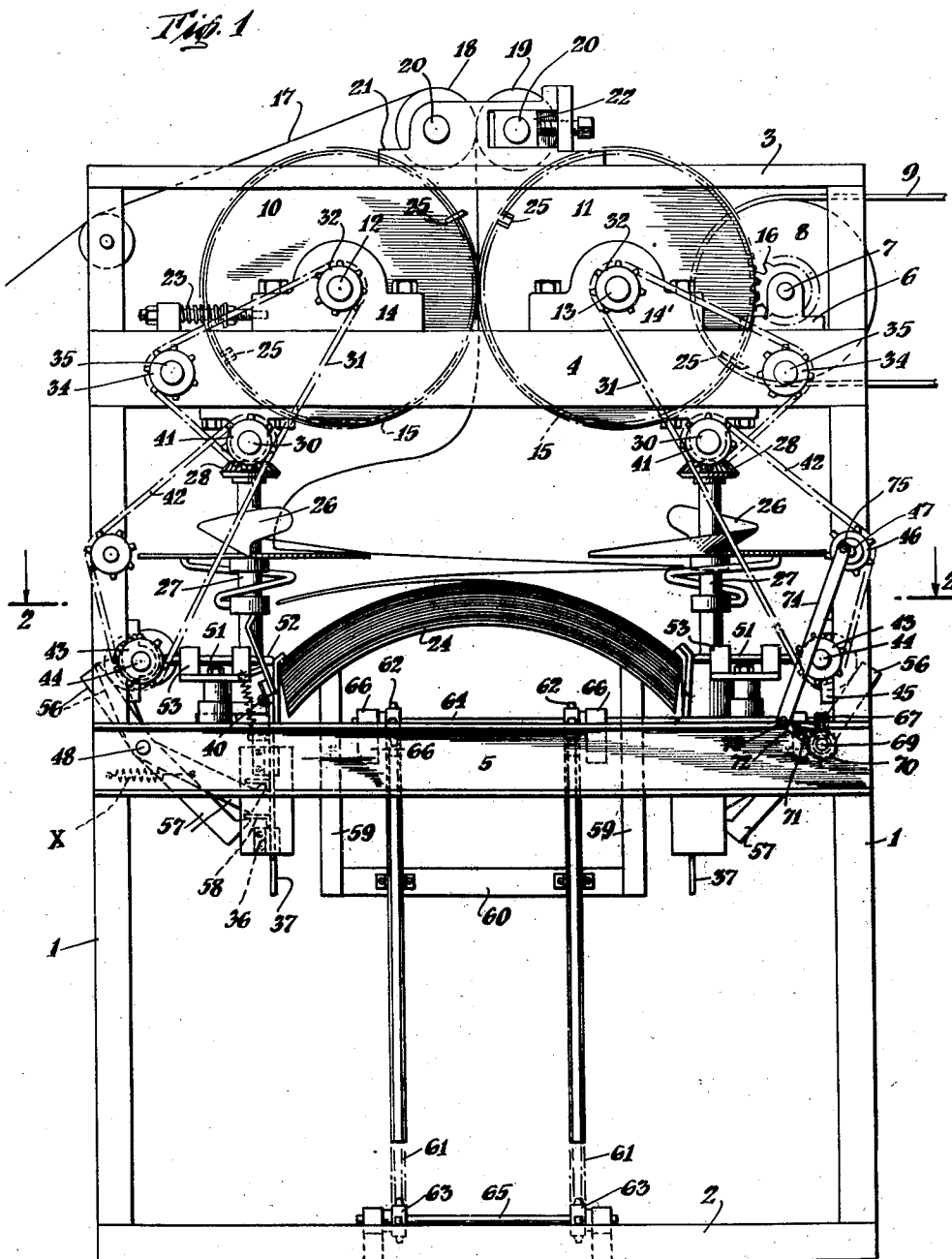


Oct. 3, 1944.

2,359,417

L. T. HAND
METHOD OF AND MACHINE FOR STACKING AND COMPACTING
FOLDED PLIES OF PAPER WEB
Filed March 2, 1943

4 Sheets-Sheet 1



INVENTOR.

Leslie T. Hand

BY
Frederick W. Barker

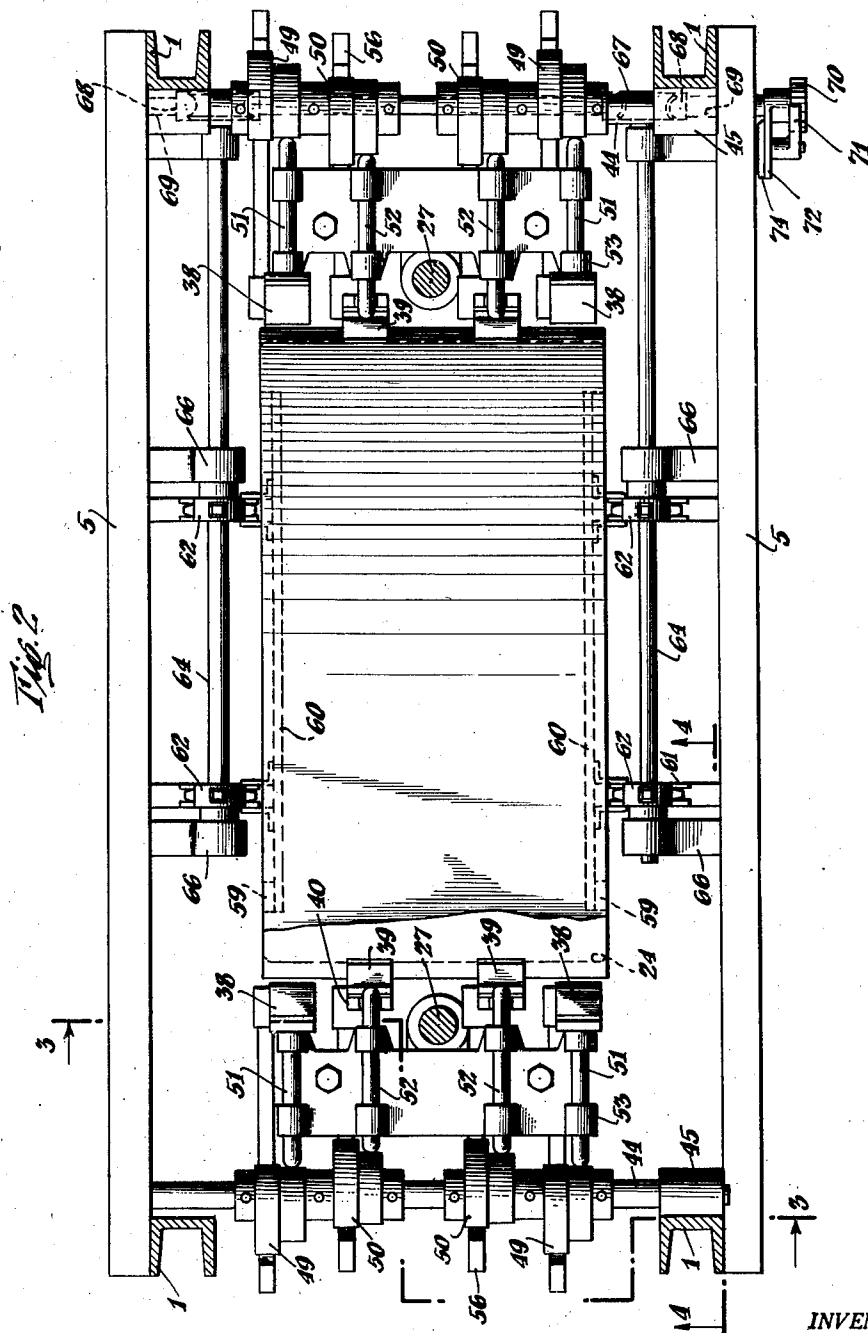
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INVENTOR.

Leslie T. Hand

BY

Frederick W. Barker

ATTORNEY

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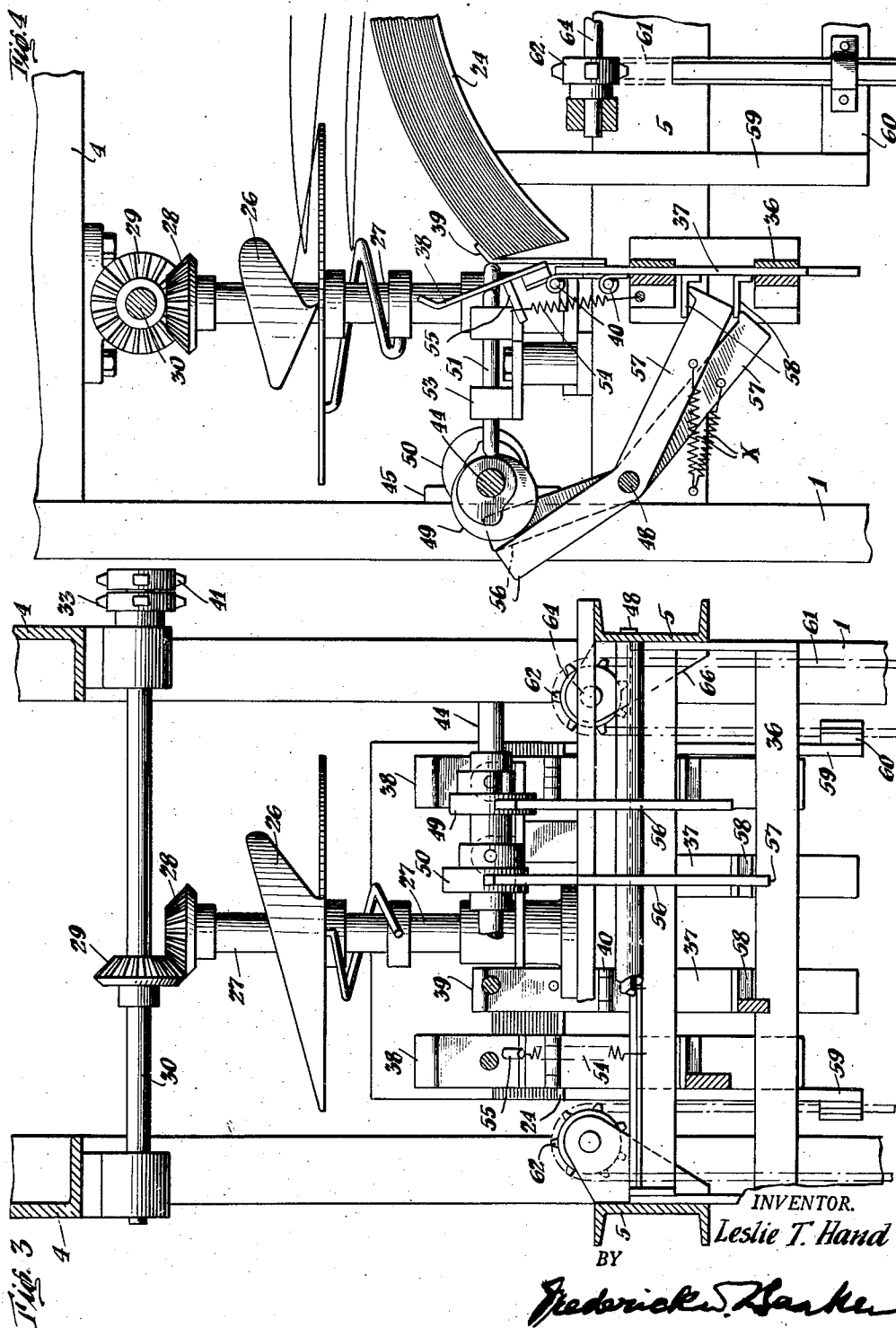
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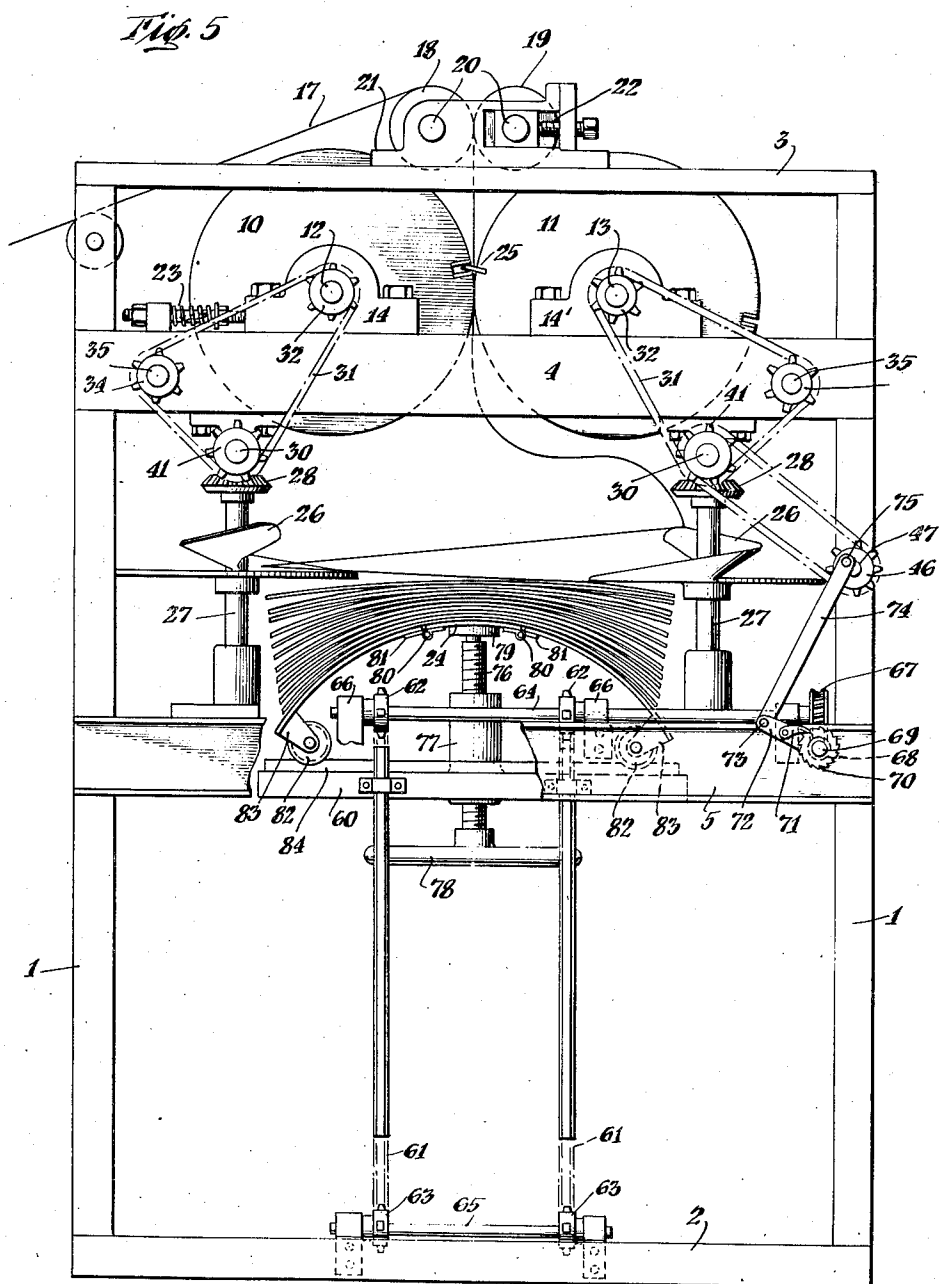


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14. **L. T. HAND**
METHOD OF AND MACHINE FOR STACKING AND COMPACTING
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Filed March 2, 1943 4 Sheet

4 Sheets-Sheet 4



INVENTOR.

Leslie T. Hand

BY

Frederick N. Barker

ATTORNEY

UNITED STATES PATENT OFFICE

2,359,417

METHOD OF AND MACHINE FOR STACKING
AND COMPACTING FOLDED PLIES OF PA-
PER WEBLeslie T. Hand, Brooklyn, N. Y., assignor to
Morsegraph, Inc., New York, N. Y., a corpora-
tion of New York

Application March 2, 1943, Serial No. 477,700

15 Claims. (Cl. 270-73)

This invention relates to machines for folding, stacking and compacting webs of paper as for use in providing strips or tapes to be employed in telegraphic recording instruments, teletype-writers and the like, a machine of this character being described and illustrated in my Patent No. 1,985,676, and my present improvement being directed to means whereby the compacting and stacking of the paper folds is effected more efficiently and expeditiously than has been possible with the instrumentalities previously employed. My present improvement is also applicable to the production of zig-zag or fan fold paper as was the machine of Patent No. 1,985,676.

In my earlier Patent No. 1,985,676 rotating helicoidal members were employed to engage the falling paper folds and to compact them, in succession, upon the stack created thereby. This operation has been quite successful and in commercial usage for a number of years. Now, however, it has become desirable to increase the output of the machine by reason of the greater demand for the product and it is to meet this demand that my present improvement has been devised and developed.

When increasing the output or operating the machine at a higher rate of speed, the rotation of the helicoidal members in frictional contact with the top fold of the resultant stack causes static electrical and other interfering forces which necessitated further invention.

As the interfering forces above referred to were the result of pressure of the top of the folded stack against the under surface of the revolving helicoidal members, my present improvement involved the invention of means to reduce this pressure.

The present machine, like that of Patent No. 1,985,676, has web indenting means that enable the web to fall in folds upon a table on which a stack is formed, and it also employs helicoidal devices for guiding and compacting the folds upon the stack, but now, in addition to these guiding and compacting means I employ means to reduce the pressure between the top fold of the stack and the ultimate compacting means, that is, the helicoidal members or compacting fingers.

This pressure reducing means occurs: (1) through sets of cam operated fingers, or (2) through divided and hinged sections of the table on which the folds are stacked, and (3) through a combination of the cam operated fingers and the hinged table sections.

There are two sets of cam operated fingers, of which one set engages the folds leaving the heli-

coidal members to move said folds toward the stack, and another set of these fingers then firmly compacts the folds upon the stack far more efficiently than occurs when the helicoidal members alone performed the compacting operation.

Other features and advantages of my invention will hereinafter appear.

In the drawings:

Figure 1 is a side elevation of my improved machine, showing the frame supporting the web feed means, the fold receiving table, the guide means and the compacting means.

Figure 2 is a plan view of the same, taken on the line 2-2 of Fig. 1.

Fig. 3 is a section on the line 3-3 of Fig. 2.

Fig. 4 is a section on the line 4-4 of Fig. 2, and

Fig. 5 is a side elevation of my improved machine to show the pressure reducing means through dividing and hinging sections of the table on which the folds are stacked.

The frame of the machine is composed of the uprights 1, base 2 and top members 3. Also there are transverse beams 4 and 5 extended between the uprights 1.

Mounted upon upper beams 4 are bearings 6 in which is journaled a shaft 7 carrying a pulley 8 that is driven by a belt 9 emanating from a suitable source of power (not shown). Rollers 10 and 11 are mounted on shafts 12, 13, respectively, said shafts being journaled in bearings 14, and 14' secured on beams 4 and said rollers are peripherally disposed in juxtaposed position and carry gears 15 that are intermeshed. The gear of roller 11 is shown to be in mesh with a pinion 16 on the pulley shaft 7, the rollers 10, 11 thus being caused to rotate in opposite directions.

A web of paper, indicated at 17, which emanates from a suitable supply source (not herein shown), is caused to pass between a pair of rollers 18, 19, mounted on shafts 20, respectively, said shafts being journaled in bearing members 21 that are secured on top of the frame members 3. The degree of pressure under which the rollers 18, 19 contact the web 17 is governed by adjustment means 22. Also the degree of pressure under which the rollers 10, 11 contact the web 17 is governed by adjustment means 23, operating with respect to bearing members 14, for which purpose said bearing members are slidably mounted on beam 4.

The web 17, leaving rollers 10, 11, is caused to fall upon a table 24, being guided thereto in a manner to be described hereinafter.

Table 24 is upwardly convex so that the stack of paper web falling thereon will not assume a

concave surface curvature, as set forth in my earlier Patent No. 1,985,676.

The paper web 17, in passing between rollers 10, 11 is creased, as by the indenting means, indicated at 25, similar to the indenting means of my said earlier patent, to thus be caused to fall in folds upon the table. The helicoidal members 26 for lightly compressing the folds of paper are mounted on vertical shafts 27, which are operatively connected respectively to the horizontal shafts 30 by bevel gears 28 and 29. The shafts 30 are operatively connected respectively to the roller shafts 12 and 13 by chains 31 which extend about sprockets 32 on rollers 12 and 13, about sprockets 33 on shafts 30 and about idler sprockets 34 on shafts 35. In this manner the helicoidal members 26 are driven by and in timed relation with the creasing rollers 10 and 11.

These helicoidal members serve to guide and compact the falling paper web in folds or plies on to the table, where they are to be further compacted by the following means: Slidable in guides 36, that are secured to the beams 5, are bars 37 which carry hinged fingers 38, 39, whose hinges are shown at 40. These fingers are in two pairs located at each side of the paper stack, the fingers 38 having as their function the act of engaging the paper plies when leaving the helicoidal members and directing the plies down toward the forming stack, while the function of the fingers 39 is to take over when the fingers 38 have performed their function and to firmly press the folds of the paper against the top of the stack. By this compacting means not only is the machine able to operate at much greater speed than heretofore but also the compacting efficiency is much enhanced.

The operating means for fingers 38, 39 are as follows:

Shaft 30 also carries a sprocket wheel 41 and a sprocket chain 42 engages wheel 41 with a sprocket wheel 43 that is carried by a shaft 44 which is journaled in a bearing member 45 secured to a frame member 1. Chain 42 also engages an intermediary sprocket wheel 46 that is carried by a shaft 47 journaled in a bearing member secured to a frame member 1. It will be appreciated that these instrumentalities are duplicated, in pairs, at opposite sides of the paper stack. Each shaft 44 also carries a pair of cams 49, 50, and push rods 51, 52, each slidable in bearing members 53, lie between respective cams and the fingers 38, 39, whereby, in the rotation of shafts 44 said cams, in succession, move the fingers 38, 39 toward their operative positions as the respective finger carrying bars 37 are moved downwardly. Springs 54, respectively connected to a frame portion and connected respectively to spurs 55 on the fingers 38, 39, serve to retract said fingers from the operative positions to which they had been moved by the cams. Tappet members, mounted on the beam 5 by pivot 48 respectively engage the cams 49, 50 by one arm 56, their other arms 57, which latter are hook shaped at their ends being adapted to engage projections 58 on the bars 37 to thereby lift said bars and hence the fingers 38, 39 by cam action. The tappets are retractable by means of springs X.

Table 24, which is mounted on a frame composed of the vertical members 59 and horizontal members 60, is raised and lowered by chains 61, secured by frame members 60, and passed over upper and lower sprocket wheels 62, 63 which are respectively mounted on shafts 64, 65, shaft 64 being journaled in bearings 66 secured to beam 5

and shaft 65 having bearings secured to base member 2.

As the stack of paper plies increases in height so, in order to add to the table capacity and at the same time permit the stack compacting to be carried on with the highest efficiency, the table is lowered synchronously with the fold deliveries and thus with the stack fold additions. To this end the shaft 64, whose rotation causes the lowering of the table, carries a worm gear 67, which meshes with a worm threaded member 68 that is mounted on a shaft 69, journaled in the frame, said shaft 69 carrying a ratchet wheel 70 that, in its rotation, causes the threaded member 68 to rotate shaft 64. The ratchet wheel 70 is rotated, in step by step movement, by means of a dog 71, pivoted to an arm 72 which in turn is pivotally connected, at 73, to a pitman 74 which, at 75 is pivoted to sprocket wheel 46, in eccentric relation to pivot 47. Thus, with each revolution of sprocket wheel 47 ratchet wheel 70 is moved one tooth or step, and this movement is communicated to sprocket chains 61 by shaft 64 and hence to the table.

In the example of my invention illustrated in Figure 5, table 24 is seen to be supported by horizontal member 60, but in place of the vertical members 59 there is provided a threaded vertical member 76 that extends through a threaded nut 77 which is fixedly mounted on horizontal member 60. On the lower end of threaded vertical member 76 is a wheel 78, and on the upper end is a thrust bearing 79. The table 24 is broken at 80 and fastened together with hinges 81. As the table 24, supported by horizontal member 60, is lowered as previously described, wheel 78 is turned manually or by a synchronous motor (not shown) so that bearing 79 is moved upwardly in relation to horizontal member 60 but at a slower rate than the table 24 and horizontal member 60 are being lowered by ratchet 70. As the threaded vertical member 76 is turned by wheel 78 through fixed nut 77, the outer portions of table 24, hinged at 80, move toward each other, thereby relieving the pressure of the top of the stack against the rotating under surface of helicoidal members 26. The outer portions of the table 24 are terminally supported by wheels 82 journaled in bearings 83 which are fastened to the outer portions of the table 24. The wheels 82 roll freely on rail 84.

A combination of means shown in Figures 1 and 5 causes the reduction of pressure against the cam operated fingers 39, which fingers firmly press the folds of the paper against the top of the stack.

The use of the means shown in Figure 1; the use of the means shown in Figure 5, and the use of the combination of these means is dictated by the thickness and the character of the paper to be folded and stacked.

Variations within the spirit and scope of my invention are equally comprehended by the foregoing disclosure.

I claim:

1. The method of folding and stacking paper which comprises indenting a web of paper to form folded plies therein, guiding the folds in zigzag manner toward a support, lightly compacting said folds in a stack on the support, subsequently applying further compacting pressure to the stack with the addition of each fold in a continuous operation and raising the middle of the bottom of the stack with respect to the ends of the bottom thereof as the height of the stack increases.

2. The method of folding and stacking paper

which comprises indenting a web of paper to form folded plies therein, guiding the folds in zigzag manner toward a support, compacting said folds in a stack on the support and raising the middle of the upper part of the support with respect to the ends of the upper part thereof as the height of the stack increases to compensate for the increased height of the stack at the folded ends of the plies.

3. The method of folding and stacking paper which comprises creasing a continuous uninterrupted web of paper on unperforated lines to form folded plies therein, guiding the folds in zigzag manner toward a support, compacting said folds in a stack on the support and decreasing the transverse curvature of the top fold of the stack occasioned by the greater thickness of paper at the folded edge by raising the middle part of the support with respect to the sides of the support.

4. In a machine for delivering a web of indented paper in folded plies, a convex table to receive said plies in a stack thereof, means for guiding the folds in their passage, a set of fingers to engagingly direct the folds toward the table, another set of fingers to press the folds compactly in stack form, respective cams, retractile tappets and push rods to actuate said sets of fingers in succession, means for operating said cams, tappets and push rods, and means for raising the middle of the table with respect to the sides thereof as the height of the stack increases.

5. In a machine for delivering a web of indented paper in folded plies, a convex table to receive said plies in a stack thereof, means for guiding the folds in and compacting them on the stack, said table having two hinged portions, a vertically movable support for said table, a threaded member centrally connecting said table with said support, and means for depressing said support with the increase in height of the stack, said threaded member serving to raise the table centrally, with relation to said support, while its hinged portions converge downwardly to relieve the pressure exerted on the topmost fold.

6. In a machine for delivering a web of indented paper in folded plies on a stack the combination of a support having an upper surface for receiving the stack and means for raising the middle of the upper surface of the support with respect to the ends thereof as the height of the stack thereon increases.

7. In a machine for delivering a web of indented paper in folded plies on a stack, the combination of a support having an upper surface for receiving the stack, means for lightly compacting the folds at the ends of the stack, means for further compacting said folds at the ends of the stack and means for changing the curvature of the upper surface of the support to raise the centre thereof with respect to the ends as the height of the stack increases.

8. The method of folding and stacking paper, which comprises indenting a web of paper to form folded plies therein, delivering the folds in a zigzag manner to a support and raising the middle of the upper part of the support with respect to the ends thereof as the height of the stack thereon increases.

9. In a machine for delivering a web of indented paper in folded plies, a table to receive said plies in a stack thereof, a set of fingers for pressing the folds compactly in stack form, means including a cam for reciprocating said fingers vertically and for moving the upper ends of the fingers laterally for effective operation thereof.

10. In a machine for delivering a web of indented paper in folded plies, a table to receive said plies in a stack thereof, a set of fingers for pressing the folds compactly in stack form, means including a cam for reciprocating said fingers vertically and means including a cam for moving the upper ends of the fingers laterally for effective operation thereof.

11. In a machine for delivering a web of indented paper in folded plies, a support for receiving said plies in a stack thereof, reciprocable members, fingers hinged to said reciprocable members for engaging and compacting the folded edges of said plies, means for reciprocating said first-mentioned members in a direction perpendicular to the plies of the stack and means for swinging said fingers into and out of effective position with respect to the stack.

12. In a machine for delivering a web of indented paper in folded plies, a support for receiving said plies in a stack thereof, reciprocable members, fingers hinged to said reciprocable members for engaging and compacting the folded edges of said plies, cam means for reciprocating said first-mentioned members in a direction perpendicular to the plies of the stack and cam means for swinging said fingers into and out of effective position with respect to the stack.

13. In a machine for delivering a web of indented paper in folded plies, a table to receive said plies in a stack thereof, a set of fingers for engaging and compacting the folds, means for reciprocating said fingers in a direction substantially perpendicular to the plane of the plies on the stack, said means being adapted to supply a substantially greater force to certain of said fingers than to others, whereby certain fingers having the lesser force applied guide and hold the plies in position and other fingers having a greater force applied compact them.

14. The method of folding and stacking paper, which comprises indenting a web of paper to form folded plies therein, delivering the folds in a zigzag manner to a support having a raised middle portion, stacking the paper on said support and applying pressure at the folded edges of the plies as the height of the stack increases to draw the plies down over the raised portion to limit the curvature at the top of the stack.

15. In a machine for delivering a web of indented paper in folded plies on a stack, the combination of a support having a middle portion substantially higher than the side portion thereof, and means for applying pressure at the folds of the stack as the height of the stack increases to stretch the plies over the raised middle portion of the support to limit the curvature of the upper surface of the stack.

LESLIE T. HAND.