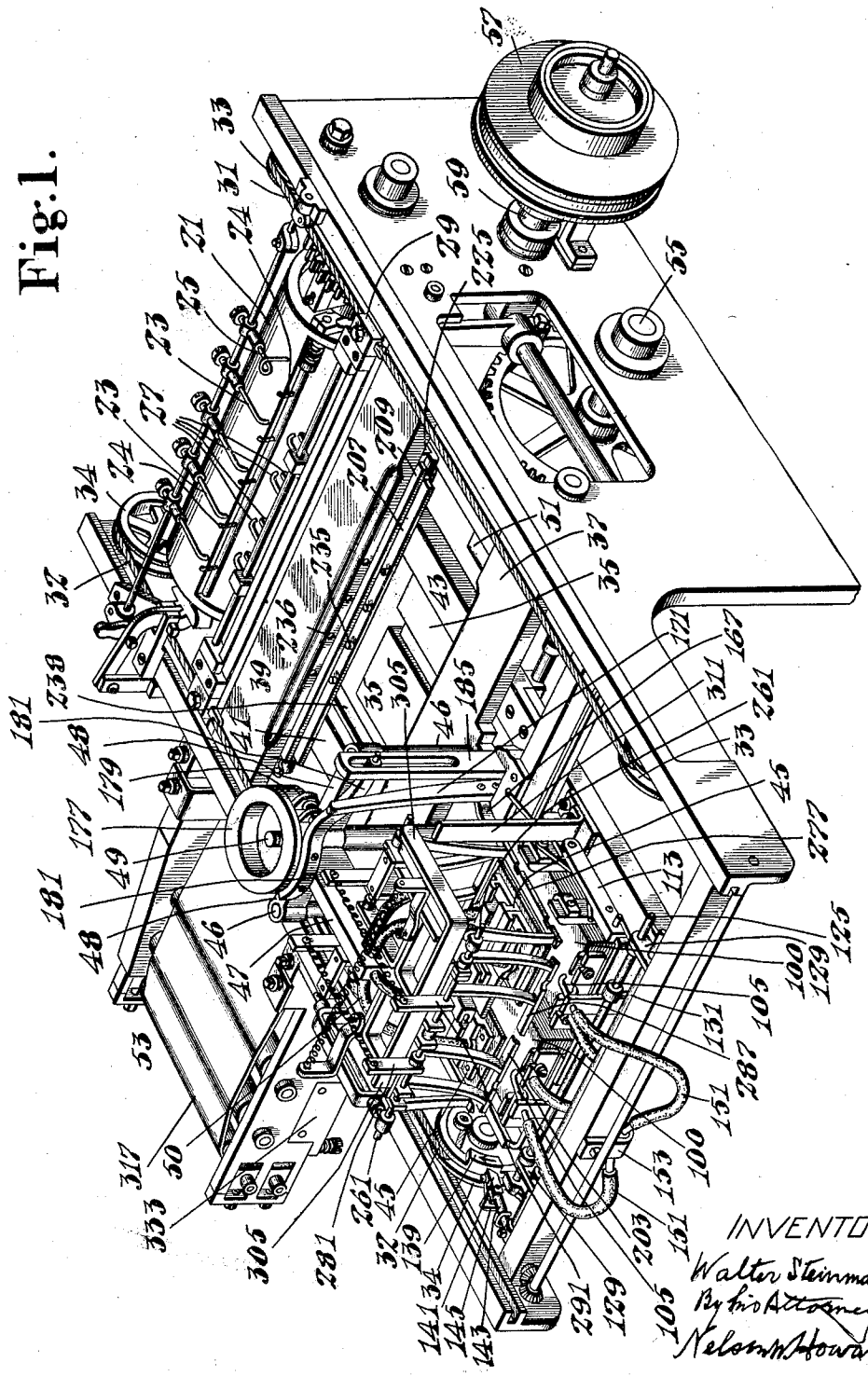
Dec. 29, 1931. W. STEINMANN 1,838,464

MACHINE FOR MAKING CASES FOR BOOKS

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Fig. 1.



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Fig.2.

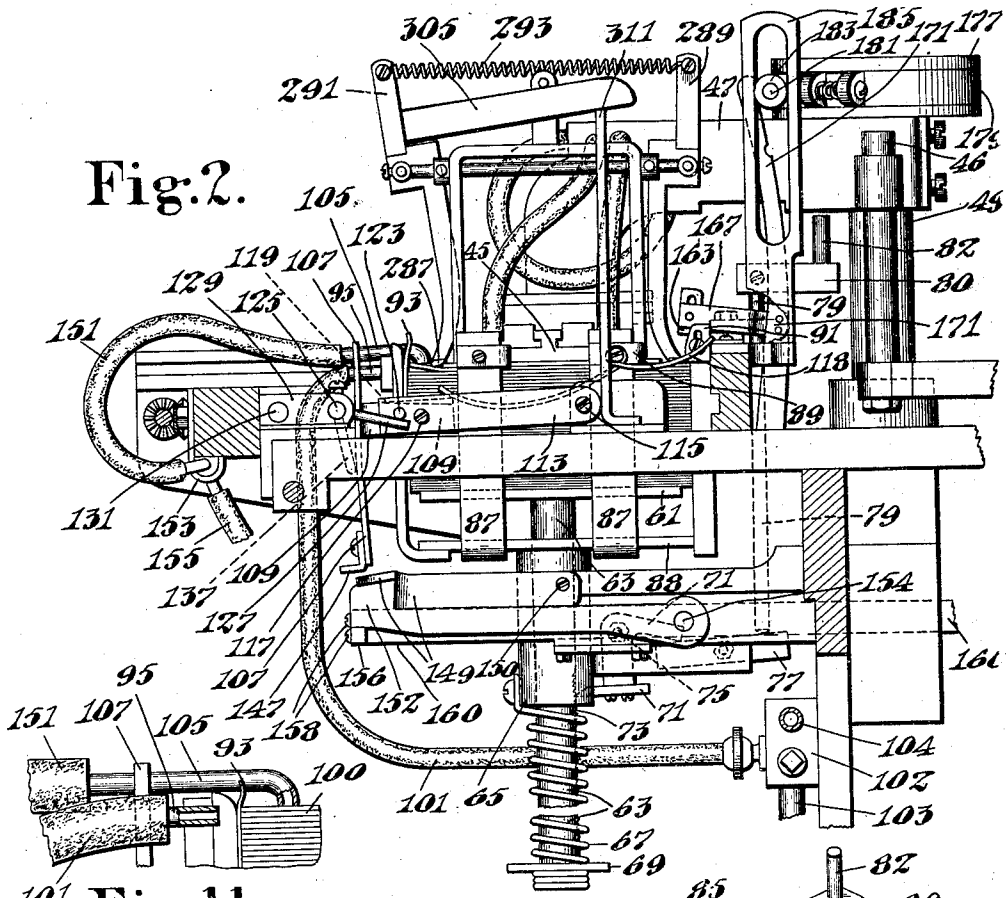


Fig.11.

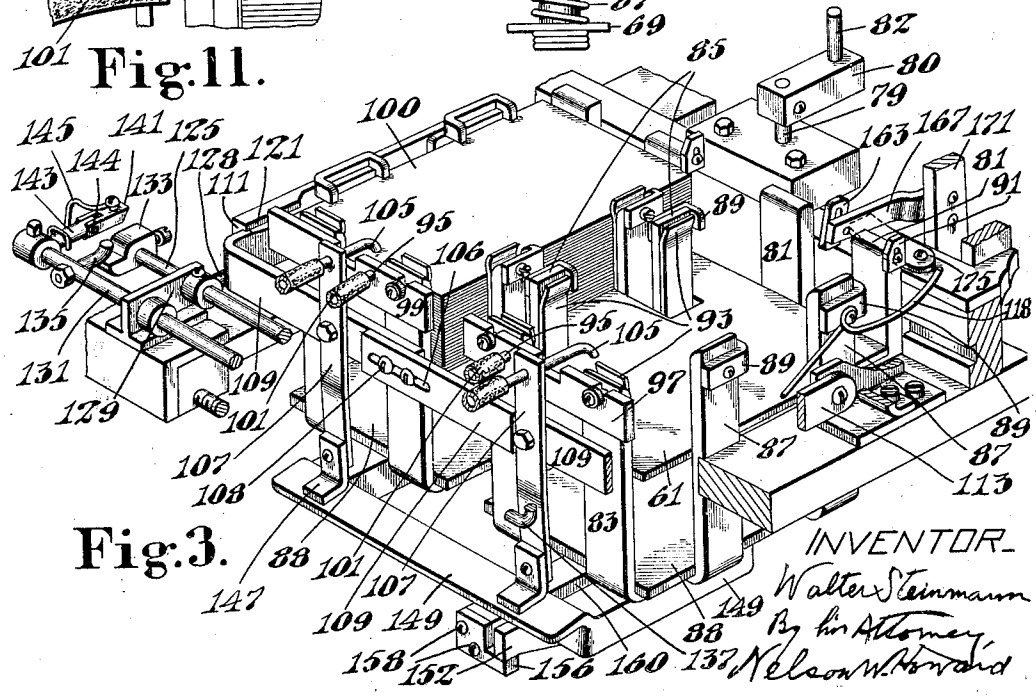


Fig.3.

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MACHINE FOR MAKING CASES FOR BOOKS

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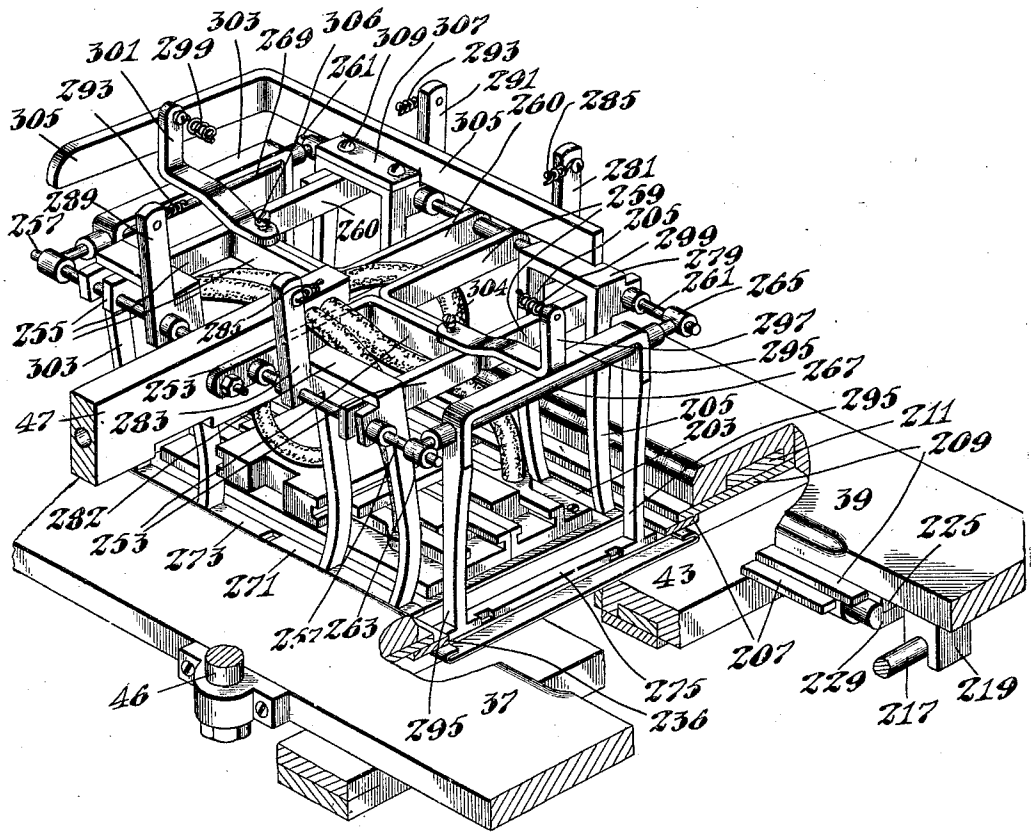


Fig. 4.

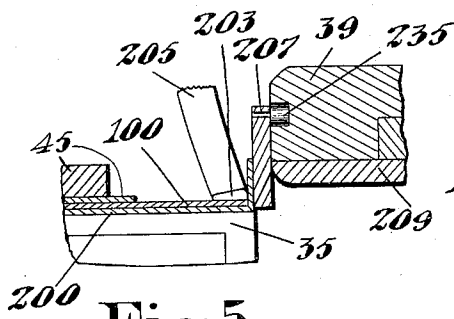


Fig. 5.

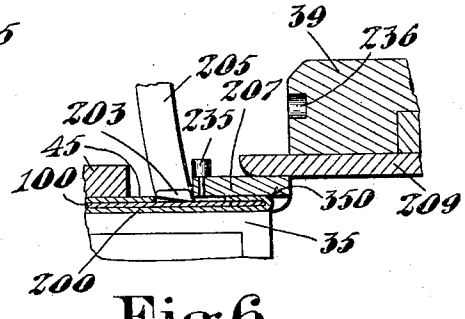


Fig. 6.

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MACHINE FOR MAKING CASES FOR BOOKS

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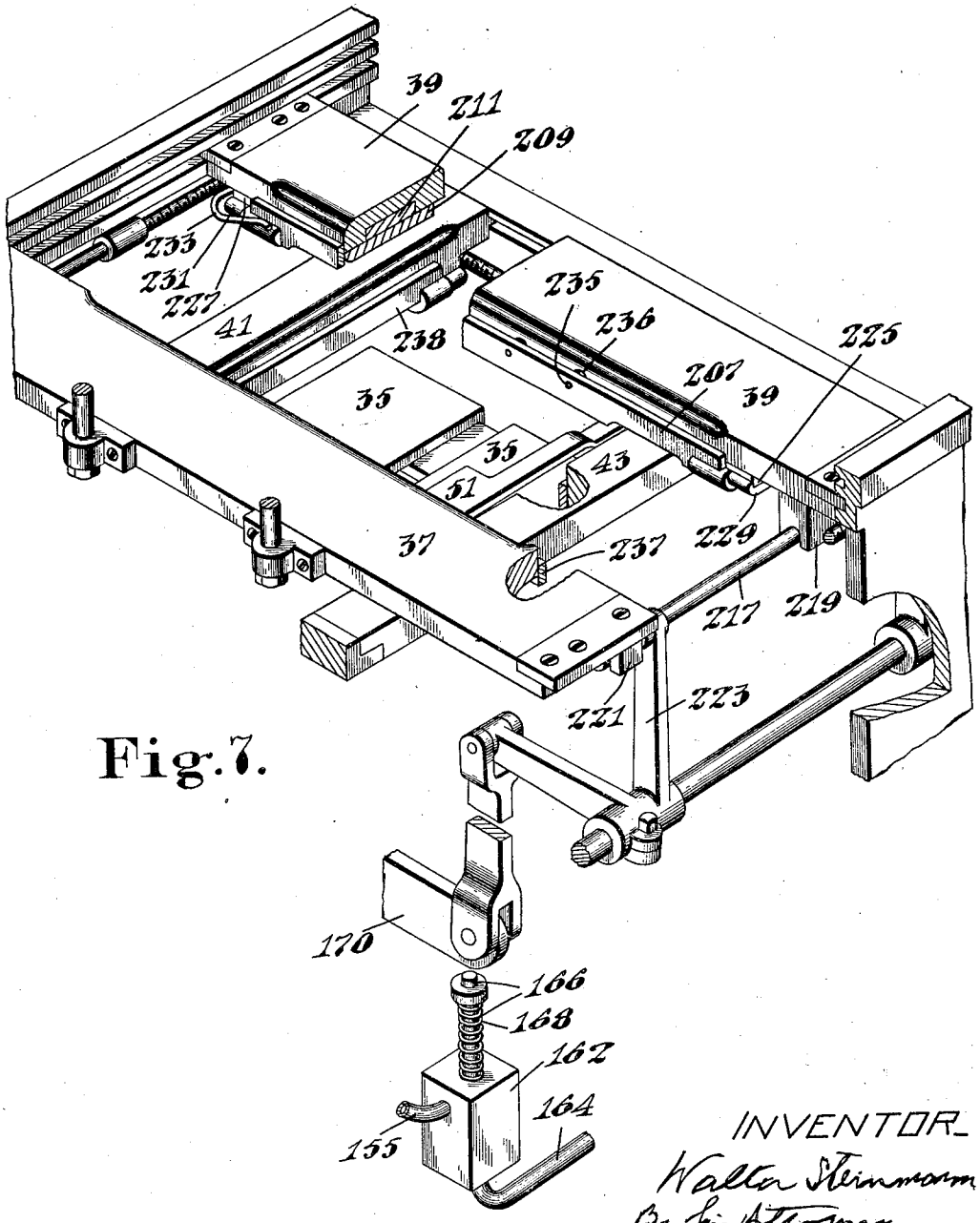


Fig. 7.

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Fig.8.

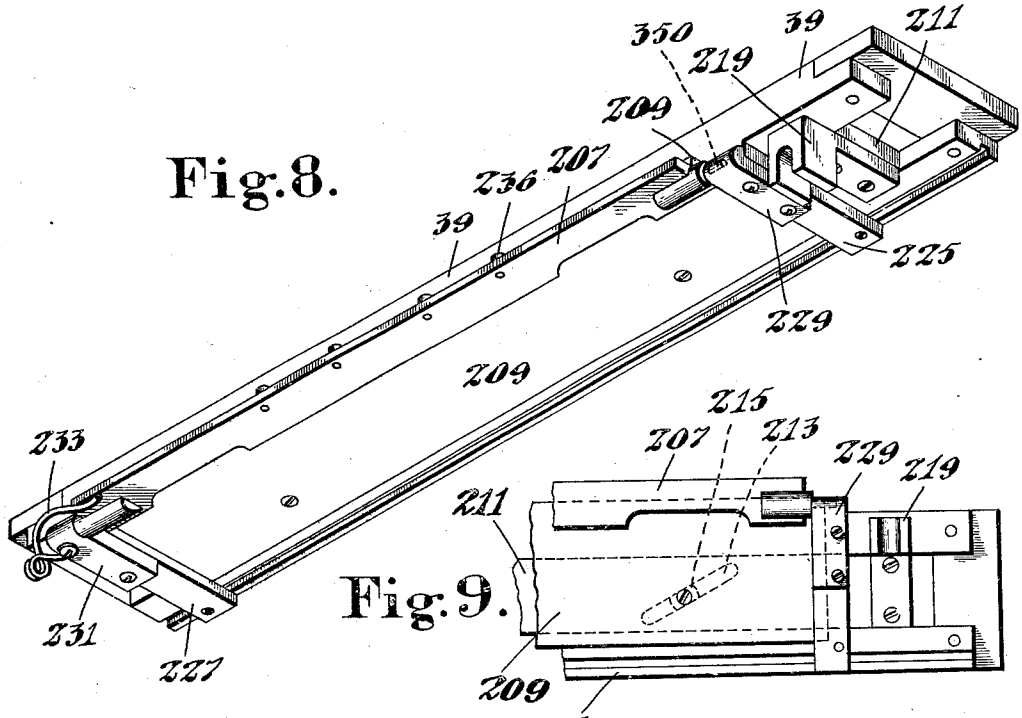


Fig.9.

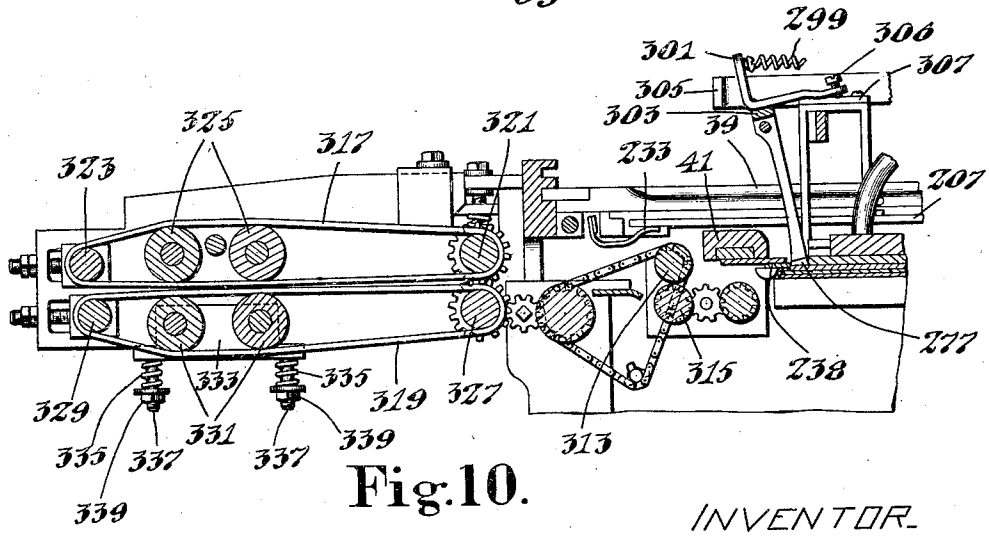


Fig.10.

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UNITED STATES PATENT OFFICE

WALTER STEINMANN, OF NEWARK, NEW JERSEY, ASSIGNOR TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY

MACHINE FOR MAKING CASES FOR BOOKS

Application filed January 9, 1928. Serial No. 245,539.

This invention relates to machines for making cases for books and is herein illustrated as embodied in a machine which is particularly adapted to the manufacture of flexible cases.

Cases for books commonly comprise a cover of flexible material, such as cloth, paper or leather, and two boards, the margin of the cover being folded over upon the adjacent margins of the boards. In the manufacture of these cases, a cover is first coated with glue or other suitable adhesive, two boards are placed upon the cover in proper position, and then the margin of the cover is folded over the adjacent edges of the boards and pressed into place. The great majority of book cases have boards which are thick and stiff; and when such a book case is being made, the margin of the cover may be readily folded over the boards, since the stiff, strong edges of the boards define the line of fold and are not liable to be crumpled or otherwise bent during the folding operation. When, however, boards are used which are thin and flexible, provision should be made for preventing crumpling or bending of their edges during the time that the margin of the cover is being folded over them.

According to one feature of the present invention, there is provided a swinging folder for folding the margin of the work over the body portion thereof, and a member for holding the body portion of the work down upon a work support, the construction being such that the holddown member is moved progressively, during the folding operation, in a direction to carry it out of the path of movement of the folder. In the illustrated construction the folder is normally upright, the assembled cover and boards being pushed down past it so that a margin of the cover is bent up against the operative face of the folder. The holddown, which as will presently be explained is carried by a picker-head, at this time engages the margin of the board. As the folder is swung to bend the margin of the cover over the board, the folder presently engages the holddown and pushes it progressively from beneath the margin of the cover as the margin is being folded. A swinging folder, as contrasted with the usual reciprocating folder, has much less tendency to bend or crumple the edge of the board; and whatever tendency of this sort is present is counteracted by the action of the holddown. For convenience of explanation only one folder and one holddown have been referred to above. There are, however, in the illustrated machine four folders arranged so as to fold the four sides or edges of the book case two at a time, and a plurality of holddowns cooperating with these folders.

In the use of machines of the general type of the one illustrated, the cover is first coated with glue and placed adjacent to the folding mechanism, and then a feeder or picker-head takes two boards from a source of supply, places them upon the glue-coated cover, pushes the boards and cover into the field of action of the folding mechanism and remains in contact with the work during the folding operation. When thick, stiff boards are used it has been customary to pile them in two stacks, and to feed the two lowermost boards of the stacks into a position to be seized by the picker-head; but such a procedure would be obviously impractical when thin, flexible boards are to be used.

With this in view and according to another feature of the present invention, each of the two boards is taken from the top of a stack by the illustrated picker-head, a lifter being provided to bend up the margin of each board and thus to ensure that only one board at a time shall be taken from a stack, means being provided for moving the holddown, which as has been indicated is carried by the picker-head, into a position to permit it to pass by the lifter when the picker-head descends upon the stack. In the illustrated construction the boards are arranged in two stacks, there being a lifter for each stack and each of the lifters being in the form of a sucker which engages one margin of each board in the corresponding stack and bends it up. These suckers engage the boards in the same locality in which two of the holddowns engage the boards during the folding operation, and consequently the holddowns would strike the suckers when the

picker-head descends upon the stacks unless provision were made for moving them at the proper time. In the illustrated machine the holddowns are pivoted to the picker-head, are swung out of the way of the suckers when the picker-head descends upon the stacks, and are swung into operative position again when the picker-head rises.

These and other features of the invention, including certain details of construction and combinations of parts will be described as embodied in an illustrated machine and pointed out in the appended claims.

Fig. 1 is a perspective of a machine in which the present invention is embodied;

Fig. 2 is a sectional view showing more particularly the mechanism for removing a board from the top of a stack;

Fig. 3 is a perspective of the holder for the stacks of boards;

Fig. 4 is a perspective of the picker-head and part of the folding mechanism;

Figs. 5 and 6 are details in section showing a folder and a co-operating holddown in two different positions;

Fig. 7 is a perspective of the folding mechanism;

Fig. 8 is a perspective of one of the folders and the bar upon which it is mounted;

Fig. 9 is a view from beneath of a part of the same folder and bar which are shown in Fig. 8;

Fig. 10 is a view principally in section of the mechanism for pressing the folded book cases and ejecting them from the machine; and

Fig. 11 (Sheet 2) is an elevation showing a sucker and the adjacent blower.

The illustrated machine in many respects is the same as the machine described in United States Letters Patent No. 580,111 granted April 6, 1897 upon an application filed in the name of Jacobs. Referring to Fig. 1, the machine comprises a mutilated cylinder 21 upon which the cover of a book case is placed and by which it is carried into contact with a glue roll (not shown) to apply glue to certain portions of the cover. The operator stands at the right-hand end of the machine, as viewed in Fig. 1, and places the forward edge of the cover against the down-turned ends of gage fingers 23 with a side edge of the cover in contact with a gage finger 25. The cylinder 21 is given complete rotations intermittently; and it is in a pause between rotations that the edge of a cover is placed against the gage fingers. During a rotation of the cylinder, the forward edge of the cover is pressed against it by fingers 24 which operate first to engage the cover so that the cover is carried around by the cylinder and then to release the cover at the end of the rotation. Then, immediately, the edge of the cover, which has thus been coated with glue, is seized by the grippers 27 of a horizontally reciprocable transferrer slide 29. This slide is fast at one end to a cord 31 and at the other to a cord 32, and is actuated by the pairs of pulleys 33, 34 which are caused to rotate first in one direction and then in the other at the proper times, the cords being fast to the pulleys.

During the first half of the reciprocation of the slide 29, the cover, which was seized by the grippers 27, is brought into position over a cover support in the form of a platform 35 and released so as to remain upon said platform, the upper face of which is of substantially the same size as that of the finished book case and is thus somewhat smaller than the unfolded cover. The last half of the reciprocation of the slide 29 to return said slide to initial position does not take place until after the cover has been folded.

The platform, which is adjustable as to length and width to provide for different sizes of book cases, is located in a rectangular opening bounded by four bars 37, 39, 41 and 43, the bars 39, 41 and 43 being adjustable so as to vary, when desired, the size of the opening. This platform is movable vertically in a manner presently to be described. The bars 37 and 39 are at one level and the bars 41 and 43 at a lower level. Each of these bars carries a folding element, and these elements are operated in pairs in such manner that the folding elements of the bars 37, 39 operate first to fold the top and bottom margins of the cover and then, when the partly folded case has been lowered to the field of action of the folding elements of the bars 41, 43, the folding elements of those bars fold the side margins of the cover.

At the time when the glue-coated cover is delivered by the transferrer slide 29 upon the platform 35, the top of the platform is nearly flush with the tops of the bars 37, 39, so that the top and the bottom margins of the cover rest respectively upon the bar 37 and the bar 39. After the glue-coated cover has been placed upon the platform 35 with its top and bottom margins overlying respectively the bars 37 and 39, two boards are placed upon it. These boards 100 are taken, two at a time, from a locality at the rear of the machine—the left-hand end as viewed in Fig. 1—by a suction picker-head 45 carried by an arm 47 fast to the upper end of a shaft 49, said shaft being raised and lowered as well as rotated 180 degrees first in one direction and then in the opposite direction at the proper times by mechanism not shown. In order to ensure that the picker-head shall descend accurately into its two down positions, two upright stationary studs 46 are adapted to enter holes in the outer ends of arms 48 which are rigid with the picker-head arm 47 and the shaft 49. The picker-head is provided on its lower operative face with suction cups, not shown,

which are operated by an air pump and suitable valves, also not shown, through the shaft 49, the arm 47 and flexible tubes 50, the shaft and arm having suitable air passages formed therein.

Assuming that the shaft 49 is in its down position at the rear of the machine with the picker-head engaging two boards 100, the shaft is raised until the cross-arms 48 are above the studs 46, is then swung through 180 degrees so that the holes in the cross arms 48 are again in register with the studs, and is then lowered to press the two boards 100 down upon the glue-coated cover which rests upon the platform 35. The picker-head and the platform are then moved farther down until the top and bottom margins of the cover are bent up vertically and the work has been lowered into the field of operation of the top and bottom folding elements carried by the bars 37, 39. These folding elements are then operated to fold the top and bottom margins of the cover, and then the work is moved still farther down into position to have the side margins of the cover folded. Thereafter the folded case is pushed sidewise by an ejector 51 to a pressing device, indicated as a whole at 53, and from this device is fed out of the machine. The picker-head rises, swings 180 degrees and picks up another pair of boards. Meanwhile the transferrer slide 29 returns to receive another glued cover, and the operations, which have been described above, are repeated.

Briefly then, the operator stands in front of the cylinder 21 and, during a pause in the rotation of the cylinder, places a cover against the gages 23. The cover is first carried around by the cylinder to receive a coat of glue and is then deposited by the transferrer slide 29 upon the platform 35 which then occupies its uppermost position. Immediately the picker-head descends to press two boards upon the glue-coated cover; and then the boards and cover are moved down first into position to have the top and the bottom margins of the cover folded over the boards. The picker-head is raised slightly to permit the platform 35 to rise under spring pressure and press these top and bottom folds against the under sides of the folding elements. After the top and bottom margins have thus been folded, the work is carried down by the picker-head and the platform into the field of operation of the folding elements which are carried by the bars 41, 43, whereupon the side margins are folded and the folds pressed. Thereafter the folded case is presented to the pressing device 53 and then fed out of the machine. The machine as thus far described is substantially the same as that disclosed in the Letters Patent referred to, reference being made to those Letters Patent for a detailed description.

Machines like that disclosed in said Letters Patent have been used hitherto to assemble and fold book cases, the boards of which are comparatively thick and stiff, while the present invention provides a machine of this type which is adapted to assemble and fold book cases, the boards of which are thin and flexible. In general, the machine herein illustrated differs from the patented machine in that there are provided mechanisms different from those of the patented machine for handling the boards, for folding the margins and for pressing the folded cases.

Referring now more particularly to Figs. 2 and 3, two stacks of boards, each board being of a thickness, which may be only about ten thousandths of an inch, for example, are supported upon a plate 61 which is fast to the upper end of a rod 63, said rod being vertically slidable in a bore in a stationary boss 65. A tension spring 67, fast at its upper end to the boss, has a plate 69 thrust through the coils at its lower end; and upon this plate rests the bottom of the rod 63 so that the plate 61 is urged upwardly at all times, such upward movement being limited, as will be explained, by a pawl 71.

The two stacks of boards are enclosed in two skeleton magazines, the plate 61 serving as a common bottom for both of them. Inasmuch as the two magazines are practically alike, only one of them will be described in detail. Referring to Fig. 3, the magazine nearest to the observer has end walls formed respectively by two upright bars 81 and two upright bars 83, and side walls formed respectively by two upright bars 85 and two upright bars 87, all of these bars having inturned lower ends which are adjustably fastened to a stationary plate 88. Adjustably fastened to the tops of the bars 85 are abutments 89; and the bars 87 are provided with like abutments 89. These abutments, together with an abutment 91 on one of the end bars 81, rest upon the top of the stack and thereby cause the upper board to buckle somewhat when the board is lifted by the picker-head. As will be explained below, these abutments form one of several devices designed to ensure that only one board at a time shall be removed from each stack.

In order to hold the upper tiers of boards of the stack in proper position cross-wise and lengthwise of the magazine, leaf-springs 93 are attached at their lower ends to the side bars 85, said lower ends being about halfway down the side bars; and similar leaf springs (also indicated by the numeral 93) are carried by the end bars 83.

When the picker-head engages the top boards of the stacks to lift them, there is a tendency for two boards to be lifted from each stack. In order to ensure that only one board shall be lifted from each stack, suckers and blowers are provided, the former to lift

an edge of each top board and the latter to blow beneath the lifted edges. Thus there are provided blowers 95 which have their nozzles respectively mounted in and extending through short cross-bars 97, 99 which are fast respectively to the bars 83 of the right-hand magazine (Fig. 3) and to the corresponding bars of the left-hand magazine. The nozzles of the blowers are connected by rubber pipes 101 with a box 102 into which leads a pressure pipe 103 from an air pump. The blowers thus operate continuously while the machine is running. The box 102 contains a slide valve 104 but this valve, which is manually operable, has no connection whatever with the blowers, its function being to permit the suction to the picker-head to be broken when desired so that no boards will be picked up.

The suckers, on the other hand, are operated intermittently and are first lifted so as to lift the edges of the boards and then swung away from the stacks of boards so as to be out of the path of the topmost boards when said boards are lifted by the picker-head. The manner in which the suckers are swung out of the upward path of movement of the boards will be described first. The nozzles 105 of the suckers are mounted in the upper ends of upright bars 107 which are fast to a horizontal U-shaped member, designated as a whole by the numeral 109. This member is really made of three parts, two angle irons adjustably connected by means of a short bar which is brazed to one angle iron and adjustably fastened to the other angle iron by means of a slot 106 and screws 108, the adjustable connection being for the purpose of spacing the two magazines different distances apart as may be desired. For the purpose, however, of explaining the movement of the suckers, the U-shaped member 109 may be considered as all of one piece. The short legs of this U-shaped member are pivoted respectfully to two arms 111, 113 which are substantially alike, the arm 113 being shown in full in Fig. 2. This arm is pivoted at 117 to one leg of the U-shaped member 109 and at 115 to a stationary part of the machine. It has at its upper left-hand end a flange 119, the corresponding flange of the arm 111 being indicated at 121 in Fig. 3. The upper edges of the legs of the U-shaped member 109 are beveled, as shown best in dotted lines in Fig. 2, to permit the U-shaped member to rock in a counter-clockwise direction about the common axis of the pivot 117 and the corresponding pivot (not shown) at the other side of the magazines when, as will be explained, the outer ends of the arms 111, 113 are swung up to cause the suckers (after they have been lifted by mechanism presently to be described) to swing out of the path of upward movement of the topmost boards. The arms 111 and 113 are normally held down yieldingly by springs, the one which holds the arm 113 being indicated at 118 (Fig. 2). This spring has its middle portion extending around the stem of a stationary screw, one end of the spring resting upon a stationary part of the machine, and the other end resting upon the flange 119 of the arm 113.

In order to swing the arms 111, 113 upward, each arm has in its outer end a pin, the one in the arm 113 being shown at 123 beneath which extend pins 127 (Fig. 2) and 128 (Fig. 3) carried by a rock-shaft 125. This rock-shaft is mounted in bearings in stationary plates 129; and, rotatable in bearings in the same plates, is a second rock-shaft 131. Near one end of the rock-shaft 125 (Fig. 3) is fastened a finger 133; and near the corresponding end of the rock-shaft 131 is fastened a finger 135, the finger 135 overlying the finger 133 so that, when the rock-shaft 131 is rocked in a direction to swing the finger 133 down, the rock-shaft 125 will be rocked in the opposite direction,—counter-clockwise, as viewed in Fig. 2. When this occurs, the pins 127, 128 on the rock-shaft 125 lift the outer ends of the arms 113, 111 and at the same time an arm 137, which depends from the rock-shaft, pushes against one of the upright bars 107 below the level of the pivot 117 so that the suckers are swung about said pivot out of the path of upward movement of the two top boards of the stack.

The shaft 131 is rocked at the proper time by contact of a cam 139, (Fig. 1), on the rear pulley 34 with a block 141 pivoted at 144 on the outer end of an arm 143 the hub of which is fast to the rock-shaft 131. When this arm is swung down, the suckers are swung away from the stacks of boards. The pulley 34, as has been explained, rotates first in one direction and then in the other so that the cam 139 first moves up past the block (as shown in Fig. 1) and then down, in which latter movement it depresses the arm 143 and rocks the shaft 131. Because of this movement of the cam 139, the block 141 has a yoke at its rear end which straddles the flattened outer end of the arm 143, the pivot 144 passing through the arms of the yoke and the flattened outer end of the arm. The rear ends of the arms of the yoke are beveled, as shown best in Fig. 3, and contact with inclined shoulders formed at the junction of the round portion of the arm 143 with the flattened outer portion. The block 141 can thus rock upward about the pivot 144 but cannot rock downward. A tension spring 145, fast at one end to the block and having its other end extending over the arm 143, holds the block normally in the position shown.

The mechanism which has just been described serves to swing the suckers out of the path of upward movement of the topmost boards of the stacks, this swinging away being timed to occur after the picker-head has started to lift said boards. Before, however, the suckers are thus swung, they are

lifted so as to lift the edges of the top-most boards. This is accomplished (Figs. 2 and 3) by pushing up the bars 107 in which the suckers are mounted. Pushing these bars up swings them about the common axis of the pivot 115 and the corresponding pivot (not shown) at the other side of the magazines. The bars 107 have fast to their lower ends angle irons 147 located above the cross bar of a U-shaped swinging member 149, the arms of which are pivoted to a stationary part of the machine about alined pivots, one of which is shown at 150. The U-shaped member 149 is swung up by an arm 152 pivoted to a stationary part of the machine at 154, the upper outer end of the arm resting against the under side of the cross-bar of the U-shaped member. This arm 152 is normally in its lowered position, being supported by a finger 156 which engages a beveled surface on the under side of the outer end of the arm. This finger is fastened by screws 158 to the outer end of a slide bar 160 so that, when the bar is moved to the right as viewed in Fig. 2, the arm 152 swings up carrying with it the U-shaped member 149 which in turn lifts the bars 107 and consequently the suckers. It is not until these movements have taken place and the suckers have lifted the edges of the topmost boards of the stacks that the rock-shaft 125 lifts the outer ends of the arms 113, 111 to cause the suckers to swing away from the stacks about the axis of the pivot 117 in the manner which has been described. The slide bar 160 is an extension of a rack-bar, shown and described in the Letters Patent referred to, through which the picker-head shaft 49 is caused to oscillate.

The suckers are connected by rubber tubes 151 with a union 153, from which a rubber tube 155 leads to a valve box 162 (Fig. 7) from which air is exhausted through a pipe 164. The stem 166 of the valve (not shown) which controls the operation of the suckers is held up by a spring 168 and is located beneath the outer end of a rocker-arm 170 so that, when the rocker-arm depresses the valve, a vacuum is produced in the sucker nozzles. The rocker-arm 170 is identical with the corresponding arm of the patented machine and serves, as will presently be explained, to operate part of the folding mechanism.

It is desirable that the tops of the stacks of boards, from which the picker-head takes successive pairs of boards, shall be always at substantially the same level when the picker-head descends upon them. To this end the rod 63 is held against upward movement, in the position of parts shown in Fig. 2, by the pawl 71 which engages teeth 73 formed on the rod. This pawl is pivoted at 75 to a stationary part of the machine and has a tail adapted to be engaged and lifted at the proper times by movement of a lever 77 also pivoted to a stationary part of the machine. This lever is swung about its pivot by downward movement of a vertical rod 79 which is slidable in bearings in a stationary part of the machine and has at its upper end an arm 80 from the outer end of which a pin 82 projects upwardly. When the picker-head moves down to pick up two boards, the arm 47, by which the head is carried, strikes the pin 82 and throws out the pawl. This does not take place, however, until the picker-head in its downward movement has depressed the stacks a short distance. When the picker-head rises the pawl 71 again engages one of the teeth 73 and thus arrests further upward movement of the stacks of boards by the spring 67. The level at which the tops of the stacks are normally maintained by the pawl 71 may vary, of course, by about the distance between two adjacent teeth 73 but should never vary more than that. These teeth, in the illustrated machine, are one sixteenth of an inch apart and in most cases will be farther apart than the thickness of one of the boards. Boards commonly used for flexible book cases are often, as has been stated, about ten thousandths of an inch in thickness. Assuming for convenience that their thickness is twelve and one-half thousandths of an inch, then five of them have a combined thickness of one sixteenth of an inch. In such case the pawl should engage the same tooth on the rod 63 during the removal of the first five boards from the tops of the stacks and should then engage the next lower tooth so as to permit the tops of the stacks to return to their original level and so on. In this way the level of the tops of the stacks is maintained uniform within a one-sixteenth inch possible variation or within a possible variation which depends upon how fine the teeth 73 are made.

The picker-head moves rapidly down upon the stacks of boards, unlocks the pawl 71, depresses the stacks and then rises quickly, the pawl 71 becoming effective again during the upward movement of the picker-head, as has been explained above. It may happen, owing to the quick upward movement of the rod 63, that the pawl 71 engages the teeth a little too late and consequently permits the tops of the stacks to rise to a little too high a level. In order to correct his error, if it does occur, and to ensure that the tops of the stacks are at the desired level when the picker-head descends upon them, there is provided a pusher 163 which engages the top of the boards of one of the magazines (Figs. 2 and 3), before the picker-head returns for another board, and pushes the stack down if it is too high, into a position slightly below the desired level. And, inasmuch as the two stacks are supported upon the same plate 61, they, of course, move down

together. If now the pawl 71 (Fig. 2) is in engagement with a tooth lower down upon the rod than it should engage, the proper tooth is brought into engagement with it. To provide for effecting the desired operation of the pusher 163, it is fast to the outer end of an arm 167, the inner end of which is fast to the lower portion of a substantially upright curved lever 171 pivoted at its lower end to a stationary part of the machine, the pusher being normally held up in inoperative position by a leaf spring 175 fastened at one end to a stationary part of the machine and having its free end extending beneath the arm 167, said arm being swung downwardly to depress the stacks of boards when the picker-head is 180 degrees from the position shown and is moving down between the bars of the folding mechanism. The curved lever 171, by which the arm 167 and the pusher 163 are carried, is swung to the left by a part of certain mechanism for preventing overthrow of the picker-head when it swings from the stacks of boards to the folding mechanism and back again. Fastened to the top of the shaft 49, which carries the picked-head, is a cylindrical member 177 (Figs. 1 and 2) in a peripheral groove of which is located a friction band 179. Fast to this band is a horizontal arm 181 the outer end of which carries a roll 183, said roll extending into a vertical slot in a stationary upright bar 185. The upright lever 171 is held against the horizontal arm 181 by the leaf-spring 175 which has been described above. It will be evident that, when the picker-head moves down, the arm 181 will swing the arm 171 more or less to the left, depending upon how far the picker-head moves down. When the picker-head moves down upon the stacks of boards (see Fig. 2) the movement does not continue down far enough to cause the pusher 163 to become operative. When, however, the picker-head has been swung 180 degrees and moves down in the locality of the folding mechanism, it moves down much farther and, at that time, the upright lever 171 is swung far enough to the left to cause the pusher to engage the top of the right-hand stack and push the stacks down. The pusher, as has been explained, always carries the tops of the stacks down to a level just slightly below the desired one so as to ensure that the pawl 71 shall engage the proper one of the teeth 73 if it has not already done so.

Before proceeding to a description of the rest of the machine, the mode of operation of the mechanisms which have been described will be briefly reviewed, and the timing of the various operations with respect to each other indicated.

Assuming that a cover has been folded over the boards, the picker-head rises, swings 180 degrees and comes down upon the stacks of boards, as shown in Fig. 2. In this position of parts the picker-head is moving down and still has a short distance to go. As it moves down, the arm 47 engages the pin 82 and throws out the pawl 71. The picker-head pushes the stacks a little farther down and then starts to move up so that the pawl 71 is presently permitted to engage one of the teeth 73. Usually it will engage the proper tooth; but in case the upward rebound of the rod 63 due to the spring 67 is too rapid, the pawl may engage, for example, the tooth below the proper one so that the tops of the stacks are slightly too high. In such case, the stacks are pushed down by the pusher 163 to the proper level and the proper tooth is engaged by the pawl when the picker-head is acting in conjunction with the folding mechanism in a position 180 degrees from that shown in Fig. 2.

Returning now to a consideration of the action of the suckers and blowers which cooperate with the picker-head, during the downward movement of the picker-head the suckers are rendered operative to seize the two top boards near one of their edges and are lifted by means of the U-shaped member 149 the arm 152 and the finger 156 which moves to the right. The blowers, it will be remembered, are blowing continuously and at this time blow under the lifted edges of the two top boards. Fig. 2 shows the parts of the machine in this position, the hold-down 287 presently to be described having been swung inwardly out of the way of the suckers. Before the picker-head has risen any considerable distance, the suction in the suckers is broken and the shaft 125 is rocked to cause the suckers to swing, about the axis of the pivot 117, out of the path of movement of the boards so that the edges of the boards shall not catch on the suckers. When the top boards are lifted by the picker-head their edges are held down momentarily by the abutments 89 (Fig. 3) and the corresponding abutments at the top of the walls of the left-hand magazine, with the result that the boards are buckled; and this buckling is particularly effective to permit the blowers to separate two boards, if two boards from one stack have been lifted by the picker-head. The picker-head now lifts the boards, swings 180 degrees and carries them down to the folding mechanism, as will presently be described in detail, after which it returns for two more boards.

Inasmuch as the boards are thin and flexible, the machine is provided with hold-downs to engage and hold down the margin of the boards during the folding operation, and is also provided with swinging folders which perform the folding operation. Referring first to Figs. 5 and 6, the construction and the general mode of operation of one of the hold-downs and one of the folders will be de-

scribed, the construction and mode of operation of the other hold-downs and folders being substantially the same. When the picker-head 45 places a pair of boards upon a cover, which then rests upon the cover-support 35, and the picker-head and cover support move down between the bars 37, 39 into the field of action of the folders which are to fold the top and bottom margins of the cover, the top and bottom margins of the cover are bent up by being pushed down past the folders, one of which is shown at 207. Fig. 5 shows the parts in this position. The picker-head rests upon a board 100, the cover being indicated at 200. The hold-downs are in the form of narrow substantially flat bars, one of which is shown at 203. They are carried at the lower ends of arms, one of which is shown at 205, said arms being pivoted at their upper ends, to the picker-head structure, as will be described, and yieldingly held in their outer positions in which the outer edges of the hold-downs register substantially with the edges of the boards. The folders, one of which is shown at 207, as has been indicated, are pivoted respectively to the bars 39, 37, 41 and 43 (Fig. 7), the location of the pivot of the folder 207 being indicated by the small cross in Fig. 6 to which the reference numeral 350 has been applied. This axis is located at a distance below the bar 39 substantially equal to the thickness of the folder actuator bar 209 plus the thickness of the folder 207 and at a distance to the left of the bar 39 substantially equal to the thickness of the folder 207. In Figs. 5 and 6, the bar 39 and its associated parts are shown. The folder 207 is swung about its axis into the position shown in Fig. 6 by the folder actuator bar 209 which is moved horizontally to the left at the proper time. As the folder 207 swings to the left, it presently contacts with the arms 205, since the distance from the pivot to the hold-down at that time is less than the width of the folder, and steadily pushes them, together with the hold-down, to the left so that the hold-down gradually recedes as the fold is made. With this construction and mode of operation covers may be folded over very thin flexible boards without crumpling the boards or causing a wavy appearance in the folded edge of the completed case.

The folding mechanism, aside from the hold-downs, is like that of the patented machine except that in the patented construction there are no swinging folders, and the bar 209 and the others which correspond to it are the folders, whereas in the present construction these bars are the actuators of the swinging folders. Referring now more particularly to Figs. 7, 8 and 9, the mounting and actuation of the swinging folder 207 will be described. The bar 39 has a groove in its under side in which a narrow bar 211 is slidable, said bar having in its lower face two diagonal slots 213 to receive small blocks 215 pivotally mounted upon the top of the folder-actuating bar 209. The bar 211 is reciprocated by means of a rod 217 (Fig. 7) which engages a yoke 219 fast to one end of the bar 211. This same rod also engages a yoke 221 which is fast to a bar like the bar 211 but mounted in the stationary bar 37. The rod 217 is held in the upper end of rocker arms, one being shown at 223, which are rocked at the proper time. The folder-actuating bar 209 has flanged ends, the flanges of which rest upon short supporting bars 225, 227 which have cut-away portions upon their adjacent upper faces to receive the flanges at the ends of the folder-actuating bar 209. With this construction, which is substantially like that of the patented machine, the folder-actuating bar 209 is moved transversely of bar 39 when the bar 211 is moved longitudinally due to the diagonal slots 213 in the bar 211 and the small blocks 215 carried by the bar 209. The swinging folder 207 has pivots at its ends which are received in bearings in the outer ends of short plates 229, 231 which are fastened to the under sides respectively of the bars 225, 227. A spring 233, fastened at one end to the plate 231 and engaging the under side of the folder 207, tends at all times to swing the folder up against the edge of the bar 39 into a substantially upright position, as shown in Fig. 7, at which time pins 235, located at the edge of the folder are received in holes 236 formed in the edge of the bar. The purpose of the pins is to avoid a possible position of parts in which parts of the machine might be broken. After the top and bottom margins of the cover have been folded and the parts are in the position shown in Fig. 6, the picker-head, as in the patented machine, is raised slightly to permit the cover support 35 to be raised to press the fold against the under face of the folder. If the pins were not present, the hold-downs might swing over the folder, in which case, when the picker-head moved down again, the folders or the hold-downs would be broken. It is believed to be unnecessary to explain the construction and mounting of the other three swinging folders which are carried respectively by the bars 37, 41 and 43 since said construction and mounting is the same as that of the swinging folder 207. In Fig. 7 the swinging folder of the bar 37 is indicated at 237 and that of the bar 41 at 238.

Referring now more particularly to Fig. 4, the hold-downs are carried, as has been explained, by the picker-head. To this end, there is fastened, one to each side of the picker-head arm 47, two U-shaped members 253, 255. A rod 257 extends through the ends of the legs of these members and through the arm 47. Fastened to the bases

of the U-shaped members 253, 255 respectively are two more U-shaped members 259, 260; and a rod 261, like the rod 257, extends through the outer ends of the legs of these members. The near ends of the rods, as viewed in Fig. 4, have adjustably fastened to them collars 263, 265 into which are threaded the opposite ends of a cross-rod 267; and the far ends of the rods 257, 261 carry, in a similar manner, a cross-rod 269. The four rods thus form a rectangular frame which is rigid with the picker-head.

There are two alined hold-downs adjacent to the bar 39, one of which is shown at 203, two alined hold-downs 271, 273 adjacent to the bar 37, one hold-down 275 adjacent to the bar 43, and one hold-down 277 (Fig. 1) which is adjacent to the bar 41 when the parts of the machine are in the positions shown in Fig. 4. The hold-down 203 is fast to the lower ends of curved arms 205 which are integral at their upper ends with a cross-bar 279, the arms and the cross-bar forming a yoke. This yoke member is rotatable on the rod 261 and has integral with it an upstanding arm 281. The opposite hold-down 271 is mounted on the rod 257 in the same manner as the hold-down 205 is mounted upon the rod 257; and the yoke 282 of the hold-down 271 has an upstanding arm 283 which is connected with the arm 281 by a tension spring 285. These two hold-downs 203, 271, are thus normally held yieldingly in their outermost positions, said positions being determined by contact of the under side of the cross-bar 279 with the top of the member 259 and by contact of the under side of the cross-bar 282 with the top of the member 253. The hold-down 273 and the hold-down 287 (Fig. 1) opposite to it are mounted in the same manner as are the hold-downs 271, 203 which have just been described; and the upright arms 289, 291, which correspond to the upright arms 283, 281, are connected by a tension spring 293, which corresponds to the tension spring 285. The two alined hold-downs 203, 287 on the one hand and the two alined hold-downs 271, 273 on the other engage respectively the top and the bottom of the boards during the folding operation. The hold-down 275, which engages a side margin of one of the boards, is fast to the lower ends of the arms of a yoke 295, which is rotatable upon the rod 267. The cross-bar of the yoke 295 has fast to it an angle iron 297, the upright arm of which is connected by a tension spring 299 with a similar upright arm of a similar angle iron 301, the latter angle iron being fast to the cross-bar of a yoke 303 rotatable upon the rod 269 and having fast to the lower ends of its arms the hold-down 277. It will be observed that the rod 267, which carries the hold-down 275, may be adjusted bodily by loosening the set-screws (not shown) which hold the collars 263, 265 on the rods 257, 261 and sliding the collars along the rods; and the rod 269 which carries the other side-hold-down may be similarly adjusted. In order to permit a fine adjustment of the hold-down 275 about the rod 267 a set-screw 304 is threaded through the tail of the angle iron 297 and contacts with the member 253. A set-screw 306 furnishes means for adjusting the position of the opposite hold-down, and further set-screws may be provided, if desired, for the top and bottom hold-downs.

When the picker-head is swung over the stacks of boards, as shown in Fig. 1, the hold-downs 203, 287 are each above one of the suckers and must be swung in before the picker-head is brought down upon the stacks. To this end the long arm of an angle iron 305 has a small, horizontally projecting flange 307 (Fig. 4) which is fastened by screws 309 to the top of the yoke which carries the hold-down 287 (Fig. 1), the long arm of the angle iron being thus in contact with the inner edges of the upright arms 281, 291. When now the picker-head moves down from the position shown in Fig. 1, the end of the short arm of the angle iron 305 contacts with the top of a stop 311 carried by the frame of the machine and is rocked upwardly about the axis of the rod 261, whereupon the alined hold-downs 203, 287 are swung in and thus do not contact with the suckers when the picker-head moves farther down. After the suckers have performed their function and the picker-head rises, the angle iron 305 is lifted from the stop 311, and the hold-downs resume their proper position with their outer edges in register with the edges of the boards.

It has been explained above that, after the folding operation has been completed, an ejector 51 (Fig. 1) delivers the folded cover to a novel pressing device indicated as a whole by the numeral 53 and shown best in Fig. 10. The folded cases are delivered between small rolls 313, 315 which pass them on into a position between the adjacent runs of two belts 317, 319. The belt 317 passes around a driving roll 321, around a roll 323 and over and under two rolls 325, the roll 323 being adjustable as shown so as to keep the belt 217 at the proper tension. The belt 319 is mounted in a manner similar to that of the belt 317 on the rolls 327, 329 and 331. The upper presser rolls 325 are mounted in stationary bearings carried by a bracket which is part of the frame of the machine. The lower presser rolls, however, have their bearings in blocks 333 which are held up by springs 335. The blocks 333 have at their lower portions oppositely extending flanges having bores through which pass downwardly extending pins 337, the pins being rigid with the machine frame. The spring 335 bear with their upper ends against the underside of the blocks

333 and at their lower ends rest upon washers which in turn rest upon nuts 339. With this construction the lower presser rolls 331 may yield; and the force with which the cases are pressed may be varied by turning the nuts 339.

Although the invention has been set forth as embodied in a particular machine, it should be understood that the invention is not limited in the scope of its application to the particular machine which has been shown and described.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:—

1. A machine of the class described having, in combination, a support for a piece of work, an angularly movable folder having an operative face, the angle between which and the plane of the work support is normally at least ninety degrees, means for bending the margin of the work and causing it to lie against the operative face of the folder, and means for swinging the folder about its axis of angular movement.

2. A machine of the class described having, in combination, a support for a piece of work, an angularly movable folder having an operative face, the angle between which and the plane of the work support is normally at least ninety degrees, means for bending the margin of the work and causing it to lie against the operative face of the folder, and a folder actuator bar movable substantially parallel to the plane of the work support to swing the folder about its axis of angular movement.

3. A machine of the class described having, in combination, a support for a piece of work, an angularly movable folder having an operative face, the angle between which and the plane of the work support is normally at least ninety degrees, means for bending the margin of the work and causing it to lie against the operative face of the folder, and a folder actuator bar movable substantially parallel to the plane of the work support to swing the folder about its axis of angular movement, said axis being located substantially at the intersection of the plane of the operative face of the folder when said face is at right angles to the work support, and a plane parallel to the lower face of the actuator bar and spaced below said lower face a distance substantially equal to the thickness of the folder.

4. A machine of the class described having, in combination, a support for a piece of work the margin of which is to be folded over the body portion thereof, a hold-down for engaging the work along the desired line of fold, means including the hold-down for bending the margin upwardly, an angularly movable folder, and means for causing the folder to be swung about its axis of angular movement to lay the margin over the body portion of the work and the hold-down to be moved out of the path of movement of the folder during the folding operation.

5. A machine of the class described having, in combination, a support for a piece of work the margin of which is to be folded over the body portion thereof, means for bending the margin into a substantially upright position, an angularly movable folder, a hold-down for engaging the work along the desired line of fold, and means for swinging the folder about its axis of angular movement to lay the margin over upon the body portion of the work and for moving the hold-down out of the path of movement of the folder.

6. A machine for folding the margin of the cover of a book case over the boards thereof having, in combination, a support for the book case, a hold-down adapted to engage the margin of a board, a pivoted folder, and means for swinging the folder about its pivot to fold the margin of the cover over the margin of the board, the folder during its swinging movement engaging the hold-down and pushing it out of the path of the margin of the cover as it is being folded.

7. A machine of the class described having, in combination, a support for the cover and boards of a book case, hold-downs adapted to engage opposed margins of the boards, angularly movable folders for bending the margin of the cover over said margins of the boards, and means for simultaneously causing the folders to be swung over the margins of the boards and the hold-downs to be withdrawn out of the paths of movement of the folders.

8. A machine of the class described having, in combination, a support for the cover and boards of a book case, hold-downs adapted to engage opposed margins of the boards, pivoted folders, and means for swinging the folders about their pivots to fold said margins of the cover over the boards, said folders acting to move the hold-downs progressively away from the edges of the boards.

9. A machine of the class described having, in combination, a support for a piece of work, a margin of which is to be folded over the body portion thereof, a hold-down adapted to engage the work along the desired line of fold, an angularly movable folder, and means for swinging the folder toward the hold-down about its axis of angular movement, said axis being located at a distance from the hold-down less than the width of the folder whereby the swinging folder contacts with the hold-down and moves it out from beneath the margin of the work.

10. A machine of the class described having, in combination, a support for the cover and boards of a book case, hold-downs adapted to engage opposed margins of the boards, folders for bending said margins of the cover over the edges of the boards, pivots about which the folders may swing, and means for

swinging the folders about their pivots to fold the margins of the cover over the margins of the boards, said pivots being located at a distance from the hold-downs less than the width of the folders whereby the swinging folders contact with the hold-downs and move them out from beneath the margin of the cover.

11. A machine of the class described having, in combination, a support for the cover and boards of a book case, said support being movable in a substantially rectangular opening in the machine, normally upright pivoted folders forming part of the walls of the opening, means for forcing into the opening a book case the cover of which is larger than the opening whereby the margin of the cover is bent upwardly against the faces of the folders, and means for swinging the folders about their pivots to fold the margin of the cover over the boards.

12. A machine of the class described having, in combination, a support for the cover and boards of a book case, said support being movable in a substantially rectangular opening in the machine, normally upright pivoted folders forming part of the walls of the opening, means for forcing into the opening a book case the cover of which is larger than the opening whereby the margin of the cover is bent upwardly against the faces of the folders, hold-downs carried by the forcing means and adapted to engage the margins of the boards, and means for swinging the folders about their pivots to fold the margin of the cover over the boards, and for moving the hold-downs away from the edges of the boards.

13. A machine for making book cases having, in combination, a cover support, means for placing a cover upon said support, means for placing boards upon the cover and for moving the support to and causing it to remain for an interval at each of two different levels, a pair of folders located at each of the two levels and angularly movable about axes substantially parallel to the adjacent edges of the boards, and means for swinging the folders about their axes to fold the margin of the cover over the boards.

14. A machine for making book cases having, in combination, a frame having an opening therein, a movable cover support located in the opening, means for applying adhesive to a cover and for placing the cover upon the support, means for placing boards upon the cover and for forcing the cover and boards into the opening whereby the margin of the cover is bent upward, pivoted folders arranged at different levels in the opening, means for moving the cover and boards to said levels, and means for swinging the folders about their pivots to fold the margin of the cover over the boards.

15. A machine of the class described having, in combination, a support for the cover and boards of a book case, a folder, a picker-head for placing the boards on the cover and for holding the boards and cover against the support during the folding operation, a hold-down for engaging a margin of a board, and means for pivotally mounting the hold-down on the picker-head.

16. A machine of the class described having, in combination, a support for the cover and boards of a book case, folding mechanism, a picker-head for placing the boards on the cover and for holding the boards and cover against the support during the operation of the folding mechanism, hold-downs for engaging opposed margins of the boards during the folding operation, and means for pivotally mounting the hold-downs on the picker-head.

17. A machine of the class described having, in combination, a support for the cover and boards of a book case, there being a substantially rectangular opening in the frame of the machine to receive the support, pivoted folders arranged in said opening, means for moving the boards and cover into the field of action of the folders, and reciprocating actuators for engaging the folders and swinging them about their pivots.

18. A machine of the class described having, in combination, mechanism for folding a cover over a board, a support for a board, a picker-head, means for causing the picker-head to descend upon the board and to lift it and transfer it to a cover, a lifter adapted to extend over the margin of the board and to co-operate with the picker-head in lifting the board, a member carried by the picker-head and adapted to engage the margin of the board during the folding operation, and means for moving the member into a position to permit it to pass by the lifter when the picker-head descends upon the board.

19. A machine of the class described having, in combination, mechanism for folding a cover over a board, a support for a board, a picker-head, means for causing the picker-head to descend upon the board and to lift it and transfer it to a cover, a sucker normally located above the margin of the board while the board is on the support, a hold-down carried by the picker-head and adapted to engage the margin of the board during the folding operation, and means for moving the hold-down into a position to permit it to pass by the sucker when the picker-head descends upon the board.

20. A machine of the class described having, in combination, folding mechanism adapted to receive a cover, a support for a stack of boards, a picker-head, means for causing the picker-head to approach the stack remove a board therefrom and transfer it to the cover, a lifter adapted to engage the

margin of the board and to bend the margin away from the stack to ensure the removal of one board only by the picker-head, a hold-down mounted on the picker-head and normally held in position to engage said margin of the board, and means for moving the hold-down out of the way of the lifter when the picker-head approaches the stack.

21. A machine of the class described having, in combination, folding mechanism adapted to receive a cover, a support for a stack of boards, a picker-head, means for causing the picker-head to descend upon the top of the stack and to transfer a board from the stack to the cover, a sucker normally located above the stack and adapted to lift up the edge of the top board to ensure the removal of only one board at a time by the picker-head, a hold-down mounted on the picker-head and adapted to engage said margin of the board during the folding operation in the same locality in which it was engaged by the sucker, and means for moving the hold-down out of the way of the sucker when the picker-head descends upon the stack of boards.

22. A machine of the class described having, in combination, folding mechanism adapted to receive a cover, a support for a stack of boards, a picker-head, means for causing the picker-head to descend upon the top of the stack and to transfer a board from the stack to the cover, a lifter normally located above the margin of the board, a hold-down adapted to engage the margin of the board during the folding operation, said hold-down being pivotally mounted on the picker-head, a member carried by the picker-head, movement of which swings the hold-down about its pivot, and a stop located adjacent to the support for the stack in position to engage and move said member when the picker-head descends.

23. A machine of the class described having, in combination, folding mechanism, a support for a stack of boards, a suction feeder adapted to remove a board from the stack and transfer it to the folding mechanism, a sucker for holding up an edge of the board to facilitate its removal from the stack, and a blower for directing a blast of air between the board and the stack.

24. A machine of the class described having, in combination, folding mechanism, a support for a stack of boards, a feeder adapted to remove a board from one end of the stack and transfer it to the folding mechanism, a sucker normally resting against the margin of the end board, means for moving the sucker to cause it to hold the margin of the board away from the stack at the time of the removal of the board, means for directing a blast of air between the board and the stack, and means acting during the movement of the feeder away from the stack to move the sucker away from the feeder.

25. A machine of the class described having, in combination, folding mechanism, a support for a stack of boards, a feeder adapted to approach the stack, to engage the top board thereof, to lift the board and to transfer it to the folding mechanism, a lifter for holding up the margin of the board at a time when the feeder is in engagement with it, and means for moving the lifter to one side during the rise of the feeder.

26. A machine of the class described having, in combination, folding mechanism, a support for a stack of boards, a feeder adapted to approach the stack, to engage an end board thereof, to move the board away from the stack and to transfer it to the folding mechanism, means for engaging a margin of the board and bending it away from the stack to aid the feeder in separating the board from the stack, and means for thereafter moving said means out of the path of the board.

27. A machine of the class described having, in combination, folding mechanism adapted to receive a cover, a support for a stack of boards, means tending to move said support upwardly, a toothed member connected to the support, a pawl normally in engagement with the toothed member to determine the level of the top of the stack, said level being above that of the folding mechanism, a feeder movable to engage the topmost board of the stack, to push the stack down, to rise and carry the board into position above the folding mechanism, to lower the board upon the cover, to move down to present the cover to the folding mechanism and to rise again, means for rendering the pawl inoperative when the stack is being pushed down by the feeder and for rendering it operative when the stack is rising, and means for depressing the stack a second time and permitting it to rise again when the feeder is moving down and up in the locality of the folding mechanism.

28. A machine of the class described having, in combination, folding mechanism, a support for a stack of boards, a spring tending at all times to move said support upwardly, a pawl normally operative for limiting the extent of such movement and thereby determining the level of the top of the stack, a feeder adapted to engage the topmost board of the stack, to press the stack down and to rise and transfer said board to the folding mechanism, and means for rendering the pawl inoperative during the downward movement of the stack and for rendering it operative again during the upward movement of the stack.

29. A machine of the class described having, in combination, a support for the stack of blanks, means tending to move said support upwardly, a locking member normally en-

gaging the support to limit the exent of its upward movement, a feeder adapted first to push the stack down and then to rise and carry away the topmost blank of the stack, and means for disengaging the locking member from the support and for permitting it to engage the support again during the movements of the stack.

30. A machine of the class described having, in combination, a support for a stack of blanks, yielding means tending at all times to move said support upwardly, a locking member normally engaging the support to limit the extent of its upward movement, a feeder adapted first to push the stack down and then to rise and carry away the topmost blank of the stack, means for disengaging the locking member from the support and for permitting it to engage the support again during the movements of the stack, and means for pushing the stack down a second time before the feeder returns for a second blank.

31. A machine of the class described having, in combination, a support for a stack of blanks, a spring tending at all times to move said support upwardly, a toothed member connected to the support, a pawl normally in engagement with the toothed member to determine the level of the top of the stack, a feeder adapted to engage the topmost blank of the stack to push the stack down and to rise and carry away said blank, and means operating during the downward movement of the feeder for rendering the pawl inoperative and during the upward movement of said feeder for rendering the pawl operative.

32. A machine of the class described having, in combination, a support for a stack of blanks, a spring tending at all times to move said support upwardly, a toothed member connected to the support, a pawl normally in engagement with the toothed member to determine the level of the top of the stack, a feeder adapted to engage the topmost blank of the stack to push the stack down and to rise and carry away said blank, means operating during the downward movement of the feeder for rendering the pawl inoperative and during the upward movement of said feeder for rendering the pawl operative, and means for pushing the stack down a second time and releasing it before the feeder returns for a second blank.

33. A machine of the class described having, in combination, a support for a stack of blanks, a spring tending at all times to move said support upwardly, a toothed member connected to the support, a pawl normally in engagement with the toothed member to prevent upward movement of the support and thereby determine the level of the top of the stack, a feeder adapted to engage the topmost blank of the stack, to push the stack downward, then to rise and carry away said blank, and a member, movement of which withdraws the pawl from engagement with the toothed member, said member being located in the downward path of movement of the feeder.

34. A machine of the class described having, in combination, a support for a stack of blanks, means for lifting the topmost blank from the stack, and abutments extending slightly over opposite margins of the topmost blank whereby said blank is buckled when it is lifted.

35. A machine for folding the margins of the cover of a book case over the boards thereof having, in combination, a support for the work, a folder angularly movable about an axis parallel to and near the surface of the work support, and means for swinging the folder about said axis to fold a margin of the cover over a board.

36. A machine of the class described having, in combination, a support for a piece of work, a folder pivotally movable about an axis parallel to the surface of the work support and spaced therefrom a distance equal to the thickness of the folded work, and means for swinging the folder about its axis of pivotal movement to fold the margin over the body portion of the work.

37. A machine for folding the margin of the cover of a book case over the boards thereof having, in combination, a support for the case, a folder pivotally movable about an axis parallel to the surface of said support and spaced therefrom a thickness equal to the thickness of the case, means for bending a margin of the cover and causing it to occupy a position located in the path of movement of the folder, and means for swinging the folder about its axis of pivotal movement.

38. A machine of the class described having, in combination, mechanism for folding a cover over a board, a support for a board, a picker-head, means for causing the picker-head to descend upon a board and to lift it and transfer it to a cover, a lifter adapted to extend over a margin of the board and to cooperate with the picker-head in lifting the board, a member carried by the picker-head and adapted to engage the margin of the board during the folding operation, and means for producing relative movement between the lifter and the member such that the lifter will be out of the path of the descending member.

39. A machine of the class described having, in combination, folding mechanism adapted to receive a cover, a support for a stack of boards, a picker-head, means for causing the picker-head to descend upon the top of the stack and to transfer a board from the stack to the cover, a lifter adapted to engage a margin of a board of the stack, a hold-down carried by the picker-head and adapted to engage the margin of the board during

the folding operation, a member carried by the picker-head, movement of which moves the hold-down inwardly of the picker-head, and means becoming operable before the picker-head has descended upon the stack for operating the member.

40. A machine of the class described having, in combination, a support for a stack of blanks, yielding means tending to move the support upwardly, locking means normally engaging the support to limit the extent of its upward movement, a feeder adapted to remove the blanks one by one from the top of the stack, and means for disengaging the locking member from its support and for permitting it to engage the support again during each complete movement of the feeder.

41. A machine of the class described having, in combination, a support for a stack of blanks, means tending to move said support upwardly, locking means normally engaging the support to limit the extent of its upward movement, a feeder adapted first to move down into operative relation to the topmost blank of the stack and then to rise and carry away said topmost blank, and means for disengaging the locking means from the support and for permitting it to engage the support again during the movements of the feeder toward and from the stack.

42. A machine of the class described having, in combination, a support for a stack of blanks, yielding means tending to move said support upwardly, locking means normally engaging the support to limit the extent of its upward movement, a feeder adapted first to move down into operative relation to the topmost blank of the stack and then to rise and carry away said topmost blank, and means for disengaging the locking means from the support and for permitting it to engage the support again during the movements of the feeder toward and from the stack.

43. A machine of the class described having, in combination, a support for a stack of blanks, means tending to move said support upwardly, locking means normally engaging the support to limit the extent of its upward movement, a suction feeder adapted first to move down into operative relation to the topmost blank of the stack and then to rise and carry away said topmost blank, and means for disengaging the locking means from the support and for permitting to it to engage the support again during the movements of the feeder toward and from the stack.

44. A machine of the class described having, in combination, a support for a stack of blanks, means tending to move said support upwardly, locking means normally engaging the support to limit the extent of its upward movement, a feeder, means for moving said feeder down to engage the topmost blank of the stack and then up to carry away said blank, and means operating during the downward movement of the feeder to disengage the locking means from the support and during the upward movement of the feeder to reengage the locking means with the support.

45. A machine of the class described having, in combination, a support for a stack of blanks, means tending to move said support upwardly, locking means normally engaging the support to limit the extent of its upward movement, a suction feeder, means for moving said feeder down to engage the topmost blank of the stack and then up to carry away said blank, and means operating during the downward movement of the feeder to disengage the locking means from the support and during the upward movement of the feeder to reengage the locking means with the support.

46. A machine of the class described having, in combination, a support for a stack of blanks, means tending to move said support upwardly, locking means normally engaging the support to limit the extent of its upward movement, a fixed abutment overhanging the top of the stack and thereby providing a limit above which the top of the stack cannot rise, a blower for directing a blast of air against the edges of the upper blanks of the stack, a feeder adapted first to move down into operative relation to the topmost blank of the stack and then to rise and carry away said topmost blank, and means for disengaging the locking means from the support during the downward movement of the feeder and for reengaging the locking means with the support during the upward movement of the feeder.

47. A machine of the class described having in combination, a support for a stack of blanks, means tending to move said support upwardly, locking means normally engaging the support to limit the extent of its upward movement, a fixed abutment overhanging the top of the stack and thereby providing a limit above which the top of the stack cannot rise, a blower for directing a blast of air against the edges of the upper blanks of the stack, a sucker for lifting a margin of the topmost blank of the stack, a feeder adapted first to move down into operative relation to the topmost blank of the stack and then to rise and carry away said topmost blank, and means for disengaging the locking means from the support during the downward movement of the feeder and for reengaging the locking means with the support during the upward movement of the feeder.

48. A machine for folding the margins of the cover of a book case over the boards thereof having, in combination, a support for the

work, a slidingly adjustable folder supporting member, a folder carried by said member, said folder being angularly movable about a horizontal axis, and means for swinging the folder about said axis to fold a margin of the cover over a board.

In testimony whereof I have signed my name to this specification.

WALTER STEINMANN.