Sept. 1, 1942. L. BAKER 2,294,649

METHOD OF AND APPARATUS FOR HANDLING SHEETS

Filed July 26, 1940 6 Sheets-Sheet 1

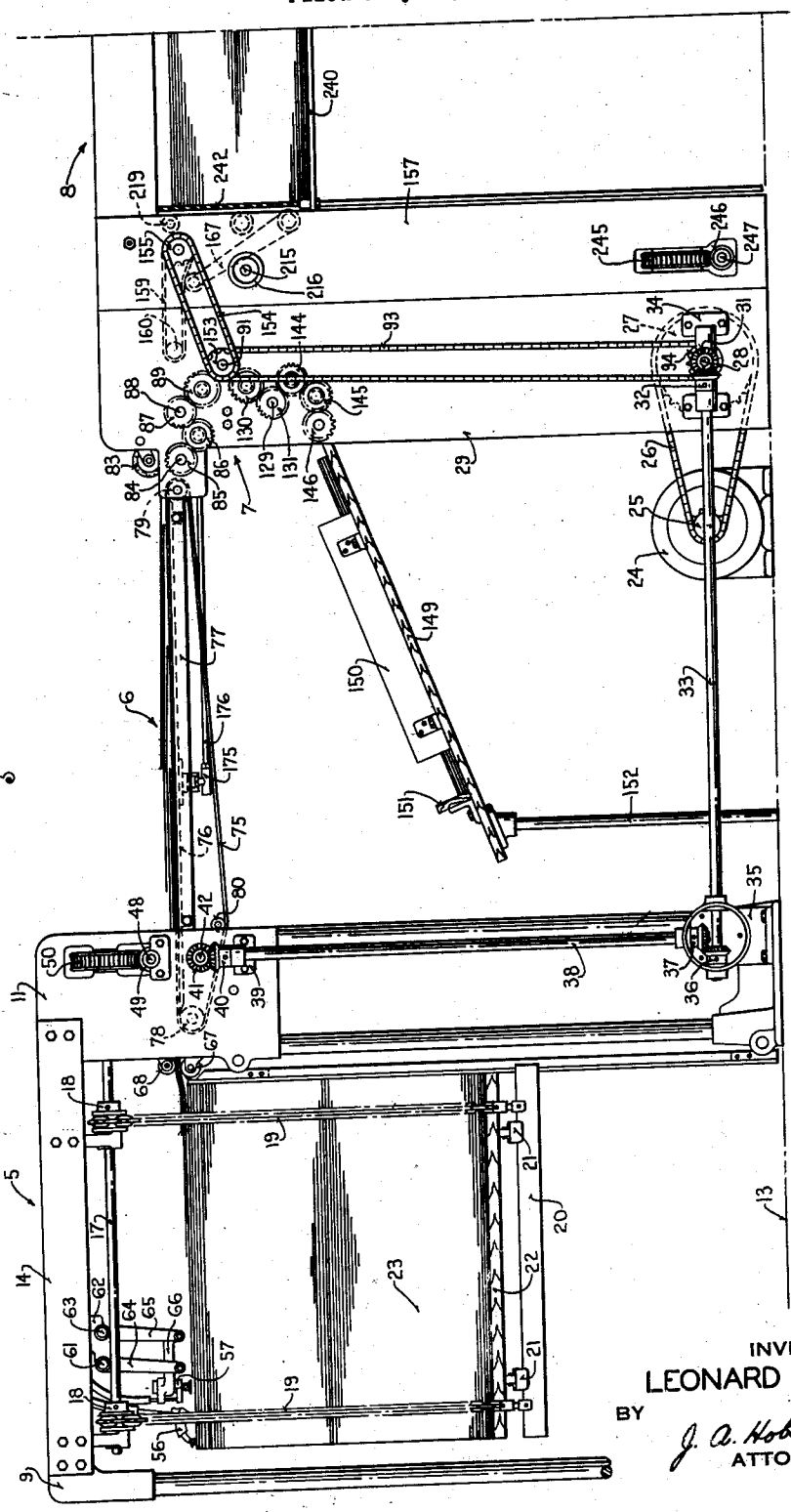


Fig. 1

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METHOD OF AND APPARATUS FOR HANDLING SHEETS

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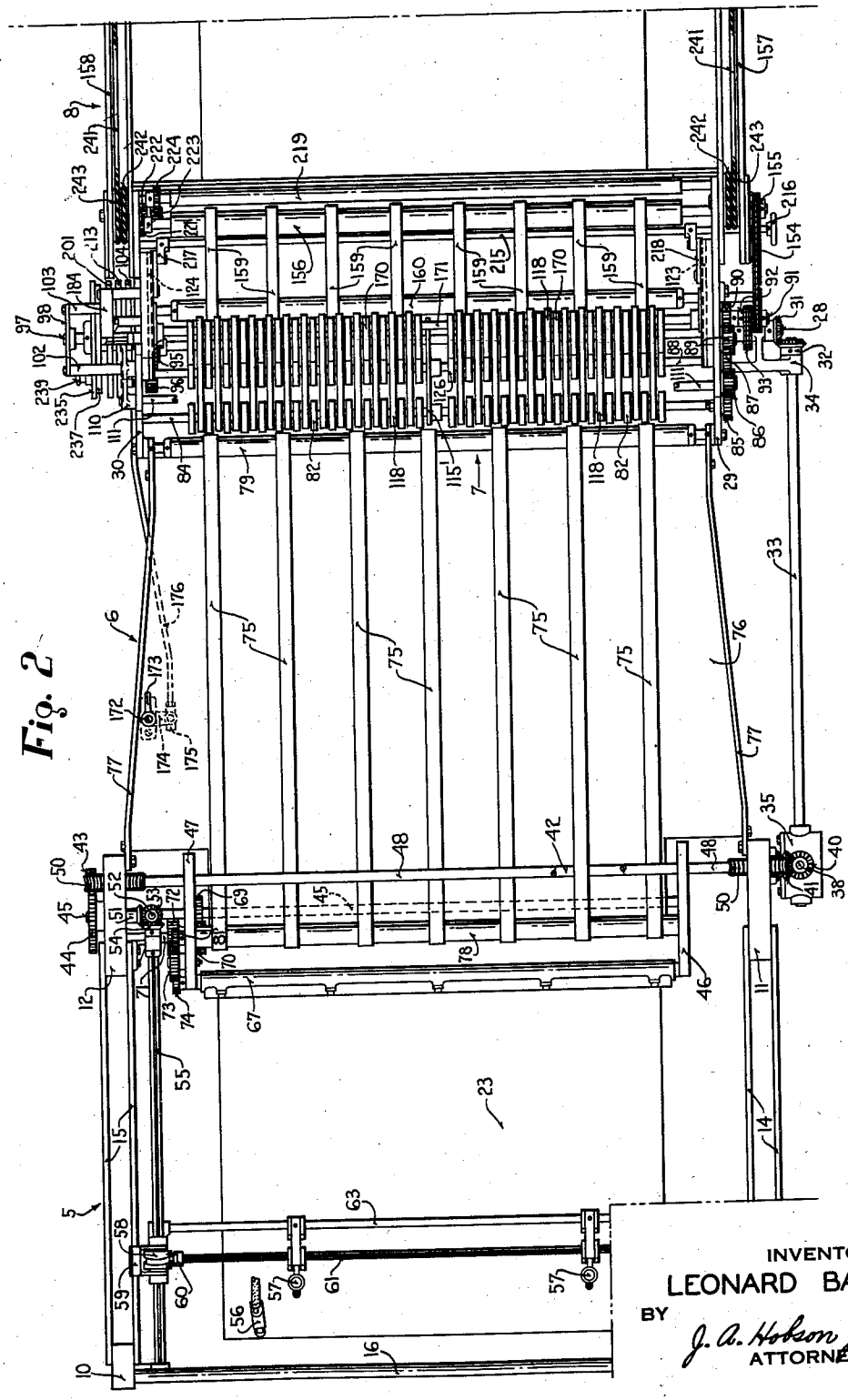


Fig. 2

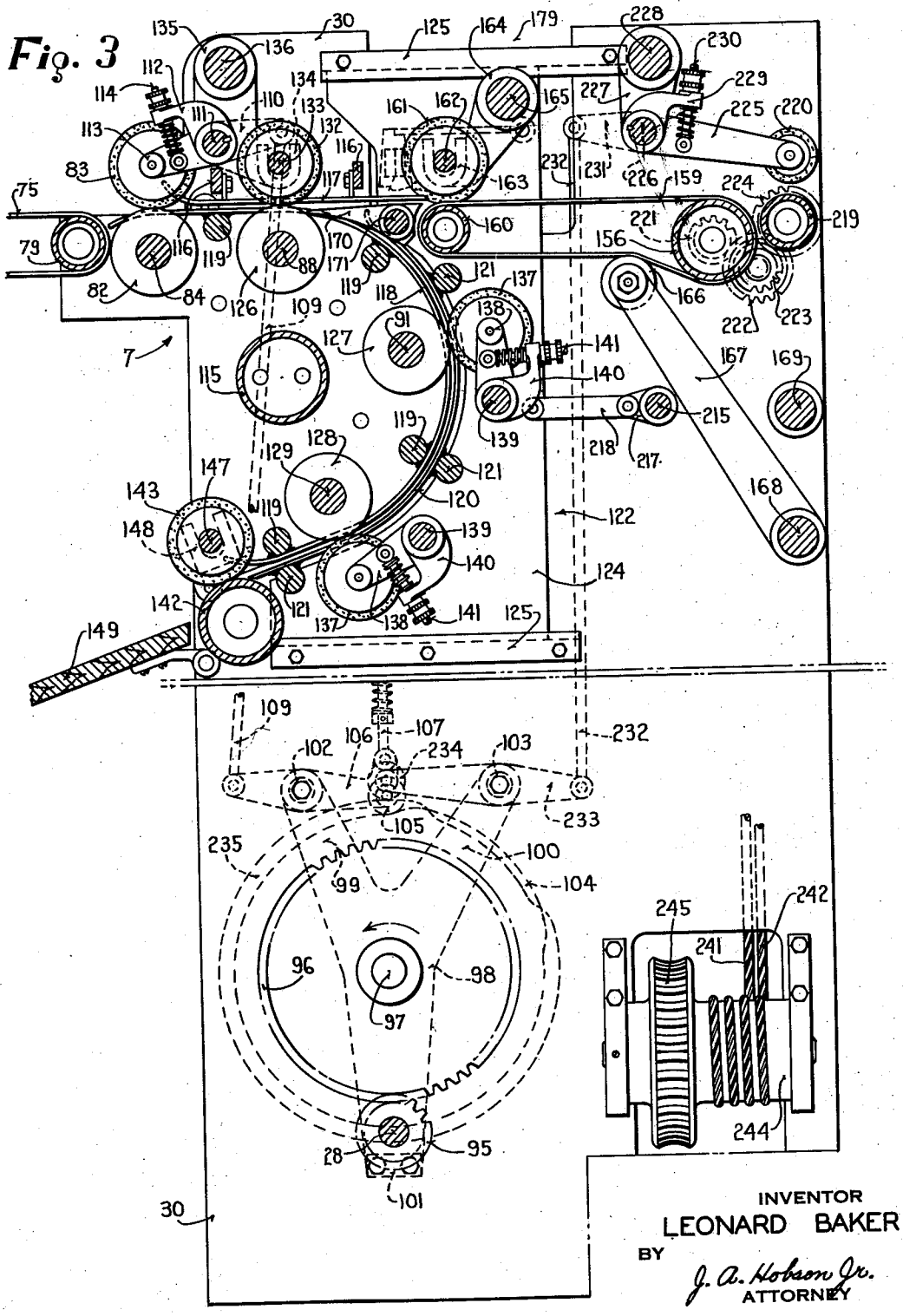
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METHOD OF AND APPARATUS FOR HANDLING SHEETS

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Fig. 3



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Fig. 4

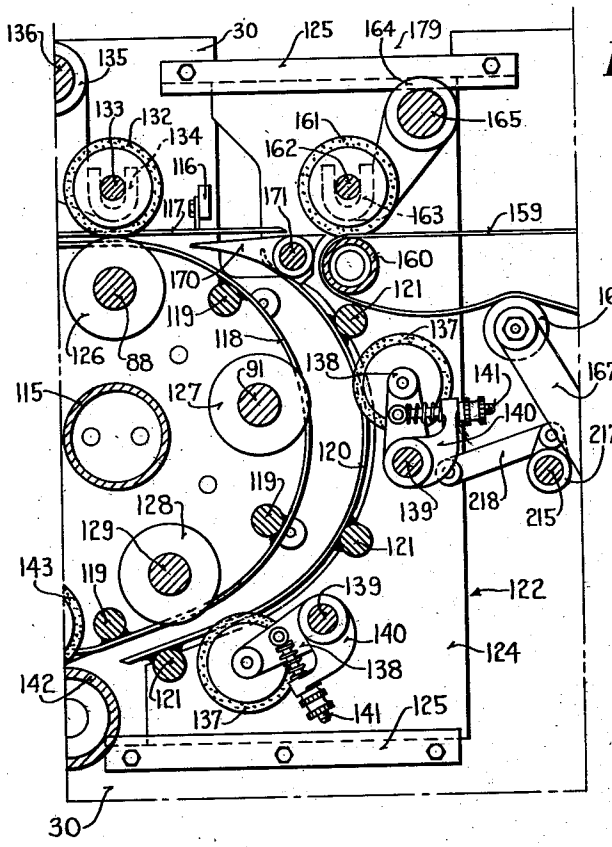


Fig. 5

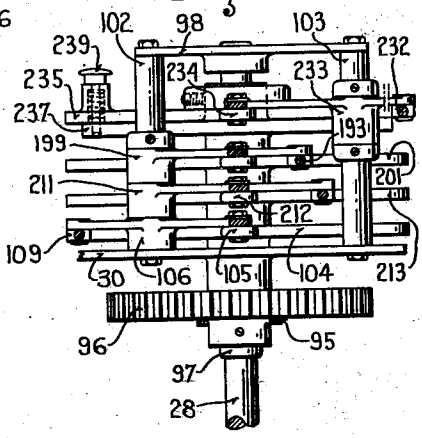


Fig. 6

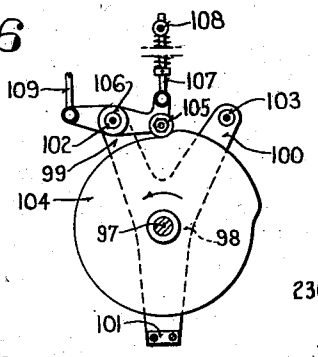


Fig. 8

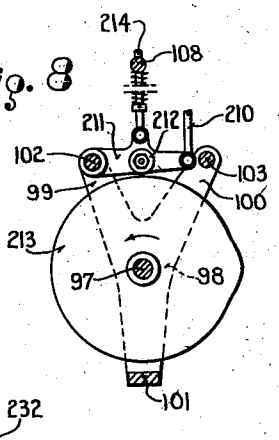
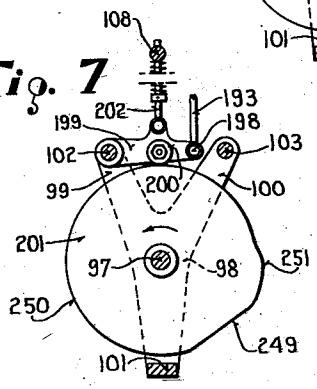


Fig. 7



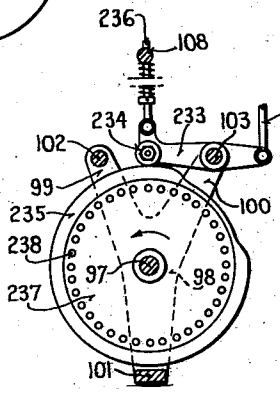


Fig. 9

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Fig. 10

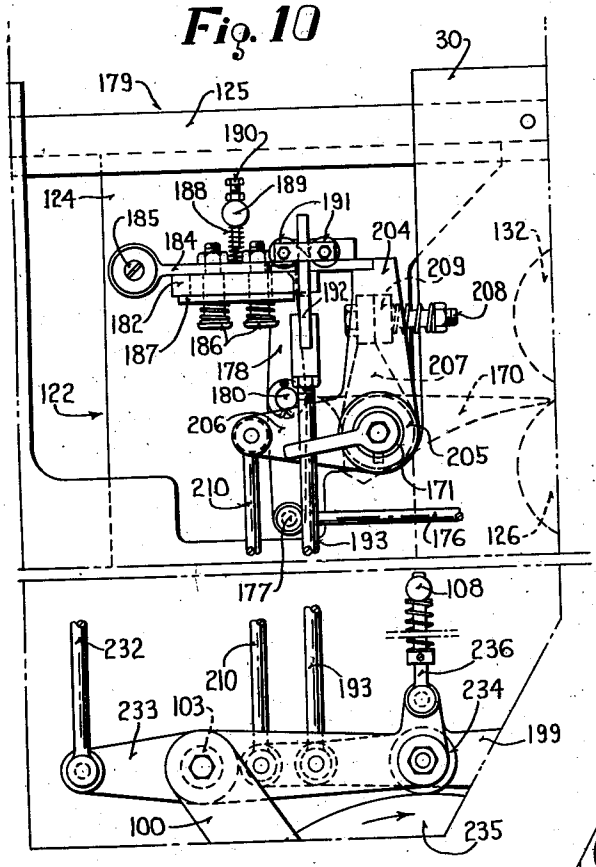


Fig. 14

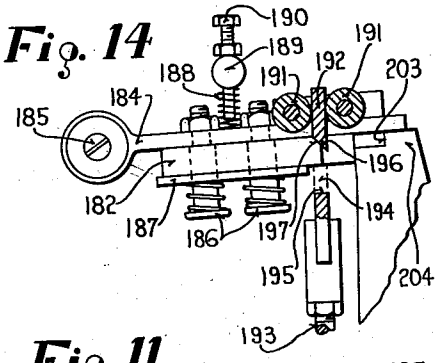


Fig. 11

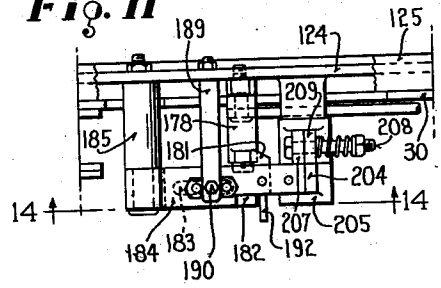


Fig. 13

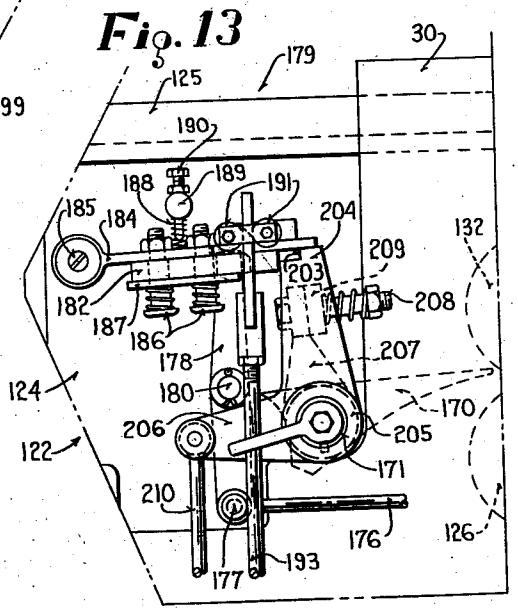
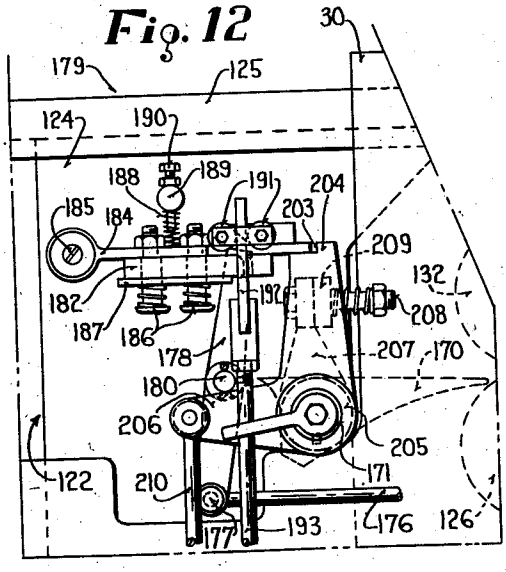


Fig. 12



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METHOD OF AND APPARATUS FOR HANDLING SHEETS

Filed July 26, 1940 6 Sheets-Sheet 6

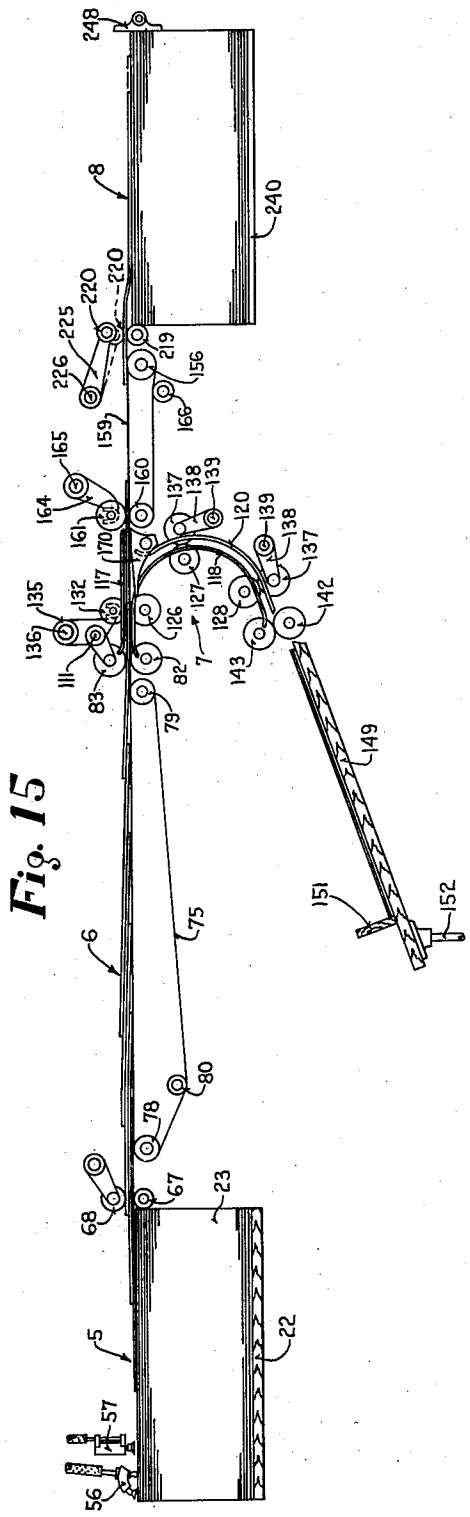


Fig. 15

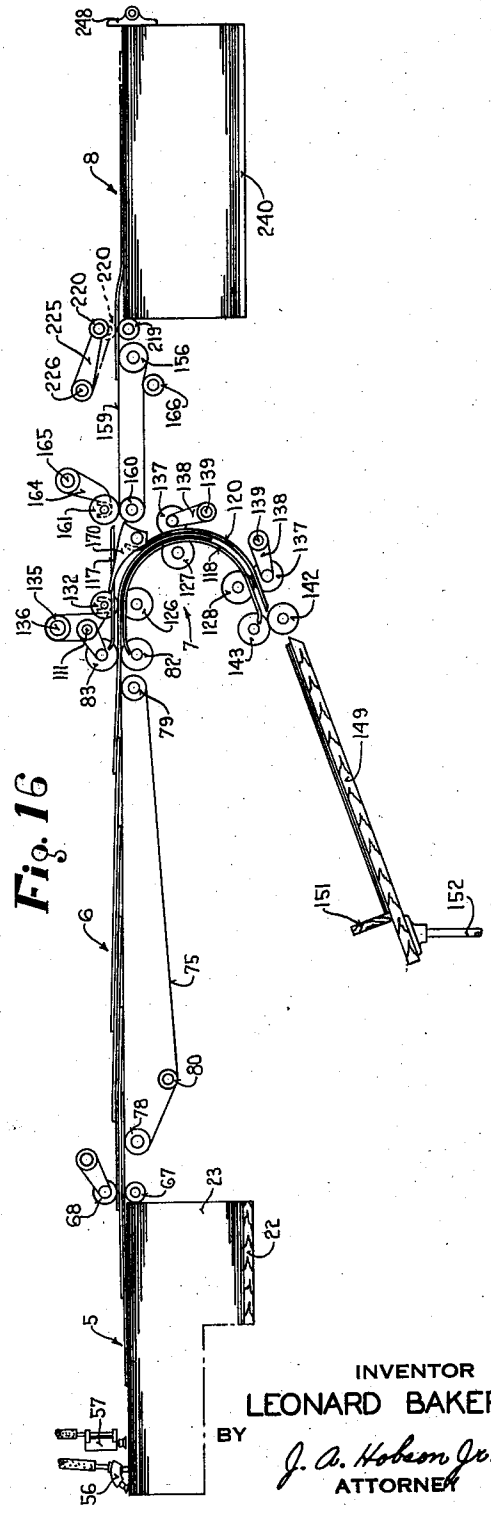


Fig. 16

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Patented Sept. 1, 1942

2,294,649

UNITED STATES PATENT OFFICE

2,294,649

METHOD OF AND APPARATUS FOR HANDLING SHEETS

Leonard Baker, Hillsdale, N. J., assignor to Dexter Folder Company, Pearl River, N. Y., a corporation of New York

Application July 26, 1940, Serial No. 347,628

40 Claims. (Cl. 271—64)

This invention relates to handling sheets of paper, cardboard or other materials, and while capable of general use, is particularly adapted for the feeding and separation of sheets in order to segregate sheets that are good or without defects from imperfect or defective sheets and thus insure that sheets supplied to various customers will meet the required standards for different classes of printed or other products which they supply to the trade.

One object of the present invention is to provide a novel method of and apparatus for handling sheets which enables them to be separated and delivered at different points by selection while in a slowly advanced stream.

Another object of the present invention is to provide an improved method of and apparatus for handling sheets which enables sheets that are good or without defects to be separated and segregated from imperfect or defective sheets with much greater rapidity and accuracy than has heretofore been possible.

Another object of the present invention is to provide apparatus for feeding, separating and segregating good and defective sheets and which, through a novel association of sheet feeding, switching and delivering mechanisms, considerably reduces the space heretofore required for installation of apparatus for similar purposes.

Another object of the present invention is to provide novel operating and control mechanisms for a switch employed to direct sheets selectively to different points of delivery therefor.

Another object of the present invention is to provide novel sheet advancing, guiding and switch means for removing or deflecting imperfect or defective sheets out of the line of travel of sheets to a place of delivery for good or perfect sheets.

These and other objects of the present invention will appear as the following description thereof proceeds, and in order to more clearly understand the invention reference may be had to the accompanying drawings illustrating apparatus constituting one embodiment of said invention and by which the method thereof may be carried out.

In said drawings:

Fig. 1 is a side elevation of said apparatus;

Fig. 2 is a top plan view thereof with parts omitted for purposes of clearer illustration;

Fig. 3 is an enlarged broken or fragmentary vertical longitudinal sectional view of sheet feeding, switching and guiding means included in said apparatus, illustrating parts of said means moved into opposed, operative relation;

Fig. 4 is a view similar to Fig. 3 but showing parts of the sheet feeding, switching and guiding means shifted relatively to provide for removal of jammed or misfed sheets from between the same;

Fig. 5 is an enlarged fragmentary top plan view, partly in section, of fast acting drop roller operating, latch operating, switch operating and slow down roller operating cams and devices actuated thereby;

Figs. 6 to 9 inclusive are side elevations, partly in section, of the fast acting drop roller operating, latch operating, switch operating and slow down drop roller operating cams and devices, respectively;

Fig. 10 is an enlarged broken or fragmentary side elevation of switch mechanism, a latch therefor, and latch operating means, showing a latch carried part in position to prevent operation of the latch by the latch operating means;

Fig. 11 is a top plan view of the latch and associated devices shown in Fig. 10, with parts omitted for purposes of clearer illustration;

Fig. 12 is a view similar to Fig. 10, but showing the latch carried part in position for actuation of the latch by the latch operating means;

Fig. 13 is a view similar to Figs. 10 and 12 but showing the latch and the switch mechanisms in positions occupied thereby when actuated by the latch operating means and the switch operating means respectively;

Fig. 14 is a vertical longitudinal sectional view on the line 14—14 of Fig. 11, showing the latch in a position occupied thereby when about to be reset;

Fig. 15 is a diagrammatic side elevation showing the switch mechanism in the position occupied thereby for advance of good sheets to a place of delivery therefor; and

Fig. 16 is a view similar to Fig. 15 but showing the switch mechanism in a position occupied thereby for deflection of imperfect or defective sheets to another place of delivery therefor.

Broadly stated, the method of the present invention comprises forming and advancing, preferably in a continuous manner and with slow movement, a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, separating the sheets successively and preferably rapidly from the front of the stream, advancing for further handling thereof separated sheets selected for this purpose while in the stream, and moving or de-

flecting out of the line of travel of the separated sheets any sheet or sheets selected for this purpose while in the stream.

Sheets handled in accordance with the above method may be delivered in a manner such that sheets found by inspection in the stream to be good or without defects are advanced successively and, if desired, piled one upon another at one point, while sheets found by inspection in the stream to be imperfect or defective are delivered to a different point and, if desired, there piled one upon another in a separate pile. Further, the separated good sheets may be, and as herein disclosed preferably are, advanced rapidly one after another in spaced non-overlapping relation and are then checked or slowed down successively before assembly of said sheets one upon another in pile formation.

Referring now to the drawings, wherein like reference characters indicate like parts throughout the several views, **5** (Figs. 1, 2, 15 and 16) indicates broadly means for forming, preferably in a continuous manner, a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, and **6** indicates broadly means for advancing, preferably in a slow continuous manner, said stream of lapped sheets. The advancing means **6** provides a field of inspection adjacent which the inspector stands and inspects the sheets to determine which sheets of the stream are good or without defects and which sheets of the stream are imperfect or defective. This is preferably done at the front of the stream of lapped sheets and the imperfect or defective sheets are removed from a forward line of travel of the sheets and preferably from the front of the stream by mechanism indicated broadly at **7**, while the sheets which are good or without defects are advanced from the front of the stream along said line of travel and handled and preferably piled one upon another by mechanism indicated broadly at **8**.

The means **5** for forming the stream of lapped sheets may, for example, comprise a sheet feeder such as disclosed in U. S. Patent No. 2,208,304 granted July 16, 1940, to Edwin W. Goodwin. A detail description of this feeder is unnecessary except to point out generally some of the parts and their manner of operation whereby the stream of lapped sheets is formed. Accordingly, **9** and **10** (Figs. 1 and 2) indicate rear uprights of the feeder frame and **11** and **12** indicate front uprights thereof which, together with the rear uprights, are bolted or otherwise suitably secured to the machine foundation **13** or place of installation of the apparatus. The uprights **9** and **11** are connected together by spaced side members **14** bolted or otherwise suitably secured thereto and the uprights **10** and **12** are connected together by spaced side members **15** bolted or otherwise suitably secured thereto. Uprights **9**, **11** and their side members **14**, and uprights **10**, **12** and their side members **15** constitute side frames that are connected together in any suitable manner by cross members one of which is indicated at **16**.

The feeder has journalled thereon near the top and at opposite sides thereof shafts **17** provided with sheaves **18** in teeth of which are engaged chains **19** the lower ends of which are secured in any suitable manner to longitudinally extending elevator side bars **20**. Mounted upon the side bars **20** are transversely extending elevator bars **21** that support a pile board or elevator **22** upon which is placed a pile of sheets **23**. Bolted or otherwise suitably secured on the machine foundation **13** is an electric motor **24** (Fig. 1) that is supplied with current from any suitable source and controlled by a suitable switch (not shown) employed to start and stop said motor. The motor **24** has fixed on the armature shaft thereof a sprocket **25** around which passes a driven chain **26** that also passes around and drives a sprocket **27** which is fixed on and drives the main drive shaft **28** of the apparatus. This shaft **28** extends transversely of the hereinafter described mechanism **7** and is journalled in any suitable manner in side frames **29** and **30** thereof.

The shaft **28** has fixed thereon and driven thereby a bevel gear **31** which meshes with and drives a similar gear **32** that is fixed on one end of a jack shaft **33** and serves to drive the same. The opposed ends of the shafts **28** and **33** extend through, and are journalled in any suitable manner on, a bracket **34** that is bolted or otherwise suitably secured to the side frame **29**. The end of shaft **33** opposite that carrying the bevel gear **32** extends through, and is journalled in suitable bearings on, a gear housing **35** that is bolted or otherwise suitably secured to the front upright **11** at the bottom thereof. The shaft **33** has fixed thereon and driven thereby within the gear housing **35** a bevel gear **36** which meshes with and drives a similar gear **37** also located within said housing and fixed on the lower end of a vertical driven shaft **38** extending within the housing and journalled thereon in any suitable manner. The upper end of the shaft **38** is journalled in any suitable manner in a bracket **39** that is bolted or otherwise suitably secured to the front upright **11** near the top thereof. Fixed on the upper end of the shaft **38** and driven thereby is a bevel gear **40** which meshes with and drives a similar gear **41** that is fixed on and drives a shaft **42** extending transversely of the feeder and journalled in any suitable manner on the front uprights **11** and **12**.

Fixed on and driven by the shaft **42** is a spur pinion **43** (Fig. 2) which meshes with and drives a large spur gear **44** that is fixed on and drives a shaft **45** (Fig. 2). The shaft **45** extends transversely of the feeder and is journalled in suitable bearings in the front upright **12** and in brackets **46** and **47** spaced inwardly from the front uprights **11** and **12** and secured thereto in any suitable manner. Extending transversely of the feeder above and in spaced relation with the driven shaft **42** is a worm shaft **48** that is journalled in any suitable manner in the front uprights **11** and **12** and in the brackets **46** and **47**. In the normal operation of the feeder the worm shaft **48** is driven intermittently from the shaft **45** by suitable pawl and ratchet mechanism (not shown) such, for example, as disclosed in the application of Edwin W. Goodwin, Serial No. 325,981 filed March 26, 1940, and needing no detail description herein. Fixed on the opposite ends of the intermittently rotated worm shaft **48** and intermittently driven thereby are worms one of which is indicated at **49** in Fig. 1 of the drawings. These worms mesh with and intermittently rotate worm gears **50** (Figs. 1 and 2) that are fixed on and likewise rotate the shafts **17** and the sheaves **18**. Thus, as sheets are separated and forwarded successively from the top of the pile **23** by means to be presently described, the chains **19** and the pile of sheets are raised step by step to keep the top of the pile at proper level

for separation and feeding of the sheets successively therefrom.

Fixed on and driven by the shaft 45 is a bevel gear 51 (Fig. 2) which meshes with and drives a similar gear (not shown) that is fixed on the lower end of a short vertical shaft 52. This shaft 52 is journalled in any suitable manner on the front upright 12 and fixed on the upper end of said shaft is a bevel gear 53 driven thereby. The bevel gear 53 meshes with and drives a similar gear 54 that is fixed on and drives a cam shaft 55 extending longitudinally of the feeder at one side thereof and journalled in suitable bearings on the front upright 12 and the rear upright 10. The sheets are separated one after another from the top of the pile 23 by suction sheet separating devices 56 which preferably are constructed and operated in the manner disclosed in U. S. Patent No. 2,208,304 above referred to and therefore need no detail description herein. It might be pointed out, however, that the sheet separating devices 56 are raised and lowered at suitable intervals by devices (not shown) operated from the cam shaft 55 in the manner disclosed in U. S. Patent No. 2,208,304. Further, vacuum is created and broken in the sheet separating devices 56 at suitable intervals and as disclosed in U. S. Patent No. 2,208,304, so that when said devices are lowered they engage the sheet and when said devices are raised they lift the sheet and release it for forwarding.

The separated sheets are forwarded in succession relative to the top of the pile 23 by suction sheet forwarding devices 57 that act to continuously form a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith as shown in Figs. 1, 15 and 16 of the drawings. These sheet forwarding devices 57 are constructed and operated in substantially the same manner as the sheet forwarding devices disclosed in U. S. Patent No. 2,208,304 and therefore need no detail description herein. It might be pointed out, however, that vacuum is created and broken in the sheet forwarding devices 57 at suitable intervals such that when they are moved rearwardly they engage the topmost separated sheet and when they are moved forwardly they forward said sheet under and in lapped relation with a preceding forwarded sheet and there release said first named forwarded sheet. Forward and rearward movement is imparted to the sheet forwarding devices 57 by a barrel cam 58 (Fig. 2) which is fixed on and driven by the cam shaft 55. The cam 58 is located between the arms of a bracket 59 mounted on one of the side members 15 and through which the cam shaft 55 extends. Extending in the groove of the cam 58 and rocked forwardly and rearwardly thereby is an arm 60 (Fig. 2) which is fixed on and rocks a shaft 61. This rock shaft 61 is journalled in any suitable manner on the bracket 59 and on a bracket 62 (Fig. 1) that is mounted on one of the side members 14. Extending in spaced parallel relation with the rock shaft 61 is a shaft 63 (Fig. 2) secured in any suitable manner upon the brackets 59 and 62. Fixed on and rocked by the shaft 61 are arms 64 (Fig. 1) spaced from and parallel with arms 65 that are loosely mounted on shaft 63. Pivotally connected with the lower ends of arms 64 and 65 are links 66 upon the rearwardly extending ends of which are mounted the suction sheet forwarding devices 57. It will thus appear that upon rocking of arm 60 and shaft 61 by cam 58 and through the connection of arms 64 and 65 by links 66, said arms will be rocked forwardly and rearwardly and the sheet forwarding devices 57 will move rearwardly and forwardly to take and forward the separated sheets successively and form a lapped stream thereof as previously pointed out.

In the formation and advance of the stream of lapped sheets, each sheet is forwarded under and in lapped relation with the preceding sheet between a slowly driven feed roller 67 and cooperating pressure rollers 68 (Figs. 1 and 2). In this manner, each sheet is disposed partially upon the succeeding sheet in overlapping relation therewith and the leading sheet of the stream is uppermost. The feed roller 67 is slowly driven from the shaft 45 by suitable gearing including a spur gear 69 (Fig. 2) that is fixed on and driven by said shaft. This spur gear 69 meshes with and drives a spur gear 70 that is fixed on a short shaft 71 journalled in any suitable manner on the front upright 12 and the bracket 47. Fixed on and driven by the short shaft 71 is a spur gear 72 which meshes with and drives an idler gear 73 that is journalled in any suitable manner on the bracket 47. The idler gear 73 meshes with and drives a spur pinion 74 which is fixed on and slowly drives the feed roller 67. The pressure rollers 68 are mounted in any suitable manner on the feeder frame and cooperate with the feed roller 67 to slowly feed the stream of lapped sheets therebetween and upon the sheet advancing means 6.

The sheet advancing means 6 receives and slowly advances the stream of lapped sheets and is preferably comprised by slow driven tapes 75 that travel over a feed board 76. The feed board 76 has bolted or otherwise suitably secured to the side marginal edges thereof bars 77 which, in turn, are bolted or otherwise suitably secured to the front uprights 11, 12 and the frames 29, 30. The tapes 75 pass around and are slowly driven by a roller 78 rotated slowly at the same rate as that of the slow driven roller 67, and said tapes pass around and drive a front idler roller 79 and also pass under feed board 76 and around tape tightening rollers 80. The front idler roller 79 extends transversely of the mechanism 7 and is journalled in any suitable manner on the side frames 29 and 30 thereof. The tape tightening rollers 80 are of usual construction and mounted in any suitable manner transversely of the feeder upon the front uprights 11 and 12 thereof. The slow driven tape roller 78 which slowly drives the tapes 75 and the front idler roller 79, extends transversely of the feeder and is journalled in any suitable manner on the brackets 46 and 47. This tape roller 78, as previously stated, is driven slowly and at the same speed as that of the slow driven feed roller 67 and, for this purpose, the roller 78 has fixed thereon a spur pinion 81 (Fig. 2) which meshes with and is driven by the idler gear 73.

The slow moving sheet advancing means 6, as previously pointed out, provides a field of inspection in which the stream of lapped sheets moves slowly for observation by an inspector to determine which sheets are good or without defects and which sheets are imperfect or defective. In either case, the sheets are rapidly separated in succession from the stream at the front thereof by means for this purpose to be presently described, and in this manner the slowly moving sheets of the stream are completely exposed in succession at the front of the stream thus en-

abling the inspector to observe each sheet completely at that point. The means for rapidly separating the sheets successively from the front of the stream preferably comprises a series of rapidly driven spaced and transversely aligned rollers 82 and drop rollers 83 cooperating with certain of the rapidly driven feed rollers 82. The feed and drop rollers 82, 83 (Figs. 2, 3, 15 and 16) are mounted in front of the slow moving sheet advancing means 6 to receive the sheets therefrom, and said feed and drop rollers 82, 83 are disposed adjacent the mechanism 7 and are preferably mounted on the side frames 29 and 30 thereof.

The feed rollers 82 are fixed in spaced relation upon and rapidly driven by, a rapidly driven shaft 84 which extends transversely of the mechanism 7 and is journalled in suitable bearings in the side frames 29 and 30 thereof. The shaft 84 has fixed thereon a small spur gear 85 (Fig. 1) which meshes with and is driven by an idler gear 86 journalled in any suitable manner on the side frame 29. The idler gear 86 meshes with and is driven by a small spur gear 87 fixed on a driven shaft 88 extending transversely of the mechanism 7 and journalled in any suitable manner on the side frames 29 and 30 thereof. The gear 87 meshes with and is driven by an idler gear 89 journalled in any suitable manner on the side frame 29. The idler gear 89 meshes with and is driven by a small spur gear 90 (Fig. 2) fixed on a driven shaft 91 extending transversely of the mechanism 7 and journalled in any suitable manner on the side frames 29 and 30 thereof. The shaft 91 has fixed thereon a driving sprocket 92 around which passes a driving chain 93 that also passes around and is driven by a sprocket 94 fixed on the main drive shaft 28. The gears and sprockets of the train between rollers 82 and shaft 28 are relatively small and it will thus appear that the feed rollers 82 are rapidly driven through the described connections therefor with the main drive shaft 28.

The drop rollers 83 are mounted upon and actuated toward and away from the rapidly driven feed rollers 82 by mechanism preferably comprising the following devices. Fixed on the main drive shaft 28 adjacent the inner side of the frame 30 is a spur pinion 95 (Figs. 3 and 5) which meshes with and drives a spur gear 96 that is fixed on and drives a short cam shaft 97. The cam shaft 97 is journalled in suitable bearings in the side frame 30 and a yoke 98 the arms of which are indicated at 99 and 100. The yoke 98 is secured upon the side frame 30 outwardly of and in spaced relation therewith by studs 101, 102 and 103 that are bolted or otherwise suitably secured to the yoke and its arms and to the side frame 30.

Fixed on and driven by the cam shaft 97 is a cam 104 (Figs. 5 and 6) that engages a roller 105 journalled on one end of a lever 106 pivotally mounted on the stud 102. The roller 105 is continuously maintained in engagement with the cam 104 by a vertically disposed spring pressed rod 107 having its lower end pivotally connected with the lever 106 (Figs. 3, 5 and 6) and its upper end extending through a suitable opening in and guided by a stud 108 (Fig. 10) disposed horizontally above the cam shaft 97 in spaced relation and vertical alinement therewith. The stud 108 projects outwardly from and is secured in any suitable manner to the side frame 30. The lever 106 is thus rocked by the cam 104 during rotation thereof to reciprocate a link 109 having one end pivotally connected with said lever and its opposite end pivotally connected with an arm 110. The arm 110 is fixed on and rocks a shaft 111 through reciprocation of the link 109. The shaft 111 extends transversely of the mechanism 7 and is journalled in suitable bearings in the side frames 29 and 30 thereof. Fixed on the rock shaft 111 in spaced relation along the same are arms 112 which are rocked by said shaft. Loosely mounted on shaft 111 are arms 113 upon which are journalled the drop rollers 83 that cooperate with certain of the rapidly driven feed rollers 82. The arms 112, 113 are yieldably and adjustably connected together by small spring pressed rods 114 and it will therefore be apparent that during rocking movement of the arms 112 the drop rollers 83 will be rocked toward and away from the rapidly driven feed rollers 82 with which they cooperate.

The described driving and operating connections between the main drive shaft 28, and the sheet forwarding devices 57, the slow moving tapes 75, and the drop rollers 83 are such that once during each cycle of operation of the machine the drop rollers 83 are raised, the slow moving tapes 75 advance the leading sheet of the stream between said rollers and the rapidly driven feed rollers 82, the drop rollers 83 lower and in cooperation with said feed rollers rapidly separate and advance the leading sheet from the front of the stream, and the sheet forwarding devices 57 add a sheet to the stream at the rear thereof. Rapid removal of sheets one after another from the front of the stream by the feed and drop rollers 82, 83 completely uncovers succeeding slow moving sheets adjacent that point and enables the inspector to observe each slow moving sheet completely while it is still in the stream at the front thereof and before it reaches the feed and drop rollers 82, 83. The inspector can thus separate the good sheets from the imperfect or defective sheets by the mechanism 7 which mechanism is preferably constructed and operated as follows.

The side frames 29, 30, which are bolted or otherwise suitably secured to the machine foundation 13, are connected together by a stay tube 115 (Figs. 3 and 4) that is bolted or otherwise suitably secured to said frames. The stay tube 115 has secured thereto in any suitable manner a center support 115' (Fig. 1) having bearings for the driven shafts 84, 88 and 91 and through which said shafts pass. Extending transversely of the mechanism 7 and bolted or otherwise suitably secured to frames 29, 30 are cross bars 116 (Fig. 3) which carry transversely spaced top rods 117. These top rods 117 are disposed in alinement with the spaces between the rapidly driven feed rollers 82, and said rods are bolted or otherwise suitably secured to the cross bars 116. Disposed under and in spaced relation with the top rods 117 are spaced, transversely alined stationary sheet guides 118 (Figs. 2, 3, 4, 15 and 16) that are curved forwardly, downwardly and rearwardly and have upper, rear extremities extending in the spaces between the rapidly driven feed rollers 82. The stationary sheet guides 118 are welded or otherwise suitably secured in spaced relation on cross rods 119 which extend transversely of the mechanism 7 through slots or openings in the center support 115' and are bolted or otherwise suitably secured on the side frames 29, 30.

Cooperating with the stationary guides 118 and arranged in spaced opposed relation therewith

are transversely spaced and alined movable guides 120 (Figs. 3, 4, 15 and 16) curved in conformity with the stationary guides 118 and having upper ends disposed below and in spaced relation with the top rods 117. The movable guides 120 are welded or otherwise suitably secured in spaced relation on cross rods 121 mounted on a movable carriage indicated broadly at 122. This movable carriage 122 includes side plates 123, 124 to which the cross rods 121 are bolted or otherwise suitably secured adjacent rear edges of said plates that are spaced from and curved in conformity with the guides 120. The carriage 122 and parts carried thereby may be moved toward and away from the stationary guides 118 for purposes hereinafter described, and the side plates 123, 124 of said carriage are accordingly mounted for sliding movement in and along guides 125 that are bolted or otherwise suitably secured to the side frames 29, 30. Extending in the spaces between the stationary guides 118 are a plurality of sets of spaced laterally alined rapidly driven feed rollers 126, 127, 128 disposed one set in advance of the other and arranged in conformity with the curvature of said guides.

The rollers 126 are fixed on the shaft 88 in spaced relation and are driven by said shaft. The rollers 127 are fixed on the shaft 91 in spaced relation and are driven by that shaft. The rollers 128 are fixed on and driven by a shaft 129 extending transversely of the mechanism 7 through the center support 115' and journalled in any suitable manner in said support and on the side frames 29, 30. The gear 90 (Fig. 2) meshes with and drives an idler gear 130 (Fig. 1) journalled in any suitable manner on the side frame 29. Idler gear 130 meshes with and drives a gear 131 fixed on the shaft 129 which shaft and the rollers 128 thereon are thus driven by said idler gear. The rollers 126, 127, 128 are driven at the same rate of speed as that of the rollers 82. Extending in spaces between certain of the top rods 117 are floating pressure rollers 132 (Figs. 3, 4, 15 and 16) which cooperate with certain of the driven set of feed rollers 126. The rollers 132 are fixed on a floating shaft 133 extending transversely of the mechanism 7 and journalled in open bearings 134 of brackets 135 mounted on a tie rod 136 bolted or otherwise suitably secured to the side frames 29, 30. Extending in spaces between certain of the curved movable guides 120 are sets of pressure rollers 137 cooperating with certain of the feed rollers 127 and 128. The rollers 137 are journalled on arms 138 loosely mounted on stay shafts 139 extending transversely of the mechanism 7 and bolted or otherwise suitably secured on the side plates 123, 124 of the carriage 122.

Fixed on the stay shafts 139 are arms 140 yieldably and adjustably connected with the arms 138 through the medium of small spring pressed rods 141 by which the rollers 137 may have their pressure adjusted relative to the driven feed rollers 127 and 128 with which they cooperate. Disposed at the lower or delivery end of the guides 118, 120 is a rapidly driven feed roller 142 and cooperating floating pressure rollers 143. The feed roller 142 extends transversely of the mechanism 7 and is journalled in suitable bearings in the side frames 29, 30 thereof. The gear 131 (Fig. 1) on driven shaft 129 meshes with and drives an idler gear 144 which, in turn, meshes with and drives another idler gear 145. The idler gears 144, 145 are journalled in any suitable manner on the side frame 29 and the idler gear 145 meshes with and drives a gear 146 fixed on the roller 142 which is thus driven by said last named idler gear at the same rate of speed as that of the rollers 82. The pressure rollers 143 are fixed in spaced relation on a floating shaft 147 extending transversely of the mechanism 7 and journalled in open bearings 148 bolted or otherwise suitably secured on the side frames 29, 30. Extending rearwardly from the rollers 142, 143 and disposed under the sheet advancing means 6, is a sheet delivery table 149 having side sheet piling guides 150 and an end sheet piling guide 151. The sheet receiving end of table 149 is secured in any suitable manner to the side frames 29, 30 of mechanism 7 and the opposite end of said table is supported on standards 152 bolted or otherwise suitably secured to said table and resting on the machine foundation 13.

Fixed on the shaft 91 and driven thereby is a sprocket 153 (Fig. 1) which drives a chain 154 that passes around said sprocket. The chain 154 also passes around and drives a sprocket 155 that is fixed on and rapidly drives a roller 156 (Figs. 2, 3, 15 and 16) at the same rate as that of the rapidly driven rollers hereinbefore described and including the rollers 82. The roller 156 extends transversely of the mechanisms 7 and 8. The side frames of mechanism 8 are indicated at 157 and 158 and are connected together in any suitable manner and bolted or otherwise suitably secured to the machine foundation 13. Side frames 157, 158 are disposed outwardly of and overlap side frames 29, 30 and the roller 156 is journalled in any suitable manner in said side frames.

Passing around and driven by the roller 156 are tapes 159 which pass around and drive a roller 160. The roller 160 extends transversely of the mechanism 7 and is journalled in any suitable manner in the side plates 123, 124 of the carriage 122. Cooperating with the roller 160 are floating pressure rollers 161 secured at intervals on a floating shaft 162 extending transversely of the mechanism 7 and journalled in open bearings 163 of brackets 164 mounted on a stay shaft 165 which also extends transversely of the mechanism 7 and is bolted or otherwise suitably secured on the side frames 123, 124 of the carriage 122. The tapes 159 pass over tape tightening rollers 166 journalled on arms 167 adjustably secured on a stay shaft 168 extending transversely of the mechanism 7 and bolted or otherwise suitably secured on the side frames 29, 30 thereof. A second stay shaft 169 extends transversely of the mechanism 7 and is bolted or otherwise suitably secured to the side frames 29, 30 to connect them together.

Interposed between the driven feed rollers 126 and the roller 160 is a switch comprised by transversely alined spaced elements 170 arranged below and in spaced relation with the top rods 117 and extending in the spaces between the stationary guides 118 and the movable guides 120. The switch elements 170 are secured in spaced relation on a rock shaft 171 extending transversely of the mechanism 7 and journalled in any suitable manner on the side plates 123, 124 of carriage 122. Shaft 171 and elements 170 constitute a switch unit movable, as hereinafter described, to different positions. In the position of this unit shown in Figs. 3, 10, 12 and 15, sheets found to be good or without defects and rapidly separated from the front of the stream by the rollers 82, 83 are rapidly advanced one after another in non-overlapping relation between the top rods 117 and upper portions of stationary guides 118,

then over the switch elements 170, then between the rollers 160, 161 and then onto tapes 159 which advance the sheets to the mechanism 8. In the position of the shaft 171 and switch elements 170 shown in Figs. 13 and 16 of the drawings, sheets found by inspection to be imperfect or defective are rapidly separated from the front of the stream by rollers 82, 83 and are likewise advanced under switch elements 170 along and between the stationary and movable guides 118, 120 by the rollers 126, 132, the rollers 127, 128, 137, and the rollers 142, 143 which deliver such sheets upon the table 149 where they are piled one upon another against the guides 150, 151.

The switch unit 170, 171 is operated and controlled by mechanism including the following devices. Journalled in any suitable manner in the feed board 76 at the side thereof adjacent which the inspector stands, is a short vertical shaft 172 (Fig. 2) having fixed thereon above said table a horizontally extending operating handle 173. Fixed on the short vertical shaft 172 below the table 76 is an arm 174 having pivotally connected therewith, as by a ball and socket connection 175, one end of a link 176. The opposite end of the link 176 is pivotally connected, as at 177 (Figs. 10, 12 and 13), with the lower extremity of a vertically disposed lever 178 located opposite an opening 179 in the side frame 30. The lever 178 is pivoted intermediate its opposite ends, as at 180, on the side plate 124 of carriage 122. The upper extremity of lever 178 is disposed adjacent a lug 181 (Fig. 11) extending laterally from one side and the front of a block 182 provided therein with an elongated vertical slot 183. This block 182 is slidably mounted on a latch 184 at the underside thereof, and said latch is pivotally mounted on a pin 185 that extends outwardly through the opening 179 and is bolted or otherwise suitably secured on the side plate 124 of carriage 122. Spring pressed bolts 186 extend through the slot 183 and through suitable openings in the latch 184 and a washer or plate 187, and said bolts serve to hold the block 182 on the latch 184 and provide for sliding movement of said block in opposite directions along said latch and between the latter and the plate or washer 187. A spring 188 engages the latch 184 above the same and normally tends to press said latch downwardly in the full line position thereof shown in Fig. 10 of the drawings. The spring 188 engages a pin 189 projecting outwardly through the opening 179 and secured in any suitable manner on the side plate 124 of carriage 122. The spring 188 is held in position by a screw 190 extending therein and which is threaded in a suitable opening formed in the pin 189.

Journalled in any suitable manner on the latch 184 near the top and front thereof are spaced, transversely extending rollers 191 for guiding latch controlling and operating mechanism including a plate or feeler 192 that is reciprocated between and guided by the rollers 191. The plate or feeler 192 is secured in any suitable manner on the upper end of a reciprocated rod 193 and said plate or feeler has formed in one side thereof a slot 194 (Fig. 14) the lower end of which provides a shoulder 195 and the upper end of which is shaped to provide a cam face 196. The forward end of the latch 184 is reduced and extends past the plate or feeler 192 at one side thereof. The forward end of the block 182, however, while reduced adjacent the lug 181 projects laterally from the reduced end of the latch 184 and in alinement with the slot 194 of the plate or feeler 192. The plate or feeler 192 is reciprocated continuously by the rod 193 and normally moves up and down past the block 182 and the latch 184 without lifting said latch. If, however, lever 178 is swung clockwise as viewed in Fig. 10 of the drawings, it will engage lug 181 of the block 182 and move said block forwardly on the latch into the slot 194 of the plate of feeler 192. Thereupon on upward movement of the plate or feeler 192 the shoulder 195 thereof will engage the block 182 and lift the latch 184. On downward movement of the plate or feeler 192 cam face 196 will engage a similar cam face 197 on block 182 and move said block rearwardly on latch 184 and out of the slot 194 of the plate or feeler 192.

The reciprocated rod 193 has its lower end pivotally connected, as at 198, with one extremity of a lever 199 (Figs. 5 and 7) pivoted on the pin 102 of the yoke 98. Lever 199 has journalled thereon a roller 200 that is continuously maintained in engagement with a cam 201 by a vertically disposed spring pressed rod 202 having its lower end pivotally connected with said lever and its upper end guided in a suitable opening formed in the pin 108. The cam 201 is fixed on the cam shaft 97 and driven thereby. It will thus appear that the rod 193 and the plate or feeler 192 is reciprocated by the cam 201 through the described operating connections therebetween.

The forward end of the latch 184 is normally engaged with the shoulder 203 of one arm 204 (Figs. 10 and 14) of a bell crank 205 the other arm of which is indicated at 206. The bell crank 205 is loosely mounted on the shaft 171 that carries the switch elements 170. The shaft 171 extends outwardly through the opening 179 for the mounting adjacent thereto of the bell crank 205 on said shaft. Fixed on the shaft 171 adjacent the bell crank 205 is an arm 207 yieldably connected, as by spring pressed bolt 208, with the arm 204 of said bell crank. The arm 204 is provided with a laterally extending lug 209 (Figs. 10 and 11) and the spring pressed bolt 208 passes through suitable openings in said lug and the arm 207.

The bell crank arm 206 has pivotally connected therewith one end of a rod 210 the opposite end of which is pivotally connected with a lever 211 (Figs. 5 and 8) pivotally mounted on the pin 102 of yoke 98. Lever 211 has journalled thereon a roller 212 normally maintained out of engagement with the low part of a cam 213 by engagement of latch 184 with bell crank arm 204. A suitably disposed spring pressed rod 214 has its lower end pivotally connected with lever 211 and its upper end guided in a suitable opening in the pin 108. The cam 213 is fixed on and driven by the cam shaft 97 and upon disengagement of the latch 184 from bell crank arm 204 the cam 213 will, through the described operating connections between the same and the switch elements 170, rock said elements out of and then back into the full line positions thereof shown in Figs. 3 and 15 of the drawings.

Under normal operating conditions, the carriage 122 and all parts carried thereby occupy the full line positions thereof shown in Figs. 3 and 10 of the drawings. If, however, a sheet or sheets become jammed between the stationary and movable guides 118 and 120 or in the vicinity of the switch elements 170, the carriage 122 and parts carried thereby may be moved to the full line positions thereof shown in Fig. 4 of the drawings, thus facilitating ready removal of the

jammed sheet or sheets. The carriage 122 and parts carried thereby may be moved into and out of the normal position for operation of said parts by any suitable means for this purpose but as herein shown said means is preferably comprised by the following devices. Extending transversely of the mechanisms 7 and 8 and journalled in any suitable manner in frame 30 and frames 29 and 157 is a shaft 215 (Figs. 1 and 2) having fixed thereon exteriorly of the frame 157 a hand wheel 216. This shaft 215 has fixed thereon interiorly of the frames 29 and 30 arms 217 (Figs. 2, 3 and 4) having pivotally connected therewith corresponding ends of links 218. The opposite ends of the links 218 are pivotally connected with the side plates 123, 124 of the carriage 122 and it will appear that by turning the hand wheel 216 in opposite directions, the carriage 122 and all parts carried thereby may be moved in one direction along the guides 125 to the full line position of the carriage and said parts shown in Fig. 4 of the drawings or in the opposite direction to the full line position of the carriage and said parts shown in Fig. 3 of the drawings.

The sheets found by inspection to be good or without defects are rapidly separated and advanced in spaced non-overlapping relation over the switch elements 170 by the feed and drop rollers 82, 83, then between the feed and pressure rollers 126, 132, and then between the tape roller 160 and pressure rollers 161 whereupon advance of said sheets is continued, in the manner stated, by the rapidly driven tapes 159. It is desirable to check or slow down the speed of the sheets advanced by the tapes 159 prior to delivery and piling of the same in mechanism 8 and for this purpose said sheets are delivered one after another between a slow driven roller 219 and cooperating drop rollers 220. The roller 219 extends transversely of the mechanism 7 and is journalled in any suitable manner in the side frames 29 and 30 thereof. Roller 219 is slowly driven from the fast driven tape driving roller 156 by a small pinion 221 (Figs. 2 and 3) fixed on and driven by said last named roller. This pinion 221 meshes with and drives an idler gear 222 which has compounded therewith and rotated thereby a somewhat smaller idler gear 223. The idler gears 222, 223 are journalled in any siutable manner on the side frame 30 and the idler gear 223 meshes with and slowly drives a somewhat larger gear 224 that is fixed on and slowly drives the roller 219.

The drop rollers 220 are journalled on arms 225 (Fig. 3) loosely mounted on a rock shaft 226 extending transversely of the mechanisms 7 and 8. This rock shaft 226 is journalled in any suitable manner on side frame 29 and side frames 30 and 158 and projects outwardly from the latter. The rock shaft 226 also extends through and is journalled in a center support 227 mounted on a tie rod 228 extending transversely of the mechanism 7 and bolted or otherwise suitably secured to the side frames 29 and 30 thereof.

Fixed on the rock shaft 226 are arms 229 yieldably and adjustably connected with the arms 225 by small spring pressed rods 230 through the medium of which the pressure of drop rollers 220 may be adjusted relative to the slow driven roller 219. Arms 225 are thus connected with arms 229 to rock with the latter and the rock shaft 226. Fixed on the outwardly projecting end of the rock shaft 226 is an arm 231 having pivotally connected therewith the upper end of a vertically disposed link 232. The lower end of link 232 is pivotally connected with a lever 233 (Figs. 3, 5 and 9) pivotally mounted intermediate its opposite ends on the pin 103 of yoke 98. Lever 233 has journalled thereon a roller 234 that is continuously maintained in engagement with a cam 235 by a vertically disposed spring pressed rod 236 having its lower end pivotally connected with said lever and its upper end guided in a suitable opening in the pin 108.

The cam 235 is loosely mounted on the hub of an index disk 237 fixed on and driven by the cam shaft 97 and provided with a circular series of spaced openings 238. The cam 235 has mounted thereon a spring pressed pin 239 engaging the index disk 237 through one of the openings 238, and it will thus appear that said cam is driven by said disk through the connection therebetween provided by the spring pressed pin 239. The driven cam 235, through the described operating connections between the same and the arms 225, raises and lowers the drop rollers 220 once during each cycle of operation of the apparatus, and, accordingly, sheets advanced by the rapidly driven tapes 159 are fed thereby one after another between the slow driven roller 219 and the drop rollers 220 and are checked or slowed down thereby in succession before delivery and piling of the sheets one upon another in the mechanism 8. The timing of the drop rollers 220 relative to advance of the sheets is such that said rollers are raised above each sheet until the same has partially entered the mechanism 8, whereupon said rollers are lowered and engage the rear portion of the sheet with the slow driven roller 219 thereby checking or slowing down the sheet. The rollers 219, 220 thus prevent rebound of the sheets in the mechanism 8, and provide for successive sheets, checked or slowed down in the manner stated, to be piled evenly one upon another in the mechanism 8. The leading edges of sheets, regardless of the lengths thereof, will always reach the rollers 219, 220 at the same predetermined, successive intervals, but this is not true of the trailing or rear edges of sheets of different lengths. Accordingly, and since the rollers 219, 220 act on rear portions of the sheets, the sheet engaging action of the drop rollers 220 may be advanced or retarded in accordance with decreased or increased length of the sheets so that the rollers 220 will drop into engagement with rear portions of the sheets on slow driven rollers 219 regardless of the length of said sheets. This is accomplished by disengaging pin 239 from disk 237, rotating cam 235 about the hub of said disk to set the cam in accordance with the length of the particular sheets to be handled, and engaging the pin in the proper opening of the series 238 on said disk. In this manner, the pin 239 may be engaged in any of the series of openings in disk 237 according to various lengths of sheets handled in the apparatus.

The checked or slowed down sheets, as before stated, are delivered one upon another and piled in the mechanism 8. This mechanism, as herein shown, comprises a delivery or layboy constructed and operated along the lines of deliveries and layboys known in the art and needing no detail description herein. It might be pointed out, however, that the delivery or layboy herein shown and comprising mechanism 8 includes, in addition to the side frames 157 and 158, a pile board or elevator 240 having connected therewith cables 241 which pass over sheaves (not shown) at the forward end and top of the mechanism 8. The pile board or support also has connected

herewith cables 242 and these cables, as well s the cables 241, pass over sheaves 243 journalled t the top and rear of the mechanism 8 in any uitable manner. Cables 241, 242 extend downardly and are secured to and wound upon lrums such as indicated at 244 (Fig. 3) and vhich are located at opposite sides and near the ottom of mechanism 8. The drums 244 have ecured thereto or formed integrally therewith vorm gears such as indicated at 245 and these ears and the drums are journalled in any suitable manner on the side frames 29, 30.

Worm gears 245 mesh with and are driven by worms such as indicated at 246 (Fig. 1) and these worms are fixed on and driven by a worm shaft 247 extending transversely of the apparatus and journalled in any suitable manner on the side frames 29 and 30. The sheets, slowed down by the rollers 219, 220 and delivered therefrom into the mechanism 8, engage suitable guides such as indicated at 248 (Figs. 15 and 16) and are piled one upon another on the pile board or elevator 240. As the height of the pile on the board or elevator 240 increases, the worm shaft 247 is operated from time to time by suitable means (not shown) to drive worm gears 245 and drums 244 so that cables 241, 242 are unwound from said drums and lower the pile board or elevator 240 and the pile of sheets thereon.

The operation of the entire apparatus will be clear from the foregoing description and may be briefly summarized as follows. The sheets of pile 23 are separated successively from the top thereof by the sheet separating devices 56 and formed into a stream advanced forwardly over the pile by the sheet forwarding devices 57 in such manner that each sheet is partially disposed upon and overlaps the succeeding sheet. The stream of lapped sheets is advanced slowly over the feed board 76 by the slow driven tapes 75. The inspector, standing adjacent the feed board 76 at the side thereof on which handle 173 is mounted, inspects the slowly moving sheets to determine which are good or without defects and which are imperfect or defective. Upon observing an imperfect or defective sheet the inspector turns the handle 173 in a counterclockwise direction (Fig. 2) before that sheet reaches the rapidly driven feed rollers 82 and cooperating drop rollers 83. Thereupon, at a predetermined time and in timed relation with the operation of the sheet forwarding devices 57 and the drop rollers 83, the switch elements 170 are raised and deflect the imperfect or defective sheets between guides 118, 120. This is accomplished in the following manner. When the handle 173 is turned in a counterclockwise direction (Fig. 2) by the inspector, the rod 176 is actuated to swing arm 178 so that it engages the lug 181 of block 182 and slides said block forwardly on latch 184 into the slot 194 of the reciprocating plate or feeler 192, as shown in Fig. 12 of the drawings.

Thereafter, upon upward movement of the plate or feeler 192 shoulder 195 thereof will engage block 182 and lift latch 184 out of engagement with bell crank arm 204, as shown in Fig. 13 of the drawings. Shortly in advance of the upward movement of the plate or feeler 192, bell crank 205 is rocked slightly by the high part of cam 213 (Fig. 8) to move the shoulder 203 of bell crank arm 204 away from the end of latch 184. This frees the latch from said shoulder and enables the plate or feeler 192 to freely lift the latch. When the latch 184 is lifted as aforesaid, the spring pressed rod 214 (Fig. 8) swings the lever 211 downwardly, the high part of cam 213 then having passed roller 212 which now follows the low part of said cam enabling rod 214 to swing lever 211 downwardly as aforesaid. When lever 211 is swung downwardly, rod 210 is moved downwardly and, through its connection with the switch elements 170, swings said switch elements up into the positions thereof shown in Figs. 13 and 16 of the drawings. In the meantime, cam 104 (Fig. 6) through the operating connections between the same and the drop rollers 83 has lowered said rollers into engagement with the inspected, defective sheet on the rapidly driven rollers 82 and the latter, together with the rollers 126, 132 feed said sheet under the switch elements 170 and along the guides 118, 120. Rollers 127, 128, 137, 142 and 143 then feed the inspected, defective sheet along and out of the guides 118, 120 onto the table 149 between the sheet piling guides 150 and against the sheet piling guide 151.

After turning the handle 173 in a counterclockwise direction (Fig. 2) to deflect or switch out a defective sheet, the inspector immediately releases the handle and said handle and the parts connected therewith are returned to their original positions by downward movement of the plate or feeler 192 produced by the spring pressed rod 202 and a dwell 249 on cam 201. This downward movement of the plate or feeler 192 causes the cam face 196 thereof to engage the cam face 197 of block 182 and slide said block rearwardly on the latch 184 and out of the slot 194 of the plate or feeler 192. The lug 181 on block 182 thus moves lever 178 and the parts connected therewith, including handle 173, back to their original positions. The dwell 250 of cam 201, in conjunction with the spring pressed rod 202, then slightly raises the plate or feeler 192 to bring the slot 194 of the plate or feeler 192 opposite the block 182 so that successive imperfect or defective sheets may be switched out of the line of travel of sheets to mechanism 8 by successive operations of handle 173, block 182, and switch elements 170.

After the switch elements 170 have been raised and the imperfect sheet has been switched out, the spring pressed rod 214 in conjunction with the high part of cam 213 lowers the switch elements 170 to the position thereof shown in Fig. 15 through the described connections between the lever 211 and the rock shaft 171. The bell crank 205, which previously has been rocked under the latch 184 upon lifting thereof, as shown in Fig. 13, is now rocked in the opposite direction and the latch 184, with the aid of spring 188, is reengaged with bell crank arm 204 behind the shoulder 203 thereof (Fig. 10). The inspected sheets found to be good or without defects are, as previously described, separated and advanced from the front of the stream rapidly and in non-overlapping relation by the rapidly driven feed rollers 82 and cooperating drop rollers 83. These good sheets pass over the switch elements 170, then on to the rapidly driven conveyor tapes 159, and then between the slowly driven roller 219 and drop rollers 220 which check or slow down the good sheets successively at the rear thereof whereupon said sheets are delivered into the mechanism 8 and piled one upon another on the board or elevator 240 thereof which is lowered at suitable intervals as previously described.

As long as successive slow moving sheets of the stream are found to be good or without defects,

the switch elements 170 remain in the positions thereof shown in Fig. 3 and 15 of the drawings and said sheets are separated, advanced, delivered, and piled as previously described. When a defective sheet is again found in the slowly moving stream, however, the inspector operates the handle 173 and said sheet is switched out as previously described. Successive defective sheets may, through the novel construction of the latch 184 and its associated parts and operating mechanisms, be successively switched out and piled one upon another on table 149 by successive operations of the handle 173 and the switch elements 170. In this way, the sheets which are good or without defects and the imperfect or defective sheets may be handled and separately segregated and piled, the inspecting being accomplished and conveniently due to slow motion of the sheets while being observed, and the production being far greater than heretofore possible by reason of the slow stream feeding of the sheets, the rapid separation of the inspected sheets therefrom, and rapid handling and segregation of the good and defective sheets.

While one mechanical embodiment of the present invention, and a description of the method of said invention have been disclosed herein with more or less particularlry, it is to be expressly understood that the invention is not limited to said embodiment or to said description or otherwise than by the terms of the appended claims.

What I claim is:

1. The method of handling sheets, which comprises forming and advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, inspecting the sheets successively while they are in the stream to determine which sheets are good or without defects and which sheets are imperfect or defective, separating the sheets successively from the front of the stream, advancing for further handling separated sheets found by inspection to be good or without defects, and moving out of the line of travel of the separated sheets those found by inspection to be imperfect or defective.

2. The method of handling sheets, which comprises forming and slowly advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, rapidly separating the sheets successively from the front of the stream to completely expose said sheets one after another while in the stream at the front thereof, inspecting the sheets successively each while slowly advanced and completely exposed in the stream at the front thereof to determine which sheets are good or without defects and which sheets are imperfect or defective, advancing for further handling separated sheets found to be good or without defects, and moving out of the line of travel of the separated sheets those found by inspection to be imperfect or defective.

3. The method of handling sheets, which comprises forming and slowly advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, inspecting the sheets successively while they are in the stream to determine which sheets are good or without defects and which sheets are imperfect or defective, rapidly separating the sheets successively from the front of the stream, advancing successively and assembling in pile formation the separated sheets found by inspection to be good or without defects, and moving out of the line of travel of the separated sheets those found by inspection to be imperfect or defective.

4. The method of handling sheets, which comprises forming and slowly advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, inspecting the sheets successively while they are in the stream to determine which sheets are good or without defects and which sheets are imperfect or defective, rapidly separating the sheets successively from the front of the stream, moving out of the line of travel of the separated sheets those found by inspection to be imperfect or defective, rapidly advancing successively in unlapped relation separated sheets found by inspection to be good or without defects, and slowing down said last named sheets successively and piling them one upon another.

5. The method of handling sheets, which comprises forming and advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, rapidly separating the sheets successively from the front of the stream, advancing successively for further handling thereof separated sheets selected for this purpose while in the stream, and moving out of the line of travel of the separated sheets certain sheets selected for this purpose while in said stream.

6. The method of handling sheets, which comprises forming and slowly advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, rapidly separating the sheets successively from the front of the stream to completely expose said sheets one after another while in the stream at the front thereof, moving out of the line of travel of the separated sheets certain sheets selected for this purpose while completely exposed in the stream at the front thereof, and advancing successively for further handling thereof separated sheets selected for this purpose while completely exposed in said stream at the front thereof.

7. The method of handling sheets, which comprises forming and slowly advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, rapidly separating the sheets successively from the front of the stream, moving out of the line of travel of the separated sheets at a predetermined time or times any sheet or sheets selected for this purpose while in the stream, and advancing for further handling thereof separated sheets selected for this purpose while in said stream.

8. The method of handling sheets, which comprises forming and slowly and continuously advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, rapidly separating the sheets one after another from the front of the stream to completely expose the sheets successively at the front of said stream, inspecting the sheets successively each while slowly moving and completely exposed at the front of the stream to determine which sheets are good or without defects and which sheets are imperfect or defective, deflecting out of the line of travel of the separated sheets any sheet or sheets found by inspection to be imperfect or defective, rapidly advancing successively in unlapped relation sheets found by inspection to be good or without defects, and slowing down said last named

sheets successively and piling them one upon another.

9. The method of handling sheets, which comprises forming and advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, separating the sheets successively from the front of the stream and in timed relation with formation and advance thereof, inspecting the sheets successively while they are in the stream to determine which sheets are good or without defects and which sheets are imperfect or defective, removing from the line of travel of the separated sheets and in timed relation with formation and advance of the stream and separation of the sheets therefrom any sheet or sheets found by inspection to be imperfect or defective, and advancing for further handling thereof separated sheets found by inspection to be good or without defects.

10. The method of handling sheets, which comprises continuously forming and slowly and continuously advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, rapidly and continuously separating the sheets successively from the front of the stream and in timed relation with formation and advance thereof to completely expose said sheets one after another while they are in the stream and at the front thereof, inspecting the sheets successively each while slowly advanced and completely exposed in the stream at the front thereof to determine which sheets are good or without defects and which are imperfect or defective, rapidly deflecting from the front of the stream and out of the line of travel of the separated sheets in timed relation with formation and advance of the stream and separation of the sheets therefrom sheets found by inspection to be imperfect or defective, piling the deflected imperfect or defective sheets one upon another, rapidly advancing successively in unlapped relation separated sheets found by inspection to be good or without defects, and slowing down said last named sheets successively and piling them one upon another separately from said deflected imperfect or defective sheets.

11. In apparatus of the type having means for forming and advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith and means for separating the sheets successively from the front of the stream, the combination of mechanism for deflecting out of the line of travel of the separated sheets any sheet or sheets selected for this purpose while in the stream, and means for advancing successively for further handling thereof separated sheets selected for this purpose while in said stream.

12. In apparatus of the class described, the combination of means for forming and advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, means for separating the sheets successively from the front of the stream, switch means for deflecting out of the line of travel of the separated sheets any sheet or sheets found by inspection in the stream to be imperfect or defective, and means for advancing successively for further handling thereof sheets separated from the front of the stream and found by inspection in said stream to be good or without defects.

13. In apparatus of the class described, the combination of means for forming and advancing a stream of lapped sheet seach partially disposed upon the succeeding sheet in overlapping relation therewith, means for separating the sheets successively from the front of the stream, mechanism for deflecting out of the line of travel of the separated sheets those found by inspection in the stream to be imperfect or defective, means arranged to receive the deflected imperfective or defective sheets one upon another in pile formation, means for advancing successively separated sheets found by inspection in said stream to be good or without defects, and sheet piling or delivery means arranged to receive said last named sheets and in which the same are piled one upon another separately from said deflected imperfect or defective sheets.

14. In apparatus of the type having means for forming and slowly advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith and means for rapidly separating the sheets one after another from the front of the stream to completely expose the sheets successively at the front of said stream, the combination of mechanism for deflecting out of the line of travel of the separated sheets any sheet or sheets selected for this purpose while completely exposed and in the front of the slowly advanced stream, and means for advancing successively for further handling thereof separated sheets selected for this purpose while completely exposed and in the front of said slowly advanced stream.

15. In apparatus of the class described, means for forming and slowly advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, means for rapidly separating the sheets one after another from the front of the stream to completely expose the sheets succcessively in the stream at the front thereof, mechanism for deflecting out of the line of travel of the separated sheets any sheet or sheets found by inspection in the front of the slowly advanced stream to be imperfect or defective, means for rapidly advancing successively the separated sheets found by inspection in the front of said slowly advanced stream to be good or without defects, and means for slowing down said last named sheets successively, and delivering them one upon another in pile formation.

16. In apparatus of the class described, the combination of means for forming and slowly advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, means for rapidly separating the sheets one after another from the front of the stream to completely expose the sheets successively in the front of said stream for inspection of the sheets therein, mechanism for deflecting out of the line of travel of the separated sheets any sheet or sheets found to be imperfect or defective by inspection while slowly moving and in the front of the stream, and means for rapidly advancing successively in unlapped relation for further handling thereof separated sheets found to be good or without defects by inspection while slowly moving and in the front of said stream.

17. In apparatus of the class described, the combination of means for continuously forming from a supply of sheets a stream thereof wherein each sheet is partially disposed upon the succeeding sheet in overlapping relation therewith, slowly and continuously driven conveying means arranged to receive and slowly advance the

stream of lapped sheets, mechanism adjacent the front of said conveying means for rapidly separating the sheets successively from the front of the stream and thereby completely exposing the sheets successively for inspection while slowly advancing and in the front of the slowly advanced stream, mechanism for deflecting out of the line of travel of the separated sheets any sheet or sheets found to be imperfect or defective by inspection while completely exposed, slowly advancing and in the front of the stream, and means for rapidly advancing successively in unlapped relation and piling one upon another separated sheets found to be good or without defects by inspection thereof while completely exposed, slowly advancing and in the front of said stream.

18. In apparatus of the type having means for forming and advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith and means for separating the sheets successively from the front of the stream, the combination of mechanism for deflecting out of the line of travel of the separated sheets and at a predetermined time or times any sheet or sheets selected for this purpose while in the stream, and means for advancing successively for further handling thereof separated sheets selected for this purpose while in said stream.

19. In apparatus of the class described, the combination of means for forming and advancing a stream of lapped sheets each partially disposed upon the succeeding sheet in overlapping relation therewith, means for separating the sheets successively from the front of the stream in timed relation with formation and advance thereof, mechanism for deflecting out of the line of travel of the separated sheets in timed relation with formation and advance of said stream and separation of the sheets therefrom any sheet or sheets found by inspection in the stream to be imperfect or defective, and means for advancing successively for further handling thereof separated sheets found by inspection in the stream to be good or without defects.

20. In apparatus of the class described, the combination of means for continuously forming from a supply of sheets a stream thereof wherein each sheet is partially disposed upon the succeeding sheet in overlapping relation therewith, slowly and continuously driven conveying means arranged to receive and advance the stream of lapped sheets, mechanism adjacent the front of said conveying means for rapidly separating the sheets successively from the front of the stream to thereby completely expose the sheets successively for inspection while slowly advanced and in the front of said stream, means for rapidly removing from the line of travel of the separated sheets and in timed relation with formation and advance of the stream and separation of the sheets therefrom any sheet found by inspection to be imperfect or defective while slowly advanced in the front of said stream, means for rapidly advancing successively in unlapped relation the separated sheets found to be good or without defects by inspection of each of the same while slowly advanced and in the front of said stream, and means for slowing down said last named sheets successively and delivering them one upon another in pile formation.

21. In combination, slow driven sheet conveying means, fast driven sheet conveying means, a fast driven feed roller and cooperating drop roller interposed between the fast and slow driven sheet conveying means, and switch means selectively operable to enable or prevent feed of sheets by said rollers from one to the other of said sheet conveying means, and means for operating said switch means in timed relation with the operation of said drop roller.

22. In combination, slow driven and fast driven sheet conveying means arranged in spaced relation, a fast driven feed roller and cooperating drop roller interposed between said sheet conveying means, guide means for delivering sheets from the feed and drop rollers to a point removed from said feed and drop rollers and the fast driven sheet conveying means, and switch means selectively operable to enable feed of sheets from the feed and drop rollers to said guide means or said fast driven sheet conveying means.

23. In combination, a sheet advancing conveyor, a sheet receiving conveyor spaced therefrom, fixed guide means and movable guide means opposed thereto and between which sheets may be delivered from the sheet advancing conveyor to a point removed from said sheet advancing conveyor and the sheet receiving conveyor, switch means selectively operable to enable feed of sheets from the sheet advancing conveyor to said sheet receiving conveyor or from the sheet advancing conveyor to and between the fixed and movable guide means, and means for moving said movable guide means toward and away from said fixed guide means.

24. In combination, fixed and movable opposed guides between which sheets may be delivered, switch means operable to enable or prevent feeding of sheets between said guides, and a movable carriage on which the movable guides and said switch means are mounted.

25. In combination, a series of spaced aligned fixed guides and a series of spaced aligned movable guides disposed in spaced opposed relation with said fixed guides, a series of spaced aligned switch elements disposed opposite the spaces between the fixed and movable guides, said switch elements constituting a switch unit selectively operable to enable delivery of sheets between the fixed and movable guides or prevent entry of sheets therebetween, and means for moving said movable guides toward and away from said fixed guides.

26. In combination, a series of spaced aligned fixed guides, a series of spaced aligned movable guides disposed in spaced opposed relation with said fixed guides, a series of spaced aligned switch elements disposed opposite the spaces between the fixed and movable guides, said switch elements constituting a switch unit selectively operable to enable delivery of sheets between the fixed and movable guides or prevent entry of sheets therebetween, a movable carriage on which the movable guides and the switch elements are mounted, and means for operating said carriage in opposite directions to move said movable guides and said switch elements toward and away from the fixed guides.

27. In combination, spaced aligned guides, other spaced aligned guides arranged in spaced opposed relation with the first named guides, opposed rollers arranged in the spaces between said guides for feeding sheets along and between the same, and spaced aligned switch elements between certain of the opposed rollers and extending in the spaces between said fixed and movable

guides, said switch elements constituting a unit selectively operable to enable feeding of sheets along and between the opposed guides or prevent entry of sheets therebetween.

28. In combination, curved and fixed guides, curved and movable guides arranged in spaced opposed relation with the fixed guides, switch means selectively operable to enable delivery of sheets between and along the fixed and movable guides or prevent entry of sheets therebetween, a movable carriage on which the movable guides are mounted, said switch means also being mounted on said carriage, and means for operating the carriage in opposite directions to move the movable guides and the switch means toward and away from said fixed guides.

29. In combination, curved spaced laterally aligned fixed guides and curved spaced laterally aligned movable guides between which sheets may be delivered and fed, a plurality of sets of spaced laterally aligned feed rollers disposed one set in advance of another about the curved fixed guides and extending in the spaces therebetween, a plurality of sets of laterally aligned rollers disposed one set in advance of another about the curved movable guides and extending in the spaces therebetween in opposed relation with said feed rollers, a plurality of switch elements located between certain of the sets of rollers and extending in the spaces between the fixed and movable guides, said switch elements constituting a unit selectively operable to enable feeding of sheets by said rollers along and between the fixed and movable guides or prevent entry of sheets therebetween, a movable carriage on which the movable guides, said second named sets of rollers, and the switch elements are mounted, and means for operating the carriage in opposite directions to move certain of the rollers toward and away from other rollers and to move said movable guides and the switch elements toward and away from said fixed guides.

30. The combination with a switch, means for operating the switch, and a latch engageable with and disengageable from the switch operating means to prevent or provide for operation of the switch thereby, of power driven latch operating means normally ineffective to disengage the latch from the switch operating means, and means for rendering said power driven latch operating means effective to disengage the latch from the switch operating means.

31. The combination with a switch, means for operating the switch, and a latch engageable with and disengageable from the switch operating means to prevent or provide for operation of the switch thereby, of continuously operated latch operating means normally ineffective to disengage the latch from the switch operating means, and manually operated means for rendering the continuously operated latch operating means effective to disengage the latch from the switch operating means.

32. In apparatus of the type having means for feeding sheets in a predetermined path of travel therefor, a switch, switch operating means for moving the switch into and out of the path of travel of the sheets, and a latch normally engaged with the switch operating means to prevent the same from moving the switch into said path, the combination of continuously operated latch operating means normally ineffective to disengage the latch from the switch operating means, a device manually movable in one direction to render the latch operating means effective to disengage the latch from the switch operating means and enable the latter to move the switch into said path, and means for moving the manually movable device in the opposite direction while the switch is disposed in said path to thereby reset said device and again provide for manual actuation thereof in said first named direction prior to movement of said switch out of said path by said switch operating means.

33. The combination with a switch, means for operating the switch, and a latch engageable with and disengageable from the switch operating means to prevent or provide for operation of the switch thereby, of latch operating means normally ineffective to disengage the latch from the switch operating means, and means movable into and out of a position between the latch and the latch operating means to render the same effective or ineffective to disengage said latch from said switch operating means.

34. The combination with a switch, means for operating the switch, and a latch engageable with and disengageable from the switch operating means to prevent or provide for operation of the switch thereby, of latch operating means normally ineffective to disengage the latch from the switch operating means, a device movable into a position between the latch and the latch operating means to render the latter effective to disengage said latch from said switch operating means, and manually operated means for moving said device into said position.

35. In apparatus of the type having means for feeding sheets in a predetermined path of travel therefor, a switch, switch operating means for moving the switch into and out of the path of travel of the sheets, and a latch normally engaged with the switch operating means to prevent the same from moving the switch into said path, the combination of continuously operated latch operating means normally ineffective to disengage the latch from the switch operating means, a device movable into a position between the latch and its operating means to render the latter effective to disengage the latch from the switch operating means and enable the same to move the switch into said path, manually operated means for moving the device into said position, and means for moving the device out of said position while the switch is disposed in said path to thereby reset said device and again provide for manual actuation thereof into said position prior to movement of the switch out of said path by said switch operating means.

36. The combination with a switch, means for operating the switch, and a latch engageable with and disengageable from the switch operating means to prevent or provide for operation of the switch thereby, of latch operating means normally ineffective to disengage the latch from the switch operating means, and a device on the latch movable relative thereto out of and into a position between the latch and the latch operating means to render the same effective or ineffective to disengage said latch from said switch operating means.

37. In apparatus of the type having means for feeding sheets in a predetermined path of travel therefor, a switch, switch operating means for moving the switch into and out of the path of travel of the sheets, and a latch normally engaged with the switch operating means to prevent the same from moving the switch into said path, the combination of continuously operated latch operating means normally ineffective to

disengage the latch from the switch operating means, a device movable into a position between the latch and its operating means to render the latter effective to disengage the latch from the switch operating means and enable the same to move the switch into said path, manually operated means for moving the device into said position, and cam means on said continuously operated latch operating means for automatically moving said device out of said position while the switch is disposed in said path to thereby reset the device and again provide for manual actuation thereof into said position prior to movement of the switch out of said path by the switch operating means.

38. The combination with a switch, means for operating the switch, and a latch engageable with and disengageable from the switch operating means to prevent or provide for operation of the switch thereby, of latch operating means normally ineffective to disengage the latch from the switch operating means, a device movable into and out of a position between the latch and the latch operating means to render the same effective or ineffective to disengage the latch from said switch operating means, and means on the latch for guiding said latch operating means.

39. The combination with a switch, means for operating the switch, and a latch engageable with and disengageable from the switch operating means to prevent or provide for operation of the switch thereby, of latch operating means having an abutment movable toward and away from the latch, and a device movable into and out of the path of travel of said abutment to prevent or provide for disengagement of said latch from said switch operating means by the latch operating means.

40. In combination, slow driven endless sheet conveying means, fast driven endless sheet conveying means, a fast driven feed roller and cooperating drop roller interposed between the fast and slow driven endless sheet conveying means, switch means selectively operable to enable or prevent feed of sheets by said rollers from one to the other of said endless sheet conveying means, and means for operating said switch means in timed relation with the operation of said drop roller.

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