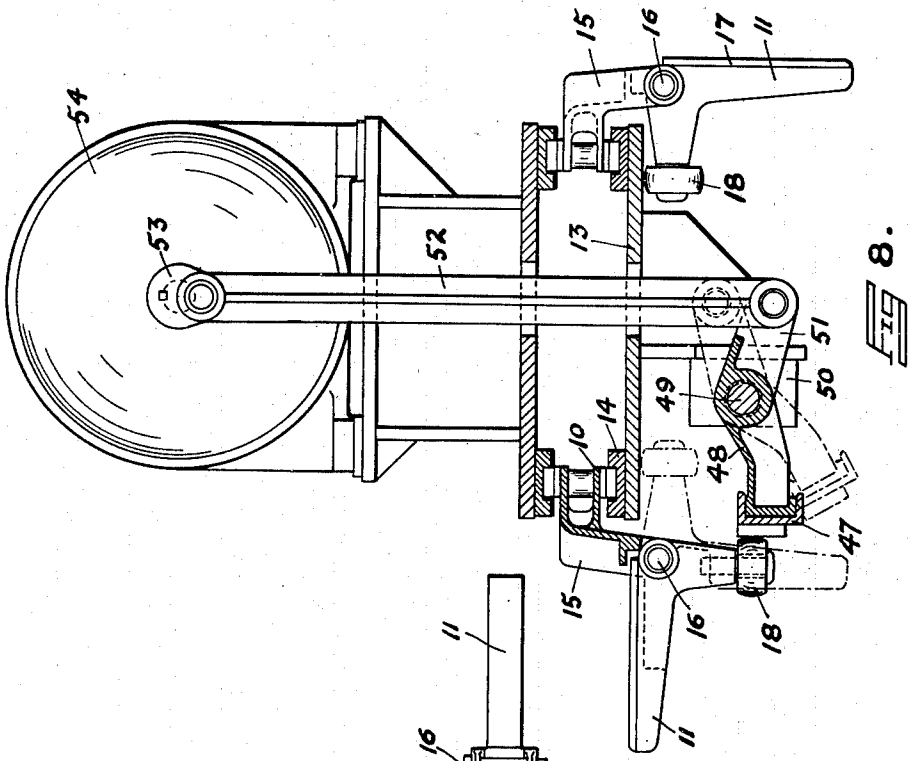


Fig. 8.

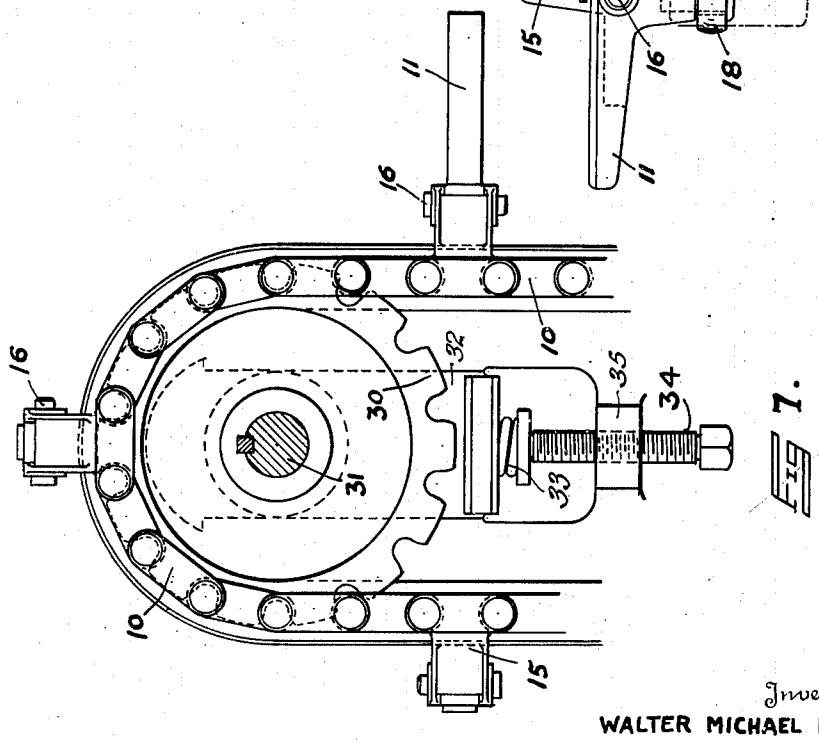


Fig. 7.

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SHEET PILER

Filed May 20, 1939 6 Sheets-Sheet 6

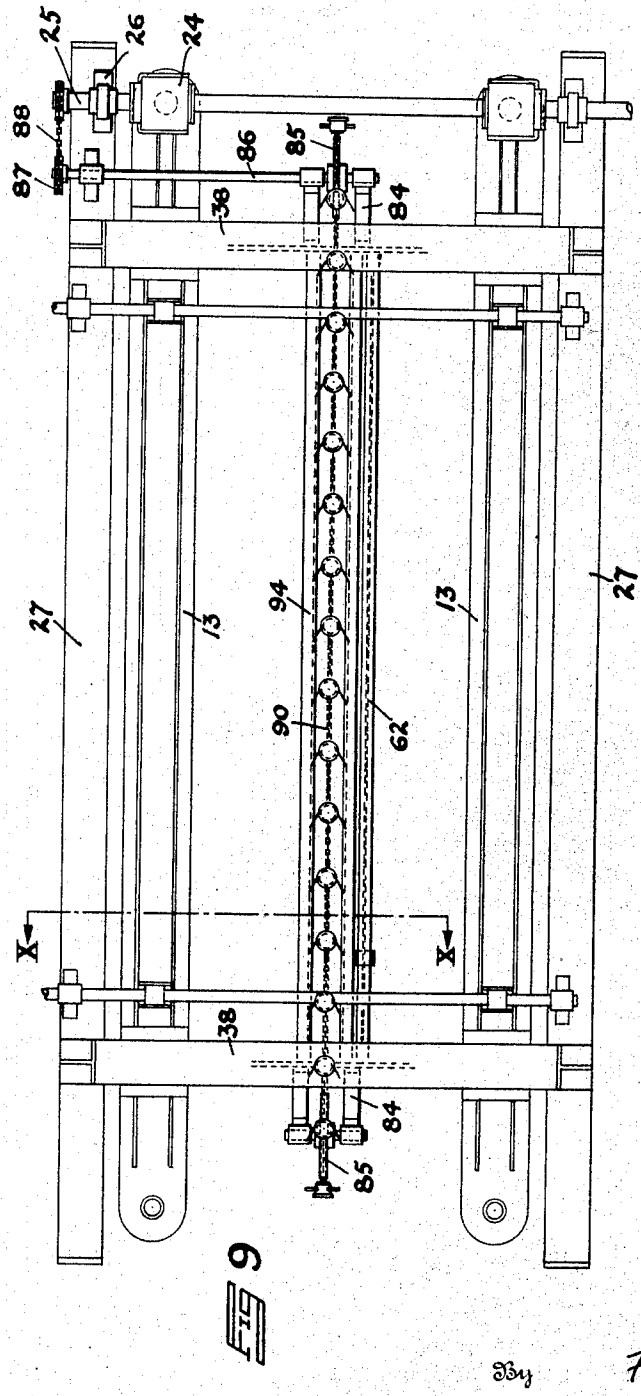


Fig 9

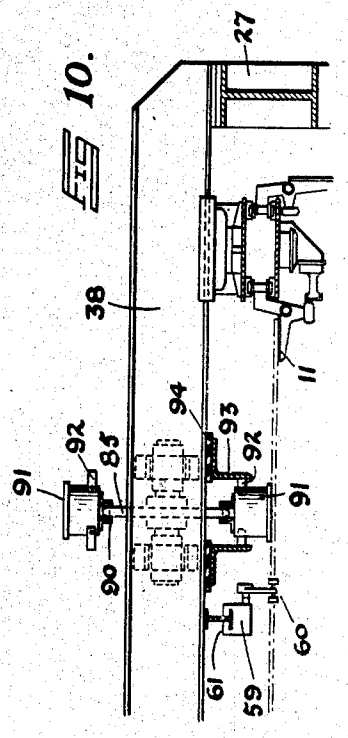


Fig 10.

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Patented Sept. 30, 1941

2,257,469

UNITED STATES PATENT OFFICE

2,257,469

SHEET PILER

Walter Michael Keil, Youngstown, Ohio, assignor to Youngstown Foundry and Machine Company, Youngstown, Ohio, a corporation of Ohio

Application May 20, 1939, Serial No. 274,770

16 Claims. (Cl. 271—68)

This invention relates to an automatic machine for stacking sheets, plates or similar articles as they issue from production or finishing apparatus and more particularly to a machine for the purpose stated which is capable of rapidly stacking highly finished metallic sheets without marring or injury to the same.

Heretofore it has been proposed in the design of machines for the purpose stated to provide means to convey the sheets or plates along a general horizontal plane spaced above the upper surface of the stack or pile being formed and to provide suitable means to withdraw all vertical support from the sheet in the horizontal plane when the sheet reached a position substantially directly above the sheets of the pile being formed. Various expedients have been resorted to to support and/or convey the sheets to the position above the pile but in all of the prior devices of which I am aware the withdrawing of the support and/or conveying means has involved the movement of parts having considerable inertia, which has retarded the rate of operation of the machines to such an extent that they are unsuitable for use in many modern high production processes. It is, therefore, the primary object of the invention to provide a machine which is capable of engaging a plurality of successive rapidly moving metallic sheets and piling the sheets into a finished pile with the lateral and end edges in vertical alignment so that the finished pile presents the appearance of a rectangular block having smooth and even faces. The operation of the machine enables the above to be accomplished in a very expeditious manner without injury to the edges or the highly finished surfaces of the sheets.

Another objectionable characteristic of the machines heretofore devised for the purpose of piling metallic sheets and of which I am aware is that a minimum interval must be maintained between the successive sheets as they issue from the production or finishing equipment and enter the piling apparatus and such interval must be increased as the speed of travel of the sheets is increased to enable the moving elements of the piling mechanism to return to their original operative positions before the succeeding sheet reaches certain of the elements. Considerable difficulty is experienced in so correlating the speed of the rolls or other production or finishing equipment and the conveyer tables to insure sufficient spacing between the successive sheets for the satisfactory operation of the piling mechanism. The rate of production of the line is, in some cases, restricted by the inability of the piling machine to handle the output and an additional attendant is sometimes required to check and correct the intervals between the successive sheets. Another object of the invention is, therefore, the provision of an apparatus for piling metal sheets which is operative to position sheets successively entering thereinto without limitation as to the intervals existing between the sheets and as to practical speeds employed.

A further object of the invention is to provide a machine for the purpose generally stated which is operative to provide means to support and move the sheets into a position immediately above the pile being formed whereby the need of any ancillary sheet moving means is obviated, thus avoiding danger of injury to the side edges of the sheets by such ancillary means or by the employment of excessive sheet moving speeds when the sheets approach or enter into the piling apparatus. The invention further contemplates the provision of a multiplicity of elements which have the dual function of supporting the sheets and moving the same longitudinally and the incorporation with such elements of an arrangement whereby a minimum of relative movement between the elements and the sheets exists to insure against any marring of the highly finished surfaces of the sheets being handled. The elements aforementioned are so arranged that they move with the sheets to move the sheets and support the same and when the sheets reach a position immediately above the pile the elements are dropped downwardly and outwardly allowing the sheets to follow without any substantial sliding movement between the highly finished surfaces of the sheets and the elements or other members and without their edges being engaged by any elements or other members.

Yet another object of the invention is the provision in an apparatus for the purpose stated of a vertically adjustable support for the pile being formed which support is integrally provided with means to move the pile from the apparatus upon the completion of its formation and which, when in its upper sheet receiving position, is generally horizontally disposed but which, when in its lower or run-out position, is inclined sufficiently to enable the pile to move by gravity from the apparatus.

A still further object of the invention is to provide a machine for piling sheets having the characteristics and advantages enumerated above but which is readily adjustable to accommodate sheets of different widths and lengths; which

is of relatively simple construction and not liable to get out of order under the severe conditions of operation to which such equipment is subjected.

These and other objects and advantages of the invention will become apparent from a consideration of the accompanying drawings and the following detailed specification wherein there is specifically disclosed a preferred embodiment of the invention. Although the invention is particularly adapted to machines for the purpose of piling highly finished metal sheets, it should be obvious that the principles thereof are equally applicable to machines for handling a wide variety of objects.

In the drawings:

Figure 1 is a plan view of a machine constructed in accordance with the principles of my invention;

Figure 2 is a part end elevation and sectional view of the machine of Figure 1, the view being taken along the line II—II of Figure 1;

Figure 3 is a section through the machine taken along the line III—III of Figure 2;

Figure 4 illustrates the cross-section of the machine, the view being taken along line IV—IV of Figure 1;

Figure 5 is a fragmentary sectional view taken along the line V—V of Figure 1;

Figure 6 is a fragmentary elevation taken of the area VI—VI of Figure 1;

Figure 7 is a fragmentary plan view of the area VII—VII of Figure 4;

Figure 8 is a detailed sectional view taken along the line VIII—VIII of Figure 1.

Figure 9 is a plan view of an apparatus which may be used on the machine of Figures 1–8 to provide support for the center of wide thin sheets; and

Figure 10 is a cross-sectional view through the apparatus of Figure 9 taken along the line X—X of Figure 9.

The machine, in its preferred embodiment, consists essentially of a pair of spaced parallel endless chains 10 supported for travel in a common horizontal plane and each pivotally supporting a multiplicity of sheet supporting fingers 11, means to maintain said fingers in sheet supporting position and means to simultaneously withdraw said maintaining means whereby all supports for the sheet in the machine will be simultaneously withdrawn allowing the sheet to fall onto the platform, indicated generally at 12, or onto a pile of sheets previously deposited on the platform. Chains 10 are each supported and guided between a pair of elongated parallel plates 13 which are rigidly connected together in spaced position by suitable means, not shown. Grooved guide bars 14 (Figure 8) extending about the outer edge of each of the plates 14 within the space defined between the plates 13 of a pair are securely fastened to the plates to provide for tracks in which the chains 10 move.

A multiplicity of evenly spaced hangers 15, each carrying a horizontal pivot pin 16, are incorporated in the chain structures and on the pins 16 are pivotally mounted the fingers 11. The latter are L-shaped, having secured thereto on one leg a face 17 of fibre or the like so as not to mar the surface of a sheet which they may support and carried on their other leg is a roller 18 the function of which will become apparent as the description proceeds.

Referring now to Figures 1 and 5, chains 10 are driven by sprockets 20, one sprocket being positioned adjacent an end of each of the plates 13 on vertical shafts 21 to which they are keyed. Shafts 21 are driven by the bevel gears 22 which in turn are driven by bevel gears 23, the bevel gears being housed within housings 24. A shaft 25 extending transversely of the machine and rotatably supported at its ends in bearings 26 mounted on the longitudinally extending frame members 27 is splined to each of the gears 23 to allow for variation in interval between the housings 24. Shaft 25 is driven by a motor 28 through reduction gear 29 conveniently attached to the fixed frame of the machine. On the opposite ends of the plates 13 and positioned therebetween are the idling sprockets 30 keyed to the vertical shafts 31, the ends of the latter being engaged by the yokes 32 which are biased to outward position by the coil springs 33. Springs 33 are adjusted inwardly and outwardly by the set screws 34 extending in threaded relation through the members 35 secured to the upper plates 13. The purpose of slidably mounting the shafts 31 is to maintain the chains 10 in taut condition.

The frame supporting the various operative elements of the machine consists of a base 36, columns 37 extending upwardly from the base, the two spaced longitudinally extending beams 27 positioned on the upper ends of the columns 37, and a pair of spaced parallel transverse I beams 38 supported at their ends on the beams 27. The plate assemblies 13 carrying the chains 10, the drive housings 24 and the tripping mechanisms, to be later described, are supported in depending relation on the beams 38, suitable slide connections 39 being provided for this purpose. The assemblies are moved towards and away from each other to accommodate different widths of sheets by the shafts 41 which are journaled at their ends in pillow blocks 42 carried by the beams 27 and which have screw threaded connections 43 with each of the assemblies. One of the shafts 41 is provided with a hand wheel 44 for manual manipulation and a chain 45 interconnecting the shafts 41 insures synchronous movement of the shafts. The threads on the shafts 41 are so pitched that rotation of the shafts results in simultaneous movement of the assemblies either inwardly or outwardly as the case may be.

Referring to Figures 6 and 8, the means employed to maintain the fingers 11 in horizontal sheet supporting position consists, in each of the assemblies above mentioned, of a bar 47 positioned beneath the inner reach of the chain 10, parallel therewith and substantially of the extent thereof. Bar 47 is carried by a number of longitudinally spaced arms 48 which are rigidly keyed to a longitudinally extending shaft 49 rotatably supported at spaced points in bearings 50 rigidly supported from the lower plate 13. Shaft 49 is adapted to be rocked by arm 51 rigidly keyed thereto. The outer end of arm 51 is pivotally connected with a rod 52 which in turn is pivotally connected with a crank 53 of a motor 54. The throw of crank 53 and the relative lengths of arms 48 and 51 is such that with rod 52 in its downward position the bar 47 presents a generally vertical surface for engagement by the rolls 18 of the fingers 11. However, as crank 53 moves rod 52 to its upward position the bar 47 moves downwardly to the position shown in dotted lines in Figure 8, withdrawing the aforementioned retaining surface and allowing the

fingers 11 to rotate to their dotted line positions as indicated in Figure 8. As the chain 10 moves about its orbit the fingers 11 as they move along the reach outwardly of the sheet supporting reach will be in downward position, as shown to the right of Figure 8, the fingers being balanced in such manner that they will assume such normal position. Depending from each lower plate 13 of the chain supporting assemblies at the incoming end thereof is a member 57 which provides a curved engaging surface for the rollers 18, which surface is operative to gradually move the rollers from a vertical position which they assume as they return along the outer reach to a horizontal position they assume when engaged by the bar 47. The surface of the member 57 is, at its leaving end, substantially flush with the adjacent bar 47 when the latter is in upper operative position and it should therefore be apparent that the function of the members 57 is to move the fingers 11 from an inoperative to an operative position as the sheet supporting traverse is reached.

A switch 59 having an operating arm 60 is positioned centrally of the path of travel of the sheets through the machine being carried by member 61 which is slidably mounted on a bar 62 supported in depending relation from the transverse frame members 38. The operating arm 60 extends downwardly, as shown more clearly in Figure 2, in order that it may be engaged by the leading end of a sheet coming into the machine. Switch 59 which is actuated by such engagement controls motors 54 (both simultaneously) through suitable conductors and relays, not shown. Motors 54 are of the single revolution type, i. e., upon energization the cranks 53 make but one complete revolution.

The sheet or pile supporting mechanism positioned below the chains 10 and indicated generally at 12 consists, in its preferred embodiment, of a pair of run-out tables 64 normally supported when in operative position on the saddles 65, the latter are provided on their upper surfaces with transverse grooves 66 into which depending lugs 67 on the tables 64 may extend. Saddles 65 are arranged to be simultaneously raised and lowered and for this purpose they are provided at their ends with screw threaded apertures to receive the vertically extending screws 68 which are rotatably mounted at their lower ends in the housings 69. Within each of the housings 69 is a gear (not shown) keyed to the screw 68 and meshing with a second gear (not shown) keyed to a horizontally extending shaft 70. The shafts 70 on one side of the machine are simultaneously driven from a reduction gear 71 and the shafts 70 on the other side of the machine are simultaneously driven from a reduction gear 72. A motor 73 drives the reduction gears 71 and 72 in unison through coupling 74 and transverse connecting shaft 75. The various transmission gearing from the motor and the threaded connections between the screws 68 and saddles 65 are so arranged that all the ends of the saddles 65 move upwardly and downwardly in unison. Extending transversely of the base 36 and supported thereon is a beam 77 whose upper surface is above the upper table supporting surface of the adjacent saddle 65 when the latter is in lowermost position. This provides for the tilting of the run-out tables 64 to the inclined position shown in Figure 4, as the latter are moved to downward position by the downward movement of the saddle 65, since the leaving end of the run-out tables will continue to move downwardly a certain distance after movement of the other end of the tables has been stopped by their engagement with member 77. However, when the tables are in their upper or sheet receiving position the tables will be horizontal.

A retractible stop 78 is positioned between the two tables 64 to engage the leading end of the sheets for the purpose of aligning them vertically. Pivotally mounted on the frame structure of the machine adjacent the other end of the tables is the member 79 which is adapted to be intermittently moved by a fluid pressure motor 80 mounted on base 36 and connected with member 79 by a rod 81. As a sheet is dropped from the fingers 11 onto a pile being formed on the tables 64, member 79 is moved in a counter-clockwise direction, as viewed in Figure 4, by motor 80 to engage the trailing end of the sheet to move the sheet against the stop 78. This provides for accurate vertical alignment of the end edges of the sheets being piled and, if desired, suitable side guides may be provided to align the side edges of the sheets vertically as the sheets fall onto the pile.

From the above description the operation of the machine should be fairly apparent. The chains 10 carrying the pivotally mounted fingers 11 are normally in continuous motion in the directions indicated in Figure 1 of the drawings and, if the formation of a pile is just being started, the tables 64 will be moved to their upper horizontal positions by the mechanism described above. Stop 78 will be in its upper operative position and as the sheets enter the machine they will be supported and carried by the fingers 11 previously moved to operative positions and retained in such position by the members 57 and 47, as explained above. The sheets will be carried along by the fingers 11 until the switch operating arm or flag 60 is reached at which time motors 54 will be energized by reason of the actuation of switch 59 and, as explained above, the bars 47 on either side of the machine will be moved to lower position, allowing each of the fingers 11 to simultaneously rotate to an operative position, thereby withdrawing all support for the sheet, allowing the same to fall free onto the tables 64. Inasmuch as the tables 64 are positioned closely beneath the supporting fingers 11 the extent of fall of the sheet is short, thereby minimizing any danger of injury to the surface of the sheet due to impact. As succeeding sheets advance through the machine the tables 64 are progressively lowered until the desired number of sheets are piled thereon, at which time the stop 78 will be retracted and the tables 64 lowered to their inclined position, shown in Figure 4, and, as this position is reached, the pile will automatically move off the tables by gravity and onto suitable conveying apparatus with which the piling machine may be associated. It should be understood, of course, that the longitudinal interval between the flag 60 and the leaving ends of the members 57 will always be greater than the length of the sheets being piled to insure the simultaneous withdrawal of all supports for the sheets. Retractable stop 78 is adjustable as to its position longitudinally of the tables 64 to accommodate sheets of varying lengths.

It should be observed that, by reason of the method and apparatus utilized in the present invention to engage, support and move the sheets as they come into the machine, the operation of the machine is not dependent on the mainte-

nance of any particular interval between the successive sheets. In accordance with usual practice suitable conveying means, not shown, is utilized to move the sheets to the machine of the present invention. By referring to Figures 1, 2 and 4 of the applicant's drawings it can be seen that as the leading ends of the sheets enter the machine the side portions of the lower surfaces of the sheets will be progressively engaged by the upwardly and forwardly moving fingers 11 which attain their horizontal positions as they complete their rotary movement about the ends of supporting members 13 and while in this horizontal position carry the sheets through the machine. As the sheets engage flag 60 the supporting fingers 11 engaging rails 47 will be simultaneously dropped to vertical position allowing the sheets to fall onto the pile but, since retraction of retaining rails 47 does not affect the initial movement of the fingers to horizontal position, at least two horizontally positioned fingers 13 are always available on either side of the machine for support of the leading end of successive sheets regardless of whether or not the leading sheet has already fallen onto the pile. The machine is operative even though the succeeding sheets abut each other as they enter the machine and, of course, the extent of any interval between the sheets is immaterial. Due to this arrangement and to the facts that the chains 10 can be operated at any desired speed and that the fingers 11 are practically instantaneously movable to inoperative positions, the machine is capable of operation at a high rate of speed. Together with the above attributes the apparatus of this invention is capable of ready readjustment to accomodate sheets of different widths and lengths. This is accomplished simply by manipulation of the hand wheel 44 to accommodate variations in width and by relocating stop 78 and flag 60 to compensate for variations in length.

Referring now to Figures 9 and 10 which illustrate an apparatus for supporting the center of wide thin sheets as the latter are moved into falling position by the fingers 11, reference numerals 84 depict brackets secured to and extending outwardly from the transverse beams 38 and on these brackets at their outer ends are journaled the sprocket wheels 85. One of the sprockets 85, preferably the one adjacent drive shaft 25, is coupled with and adapted to be driven by a shaft 86 extending to one side of the machine and provided with a sprocket 87. A suitable chain drive connection 88 is provided between shafts 25 and 86 to effect rotation of the adjacent sprocket 85 upon rotation of shaft 25 and the consequent movement of the fingers 11. An endless chain 90 is looped over the two sprockets 85, the latter being of sufficient diameter to position a reach of the chain 90 both below and above the transverse beams 38. The ratio of the drive 88, the diameter of the sprockets 85, the ratio between gears 22 and 23 and the diameter of sprockets 20 are so correlated that the linear movement of the horizontal reaches of the chain 90 is the same as the movement of the fingers 19 along their sheet supporting paths.

A series of spaced electro-magnets 91 are carried by the chain 90 and, as seen in Figure 10, the lower surfaces of the electro-magnets when traversing the lower horizontal reach of their path lies substantially in the horizontal plane of the sheet supporting surfaces of the fingers 11 when the latter are in their sheet supporting positions. Electro-magnets 91 are each provided with a pair of outwardly extending brushes 92 connected with the ends of the coils of the magnets to provide a path for the magnet energizing current. Brushes 92 are adapted to contact with spaced conductor bars 93 carried by and spanning the two transverse beams 38 on the lower sides thereof. Suitable insulation 94 is provided between the bars 93 and the beams 38. Current is conducted to the bars 93 in any suitable manner, not shown, the current supplying circuit being under the control of the switch 59 operated by the flag 60.

The operation of the sheet supporting apparatus described immediately above is as follows: Sprockets 85 are normally continuously rotated and consequently electro-magnets 91 continuously move about their orbit and when below beams 38 move in the same direction and at the same speed as the adjacent fingers 11. Current is normally supplied to the bars 93 and consequently those magnets positioned between the bars are normally energized. As a sheet advances into the machine on the fingers 11 the attraction between the magnets and the center of the sheet will hold the sheet against the magnets and, since the latter are supported from the taut chain 90, the center portion of the sheet will be maintained in proper upper position. As the leading end of the sheet engages the flag 60 switch 59 is actuated breaking the current supplying circuit to the bars 93 and simultaneously deenergizing all the magnets 91 between the bars. This will release the center portion of the sheet at exactly the same time that the edge supporting means is withdrawn, allowing the sheet to flatly fall onto the support 12 or the pile positioned thereon.

It should be apparent that other means than that specifically disclosed may be employed to conduct and control the flow of current to the electro-magnets and that a wide range of equivalents may be employed to movably support the magnets. Also, it is contemplated that in certain installations permanent magnets or vacuum cups may be substituted for the electro-magnets 91. It should also be obvious that, if the center supporting means as the magnets 91 is positioned centrally between the frame members 27, the switch supporting bar 62 must be moved to one side a sufficient distance to accommodate the center sheet supporting means.

The above specifically described embodiment of the invention should be considered as illustrative only as obviously many changes may be made therein without departing from the spirit or scope of the invention, the extent of which is indicated by the subjoined claims.

What I claim is:

1. Apparatus of the character described comprising a plurality of laterally and longitudinally spaced movable sheet supporting elements, means to move said elements along fixed closed paths including reaches extending longitudinally in a generally horizontal plane, a support for a pile of sheets positioned centrally below said elements, means to remove the elements from beneath the sheet being supported thereon when said elements are positioned along said reaches to allow the sheet to fall toward said support, means positioned in the path of travel of the sheets on said elements in control of said second mentioned means, and means to move said elements individually to sheet supporting positions, said last mentioned means being positioned along said paths but outside of said reaches.

2. Apparatus of the character described com-

prising a plurality of laterally and longitudinally spaced sheet supporting elements, means to move said elements along fixed closed paths including reaches extending longitudinally in a generally horizontal plane, a support for a pile of sheets positioned centrally below said elements, said elements when positioned along said reaches being pivotally mounted on spaced parallel longitudinally extending axes positioned outwardly of the outer edges of the sheets being handled, means to normally retain said elements in upper pivoted position whereby the sheets are supported, means to withdraw said retaining means whereby said elements will rotate downwardly and outwardly to allow the sheet being supported to fall toward said support, means positioned in the path of travel of the sheets on said elements in control of said withdrawing means, and means to rotate said elements individually to sheet supporting positions when said elements move along said paths outside of said reaches.

3. Apparatus of the character described comprising a base, a pair of longitudinally spaced laterally extending frame members on said base, a pair of spaced parallel longitudinally extending supports adjustably mounted on said frame members, an endless chain movably mounted on each of said supports and each having an inward reach parallel with an inward reach of the other, means to move said chains in such manner that both the said reaches move in the same direction, a plurality of sheet supporting fingers mounted on said chains on horizontal axes parallel with the direction of extent of said chains, said fingers being normally biased to a downward hanging position, means associated with said supports and fingers to move said fingers to a horizontal sheet supporting position as the fingers approach said reaches during movement of the chain, means to normally retain said fingers in sheet supporting position during passage over said reaches, and means positioned in the path of travel of the sheets on said fingers in control of said retaining means.

4. Apparatus of the character described comprising a sheet supporting and moving device having a pair of spaced parallel portions normally continuously moving in the same direction, a plurality of sheet supporting fingers carried by said portions and individually movable from sheet supporting positions to positions away from the sheet and vice versa, means to support a pile of sheets below said device, means to normally retain said fingers in sheet supporting positions, and means engageable by the sheet moving along said device in control of said retaining means, and means to move said fingers individually to sheet supporting positions as said fingers move into sheet engaging positions.

5. Apparatus of the character described comprising a sheet supporting and moving device having a pair of spaced parallel portions normally continuously moving in the same direction, a plurality of sheet supporting fingers carried by said device and movable from operative to inoperative positions and vice versa, means to normally maintain said fingers in operative positions during passage along said portions, means to move said fingers to inoperative positions upon completion of the traverse of said portions, means to move said fingers to operative positions upon entering said portions, means below said portions to support a pile of sheets, and means engageable by a sheet on said fingers in control of said maintaining means.

6. Apparatus of the character described comprising a plurality of normally continuously moving sheet supporting fingers, the paths of travel of said fingers including a pair of spaced parallel reaches moving in the same direction, said fingers adapted to support and move the sheets as they traverse the reaches, said fingers being movable from operative to inoperative positions and vice versa, means to move said fingers to operative sheet engaging positions as they approach said reaches, means to maintain said fingers in operative positions along said reaches, means to move said fingers to inoperative positions upon completion of the traverse of said reaches, means below said reaches to support a pile of sheets, and means engageable by the sheets supported on said fingers in control of said retaining means.

7. Apparatus of the character described comprising a plurality of moving sheet supporting fingers, the paths of travel of said fingers including a pair of spaced parallel reaches both moving in the same direction, said fingers adapted to support and move the sheets as they traverse the reaches, said fingers being individually movable from operative to inoperative positions and vice versa and being normally biased to inoperative positions, means to retain said fingers in operative positions along said reaches, means responsive to the advanced position of the sheet supported on said fingers in control of said retaining means, a support for a pile of sheets below said reaches, and means to move said fingers individually to operative positions as said fingers move along said paths outside of said reaches.

8. In apparatus of the character described, the combination of a pair of spaced elongated supports, means positioned between and below said supports to support a pile of sheets, an endless chain movably mounted on each of said elongated supports, the paths of travel of said chains including a pair of spaced parallel reaches along which the chains both travel in the same direction, a plurality of retractable sheet supporting fingers carried by and spaced along each of said chains, said fingers being normally biased to inoperative or retracted positions, means to move said fingers to operative positions as they approach said reaches, means to retain said fingers in operative positions as they traverse said reaches, and means responsive to the advanced position of the sheets supported on said fingers to render said retaining means inoperative.

9. In apparatus of the character described, the combination of a pair of spaced elongated supports, means positioned between and below said supports to support a pile of sheets, an endless chain movably mounted in a horizontal plane on each of said supports, a plurality of retractable sheet supporting fingers carried by and spaced along each of said chains, said fingers being normally biased to inoperative or retracted positions, said chains having opposite orbital movement whereby the inner reaches thereof move in the same direction, means engaging said fingers as said fingers approach said reaches to move said fingers to operative positions, means to retain said fingers in operative positions as they traverse said reaches, and means responsive to the advanced position of the sheets supported on said fingers to render said retaining means inoperative.

10. Apparatus according to claim 8 further

characterized by means to vary the interval between said supports.

11. Apparatus according to claim 8 in which said last mentioned means includes an element longitudinally adjusted along said means and engageable by the leading edges of the sheets passing through said machine.

12. Sheet piling apparatus comprising a pair of elevated spaced parallel supporting members extending at right angles to the axis of travel of the sheets through the apparatus, a pair of spaced beams slidably supported on said members and extending parallel with said axis means to vary the interval between said beams, a chain sprocket mounted at each end of each beam, a closed chain extending about the sprocket of each beam, sheet supporting fingers carried by said chains, means to drive said sprockets comprising transmission elements on said beams and coupled with certain of said sprockets, a shaft extending across said apparatus at right angles to said axis and feathered to said elements, and means to drive said shaft.

13. Apparatus according to claim 12 in which said chains are movable in their orbits in a horizontal plane, said fingers being pivotally mounted on said chains and normally biased to downward inoperative positions, means to move said fingers to operative positions upon movement of said chains, means to retain said fingers in operative positions along a portion of their path of travel, and means to render said retaining means inoperative.

14. Apparatus according to claim 12 in which said chains are movable in their orbits in a horizontal plane, said fingers being pivotally mounted on said chains and normally biased to downward inoperative positions, said fingers being provided with angularly extending portions, cam means on said beams engageable by said portions to move said fingers to operative positions as said chains move, movable retaining members against which said portions abut to retain said fingers in operative positions, and means to move said retaining members away from said portions.

15. In apparatus of the character described, the combination of a support for a pile of sheets, sheet moving and supporting means above said support comprising a pair of spaced parallel beams one on either side of said support, a closed articulated carrier on each beam, a multiplicity of spaced sheet supporting fingers pivotally mounted on horizontal axes on said carriers and movable from vertical inoperative to inwardly extending horizontal operative positions as they approach a sheet into the apparatus, and means to simultaneously move all the fingers supporting the sheet to inoperative positions when said sheet has advanced to a predetermined position above said first mentioned support.

16. Apparatus of the character described comprising means engaging the side portions of sheets to support and move the same in a generally horizontal direction, means positioned above the sheets to support the center portion of said sheets, a support for a pile of sheets positioned below both said means, and means to simultaneously render all of said supporting means inoperative.

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