E. CRAIG.
METAL BOUND BOX BLANK STAPLING MACHINE.
APPLICATION FILED JUNE 16, 1910.
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Patented Nov. 21, 1916.
9 SHEETS—SHEET 4.

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Nov. 21
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To all whom it may concern:

Be it known that I, Edward Craig, a citizen of the United States of America, and resident of St. Joseph, Berrien county, Michigan, have invented a certain new and useful Improvement in Metal-Bound-Box-Blank-Stapling Machines, of which the following is a specification.

My invention relates to machinery for making metal bound box blanks.

It relates more especially to the manufacture of metal bound boxes having sheet metal binding along the edges of the blank, the said binding having a flange by means of which the end walls of the box are afterward secured in place.

My invention contemplates, broadly, a machine that is operative to drive staples through the sheet metal binding to fasten the same to the different sections of the blank, and which will clench the staples upon the lower or inner surface of the sheet material, whereby each staple extends through the veneer of the blank and one thickness of the metal binding. It also contemplates a machine for this purpose which will, in addition to driving staples through the sheet metal binding along the edges of the blank, insert flat staples to connect together the edges of the different sections of the blank, which flat staples thereby serve as flexible hinges when the blank is folded, and prevent the corners of the box from opening.

It is also an object of my invention, in addition to the above, to provide an improved feed mechanism for feeding the wire for the staples; to provide means whereby the mechanism which feeds the flat wire—that is to say, the wire from which the flat staples are made—may be controlled at will to prevent driving of such staples at points where they are not needed; to provide an improved reversible clench-block arrangement, which is adapted to be controlled at will to clench either prong or point of the staple, leaving the other prong or point unclenched; to provide a rubber or other yielding clench-block which will support a staple while it is being driven, but which will prevent clenching thereof; and to provide certain details and features of improvement and combinations tending to increase the general efficiency of a machine of this particular character.

To the foregoing and other useful ends, my invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings—Figure 1 is a side elevation of a box blank stapling machine embodying the principles of my invention. Fig. 2 is a front elevation of the said machine. Fig. 3 is a plan of the same. Fig. 4 is a vertical section on line 4-4 in Fig. 2. Fig. 5 is an enlarged section on line 5-5 in Fig. 2. Fig. 6 is an enlarged section on line 6-6 in Fig. 2. Fig. 7 is a plan of the mechanism shown in Fig. 5. Fig. 8 is a vertical section on line 8-8 in Fig. 7. Fig. 9 is a rear elevation of the lower portion of the mechanism shown in Fig. 7. Fig. 10 is a plan view of the mechanism shown in Fig. 6. Fig. 11 is a vertical section on line 11-11 in Fig. 10. Fig. 12 is a rear elevation of the lower portion of the mechanism shown in Fig. 10. Fig. 13 is an enlarged fragmentary plan view of the reversible clench-block mechanism. Fig. 14 is a perspective of a metal bound box blank of the kind manufactured by my improved machine. Fig. 15 is an enlarged section through a portion of said box blank, showing the staple inserted through the upper layer of the sheet metal binding, and clenched on the lower layer of said binding, whereby the staple extends only through the upper layer of the binding and the veneer of the blank, but not through the lower or inner thickness of said binding. Fig. 16 is an enlarged fragmentary sectional view of a portion of the blank, showing one of the staples which serve as hinges between the sections of the blank, and which hold the corners of the box together when the blank is folded. Fig. 17 is an enlarged cross section of one of the guides of the machine, showing one edge of the blank in cross section thereon, illustrating the manner in which the sheet metal binding of the blank is engaged by the guides to keep the blank moving in a straight direction.

As thus illustrated, my invention comprises a base A, upon which are mounted the vertical side members B of the frame. These side members are connected at their upper ends by means of a cross bar or member 5 and at a point below the same by a stationary bar or cross head 5'. The reciprocating head C is of the usual form or construction, and is arranged to slide up and down in guide-ways provided in the mem-
bers B, being actuated by pitmen c which are connected with cams on the drive shaft D. The said shaft is operated and controlled in any suitable manner. A table E is supported upon the members B, being adjustable up and down, and is provided with the horizontal and parallel guides e which extend longitudinally of the machine. Between these guides, clench-blocks F are provided and mounted upon the table E, being adjustable upon the latter, whereby the width of the blank may be varied at will. The staplers G are mounted above the guides e, and are adapted to drive staples made from round wire. The staplers II are mounted above the clench blocks F, and are adapted to drive flat staples—that is to say, staples made from flat wire, or from flat strips of sheet metal. All of said staples are mounted upon the stationary cross head b', and are operated by the vertically reciprocating cross head C, in the usual and well known manner. The distance between the said staplers can be varied at will, depending upon the width desired for the blanks. The blanket to be made by this machine is shown in Fig. 11. It comprises four flexibly connected sections consisting of strips of veneer 1, 2, 3, 4, which have their edges slightly spaced apart, and which are connected by the sheet metal binding I. This binding, it will be seen, is folded upon and around the side edges of the said blank, so as to provide upper and lower layers i, j, which latter has a downwardly or upwardly disposed thereof. It is through the use of these flanges that the staple is imposed upon and through the staple in the usual manner. The said binding is provided with notches p at points opposite the space between the edges of the veneer, whereby the blank can be easily folded around the end walls of the box. The sections of the blank are also connected by means of the staples J, which latter straddle the cracks or spaces between the edges of the veneer, thus serving as hinges when the blank is folded, and preventing the corners of the box from gaping. The flat staples J, at one end of the blank, are left with their outer points or prongs un bent, whereby they may be inserted through the other edge of the blank when the latter is folded to close the box.

As shown in Fig. 17, the binding I is engaged by the guide c, the latter being in the nature of a T-iron which presents one side or channel thereof to the folded edge portion of the sheet metal binding, thus supporting the blank and preventing sidewise displacement thereof. Also the arrangement prevents distortion of the flanges p of the binding, as no weight or pressure is imposed upon these flanges during the stapling operations. The staplers G drive the staples K through the sheet metal binding and into the veneer of the blank, as shown in Fig. 17, the prongs or points of said staples being clenched or bent upon the lower thickness p of the binding.

The staplers G are of the ordinary and well known character, and may be of any construction, except for the provision of the finger g that extends between the points of the staple to prevent the latter from being deflected toward each other when they strike the metal of the binding. The said staple comprises, therefore, as shown in Fig. 11, a driver g' secured to the cross head C, a staple former g", and a loop bar g", which cooperate to form and drive the staple in the usual and well known manner. The staple former g" has the finger g pivotally secured thereto, which finger is connected by a rod and spring g' with the cross head C, whereby the staple former g" is subject to spring pressure to permit it to cease moving downward when a staple strikes the work. A latch g" is provided for locking the staple former to the staple driver, and a cam g" serves to operate said latch and hereby release the staple former and permit the staple driver to continue the downward motion alone—that is to say, without moving the staple former after the latter strikes the work. This is in accordance with the staple formerly shown in Fig. 11. It comprises four flexibly connected sections consisting of strips of veneer 1, 2, 3, 4, which have their edges slightly spaced apart, and which are connected by the sheet metal binding I. This binding, it will be seen, is folded upon and around the side edges of the said blank, so as to provide upper and lower layers i, j, which latter has a downwardly or upwardly disposed thereof. It is through the use of these flanges that the staple is imposed upon and through the staple in the usual manner. The said binding is provided with notches p at points opposite the space between the edges of the veneer, whereby the blank can be easily folded around the end walls of the box. The sections of the blank are also connected by means of the staples J, which latter straddle the cracks or spaces between the edges of the veneer, thus serving as hinges when the blank is folded, and preventing the corners of the box from gaping. The flat staples J, at one end of the blank, are left with their outer points or prongs un bent, whereby they may be inserted through the other edge of the blank when the latter is folded to close the box.

As shown in Fig. 17, the binding I is engaged by the guide c, the latter being in the nature of a T-iron which presents one side or channel thereof to the folded edge portion of the sheet metal binding, thus supporting the blank and preventing sidewise displacement thereof. Also the arrangement prevents distortion of the flanges p of the binding, as no weight or pressure is imposed upon these flanges during the stapling operations. The staplers G drive the staples K through the sheet metal binding and into the veneer of the blank, as shown in Fig. 17, the prongs or points of said staples being clenched or bent upon the lower thickness p of the binding.

The staplers G are of the ordinary and well known character, and may be of any suitable construction, except for the provision of the finger g that extends between the points of the staple to prevent the latter from being deflected toward each other when they strike the metal of the binding. The said staple comprises, therefore, as shown in Fig. 11, a driver g' secured to the cross head C, a staple former g", and a loop bar g", which cooperate to form and drive the staple in the usual and well known manner. The staple former g" has the finger g pivotally secured thereto, which finger is connected by a rod and spring g' with the cross head C, whereby the staple former g" is subject to spring pressure to permit it to cease moving downward when a staple strikes the work. A latch g" is provided for locking the staple former to the staple driver, and a cam g" serves to operate said latch and hereby release the staple former and permit the staple driver to continue the downward motion alone—that is to say, without moving the staple former after the latter strikes the work. This is all well known and understood, and the finger g constitutes the only special provision, as this is necessary in view of the fact that the staples are driven through a layer of sheet metal. Were it not for this finger, which is automatically inserted between the points of the staple at the proper time, by the pressure of the spring g', the said stapler might not puncture the metal, and would be liable to be deflected. The said finger, however, keeps the points of the staple from being clenched on that toward each other, and compels the same to puncture the metal and pass through the veneer of the blank. Then the staple points are bent upon the lower or inner thickness of the metal binding, as shown in Fig. 15.

The staplers II are of similar construction, as shown in Fig. 5, except that they do not involve the finger g of the other staplers. These staplers II are adapted to drive the wide flat staples J, and are actuated by the cross head b', all four staplers being operated simultaneously.

Each stapler G has a feed mechanism consisting of feed rolls L which are geared together, as shown in Fig. 6. A rock shaft M is mounted just back of the staplers and extends through the upper or lower of the feed rolls L, being supported in bracket bearings m on the frame. The said shaft is provided with loose ratchet wheels l, and with crank arms P which are keyed thereto, and which are provided with dogs F which engage the said ratchet wheels. The rock shaft M is mounted just back of the staplers and extends through the upper or lower of the feed rolls L, being supported in bracket bearings m on the frame. The said shaft is provided with loose ratchet wheels l, and with crank arms P which are keyed thereto, and which are provided with dogs F which engage the said ratchet wheels.
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The shaft M is operated by a suitable connection N with the drive shaft D, in the usual and well known manner, whereby the shaft M is rocked or oscillated to cause the dogs P to actuate the ratchet wheels Q and to thus operate the feed rolls L for feeding the wire to the staplers. The locking dogs O are arranged to engage the said ratchet wheels to prevent backward rotation of the shaft and feed rolls. In this way the round wire is intermittently fed to the staplers G and the staples K are formed and driven.

The staplers H are each provided with feed mechanism of the kind shown in Fig. 5. Each feed mechanism comprises upper and lower feed rolls P, which are gear-connected together, the upper or larger roll being loosely mounted on the shaft M. The ratchet wheel Q, comprised in each feed mechanism, is rigid with the upper roll, but loose on the shaft. The arms R are rigidly secured to the shaft M and are each provided with a dog r, which dogs engage the ratchet wheels Q. A cam or throw-out S is associated with each dog r and arranged loosely upon the said shaft M, whereby the dogs r can be prevented from actuating the ratchet wheel Q, when it is desired to prevent the staplers H from driving the staples.

The cams or throw-outs S are connected by links s with the crank arms s' on a rock shaft s", whereby the said cams or throw-outs can be adjusted at will to prevent feeding of the flat wire and to thereby prevent driving of the flat staples. The shaft s" is provided with a handle s, which is connected by a spring s' with the frame, said handle being adapted to work between the stops s", s', and held in normal position by the said spring. The staplers H will drive the said staples, under normal conditions; but when the operator throws the handle s" upward against the tension of the spring s', the dogs r are prevented from actuating the ratchet wheels, and as the flat wire is thus prevented from being fed, no flat staples are driven.

In Fig. 5 the mechanism is shown in condition for feeding the flat wire, but in Fig. 1 the handle s" is shown in its raised position, whereby the dogs r are thrown out of engagement with the ratchet wheels Q, thus preventing a feeding of the flat wire. In this way the flat staples are driven where needed, and during the passage of intermediate portions of the blank no flat staples are driven, notwithstanding that all four staplers are actuated each time the cross head C moves downward. In other words, the operator controls the staplers H to drive the flat staples at the edges of the veneer, but not at points intermediate such edges.

The staplers H are each provided with a clench-block F, as previously stated. The two clench-blocks are alike, and a description of one will be sufficient. The mechanism thereof is shown in Fig. 13. These clench-blocks are for clenching the points of the staples J, j. Each clench-block mechanism comprises a metal block f of a character to bend or deflect the point of the staple, and a rubber block f' associated therewith. There is also another metal block f' for the other point of the staple, and another rubber block f' which is allotted there to. The blocks f, f', are movable with the reciprocating rod f, and the blocks f, f' are movable with the rod f. The two rods are controlled by a hand lever f, and both rods are subject to spring tension tending normally to shift them to the left, as by means of springs f', as shown in Fig. 2.

When the hand lever f is in the position shown in Fig. 13, then the metal blocks f, f', are opposite each other and both points of the staple will be clenching. Obviously, however, only one point of the staple must be clenching, the other point being left un-bent. This is accomplished by moving the hand lever f to the position shown in dotted lines in Fig. 13. This brings the rubber block f' opposite the metal block f, and as the rubber will not clench the staple, one point thereof is left un-bent, as shown in Fig. 14. If the staples j are to be applied to the other end of the blank, then the hand lever f is operated to shift the rubber block f' into a position opposite the metal block f', so that one end of the staple is clenching and the other left un-bent, in the manner already described. These staples can be driven at either end edge of the blank, and the overhanging portions of the staples left un-bent, thus adapting the said staples for use in closing the box. The rubber blocks f, f' are, therefore, adapted to alternate with each other, depending upon which end of the blank is to be supplied with the projecting staples. The said rubber blocks serve as yielding supports for the staples, to prevent the same from falling down, but prevent clenching or bending thereof. It is obvious that various yielding supports or clench block arrangements can be employed without departing from the spirit of my invention. In the case of the staples H, as shown in Fig. 8, the loop bars T are provided with pointers or indicators t to enable the operator to properly position the blank to receive the staples J, j. When the blank is so adjusted that this pointer t is above the crack or slight space between the edge of the veneer, it is then in proper position to receive the staples J. Thus it is only necessary to bring the space between the section of the blank in alignment with the pointer or indicator t in order to properly locate the staples J. The staples j are located in a similar manner by pushing the blank along.
6. In a stapling machine, means for clenching one point of the staple, and a yielding support for the other point, to prevent clenching thereof.

7. In a metal bound blank stapling machine, means for stamping the sheet metal to the blank, along the edges thereof, means for applying flat staples to serve as hinges between the sections of the blank, and controlling means whereby the flat staples are properly located.

8. A machine for making box blanks having sheet material to form the sides of the box, and having sheet-metal binding extending lengthwise on the outer surface of the blank to flexibly connect together the sections along the side edges thereof, with right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising means for engaging said binding to hold the blank against displacement, constructed and arranged to support the blank without weight on said flanges, mechanism for inserting staples through the binding and the sheet material, and means to cause the clenching of the staples on the inner surface of the sheet material at one side of said flanges.

9. A machine for making box blanks having sheet material to form the sides of the box, and having sheet-metal binding extending lengthwise on the outer surface of the blank to flexibly connect together the sections along the side edges thereof, with right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising means for engaging said binding to hold the blank against displacement, constructed and arranged to support the blank without weight on said flanges, mechanism for inserting staples through the binding and the sheet material, said means including parallel stationary guides which engage the under side of said binding, and means to cause the clenching of the staples on the inner surface of the sheet material at one side of said flanges.

10. A machine for making box blanks having sheet material to form the sides of the box, and having sheet-metal binding extending lengthwise on the outer surface of the blank to flexibly connect together the sections along the side edges thereof, with right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising means for engaging said binding to hold the blank against displacement, constructed and arranged to support the blank without weight on said flanges, mechanism for inserting staples through the binding and the sheet material, said mechanism including staples having means to insert the staples through.

11. A machine for making box blanks having sheet material to form the sides of the box, and having sheet-metal binding extending lengthwise on the outer surface of the blank to flexibly connect together the sections along the side edges thereof, with right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising means for engaging said binding to hold the blank against displacement, constructed and arranged to support the blank without weight on said flanges, mechanism for inserting staples through the binding and the sheet material, said mechanism including staples having means to insert the staples through.

12. A machine for making box blanks having sheet material to form the sides of the box, and having sheet-metal binding extending lengthwise on the outer surface of the blank to flexibly connect together the sections along the side edges thereof, with right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising means for engaging said binding to hold the blank against displacement, constructed and arranged to support the blank without weight on said flanges, mechanism for inserting staples through the binding and the sheet material, said mechanism including staples having means to insert the staples through.

13. A machine for making box blanks having sheet material to form the sides of the box, and having sheet-metal binding extending lengthwise on the outer surface of the blank to flexibly connect together the sections along the side edges thereof, with right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising means for engaging said binding to hold the blank against displacement, constructed and arranged to support the blank without weight on said flanges, mechanism for inserting staples through the binding and the sheet material, said mechanism including staples having means to insert the staples through.
the binding, and means to cause the clenching of the staples on the inner surface of the sheet material at one side of said flanges.

11. A machine for making box blanks having sheet material to form the sides of the box, and having sheet-metal binding extending lengthwise on the outer surface of the blank to flexibly connect together the sections along the side edges thereof, with right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising means for engaging said binding to hold the blank against displacement, constructed and arranged to support the blank without weight on said flanges, mechanism for inserting staples through the binding and the sheet material, said means having portions to solidly support the binding and thereby adapt the said portions to be utilized as clench blocks for the staples, and means to cause the clenching of the staples on the inner surface of the sheet material at one side of said flanges.

12. A machine for making box blanks having sheet material to form the sides of the box, and having metal binding extending lengthwise of the blank to flexibly connect together the sections thereof, comprising means for engaging said binding to hold the blank against displacement, mechanism for stapling the binding to the sheet material, devices for applying flexible hinges to connect the sections of the blank, a reciprocating member for operating said mechanism and devices, and means to control said devices at will and without interfering with said mechanism.

13. A machine for making box blanks having sheet material to form the sides of the box, and having metal binding extending lengthwise of the blank to flexibly connect together the sections thereof, comprising means for engaging said binding to hold the blank against displacement, mechanism for stapling the binding to the sheet material, devices for applying flexible hinges to the blank, and means for gagging the position of the blank to receive said hinges.

14. A machine for making box blanks having sheet material to form the sides of the box, and having metal binding extending lengthwise on the outer surface of the blank to flexibly connect together the sections thereof, with right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising means for engaging said binding to hold the blank against displacement, constructed and arranged to support the blank without weight on said flanges, mechanism for stapling the binding to the sheet material, said mechanism being arranged to drive the staples with their heads extending longitudinally of said binding at one side of the vertical planes of said flanges.

15. A machine for making box-blanks by stapling sheet-metal binding to sheet material along the side edges of the blank, to flexibly connect together the sections of the blank, with the right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising staplers capable of driving staples through said binding into said sheet material, and means for guiding the blank under said staplers that the staples are driven at one side of the vertical planes of said flanges, said means being so constructed and arranged that said flanges are not subject to pressure by said staplers, thereby to prevent distortion of said flanges.

16. A machine for making box-blanks by stapling sheet-metal binding to sheet material along the side edges of the blank, to flexibly connect together the sections of the blank, with the right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising staplers capable of driving staples through said binding into said sheet material, and means for so guiding the blank under said staplers that the staples are driven at one side of the vertical planes of said flanges, said means being so constructed and arranged that said flanges are not subject to pressure by said staplers, thereby to prevent distortion of said flanges, and said means having portions which engage the binding to prevent lateral displacement thereof from the edges of the sheet material.

17. A machine for making box-blanks by stapling sheet-metal binding to sheet material along the side edges of the blank, to flexibly connect together the sections of the blank, with the right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising staplers capable of driving staples through said binding into said sheet material, and means for so guiding the blank under said staplers that the staples are driven at one side of the vertical planes of said flanges, said means being so constructed and arranged that said flanges are not subject to pressure by said staplers, thereby to prevent distortion of said flanges, and means to cause the clenching of the staples on the under surface of the sheet material at one side of said flanges.

18. A machine for making box-blanks by stapling sheet-metal binding to sheet material along the side edges of the blank, to flexibly connect together the sections of the blank, with the right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising means for engaging said binding to hold the blank against displacement, constructed and arranged to support the blank without weight on said flanges, mechanism for stapling the binding to the sheet material, said mechanism being arranged to drive the staples with their heads extending longitudinally of said binding at one side of the vertical planes of said flanges.
prising staplers capable of driving staples through said binding into said sheet material, means for so guiding the blank under said staplers that the staples are driven at one side of the vertical planes of said flanges, said means being so constructed and arranged that said flanges are not subject to pressure by said staplers, thereby to prevent distortion of said flanges, and devices to apply flexible connections between the sections of the blank along a line or lines between said binding.

19. A machine for making box-blanks by stapling sheet-metal binding to sheet material along the side edges of the blank, to flexibly connect together the sections of the blank, with the right-angle inner flanges of said binding in position for stapling to box-heads after the blank is finished, comprising staplers capable of driving staples through said binding into said sheet material, and means for so guiding the blank under said staplers that the staples are driven at one side of the vertical planes of said flanges, said means being so constructed and arranged that said flanges are not subject to pressure by said staplers, thereby to prevent distortion of said flanges, said means engaging the binding outside of said flanges.

Signed by me at St. Joseph, Mich., this 31st day of May 1910.

EDWARD CRAIG.

Witnesses:

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WILLIAM H. RAY.