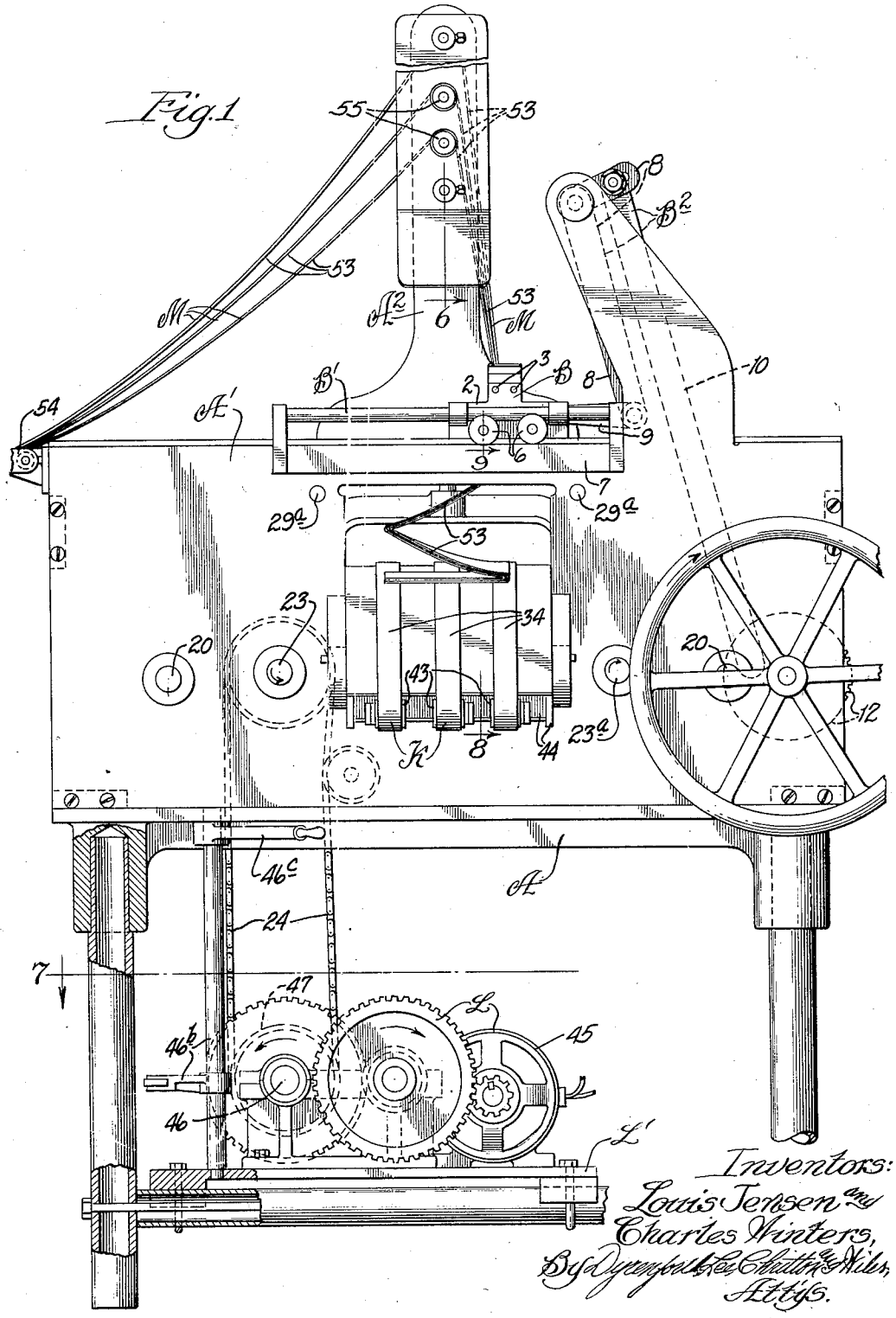
Nov. 17, 1931. L. JENSEN ET AL 1,832,557

WEB FOLDING MECHANISM

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Fig. 1



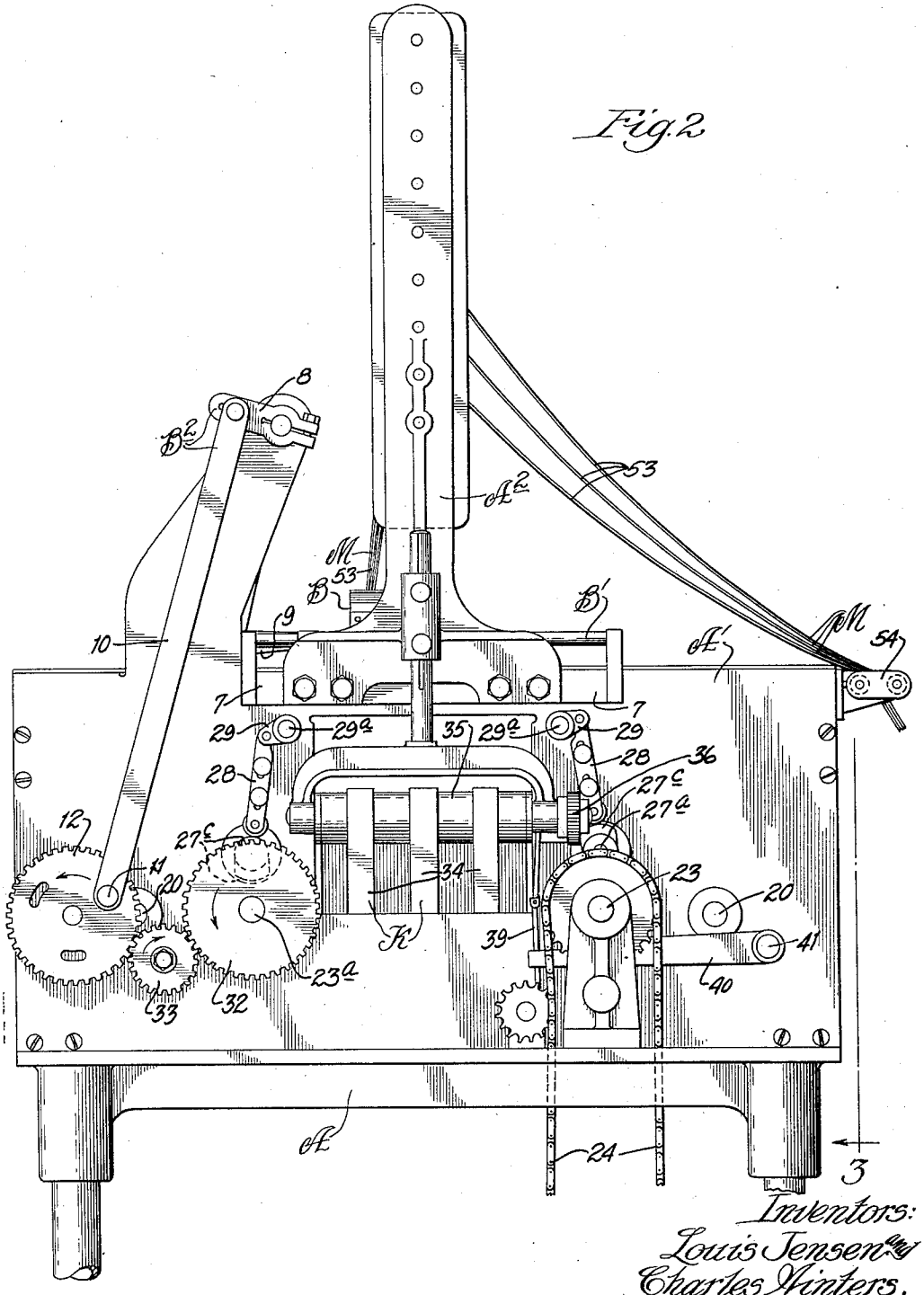
Inventors:
Louis Jensen et al
Charles Winters,
By Dyer, Holt & Chittick & Niles,
Attys.

Nov. 17, 1931. L. JENSEN ET AL 1,832,557

WEB FOLDING MECHANISM

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Fig. 2



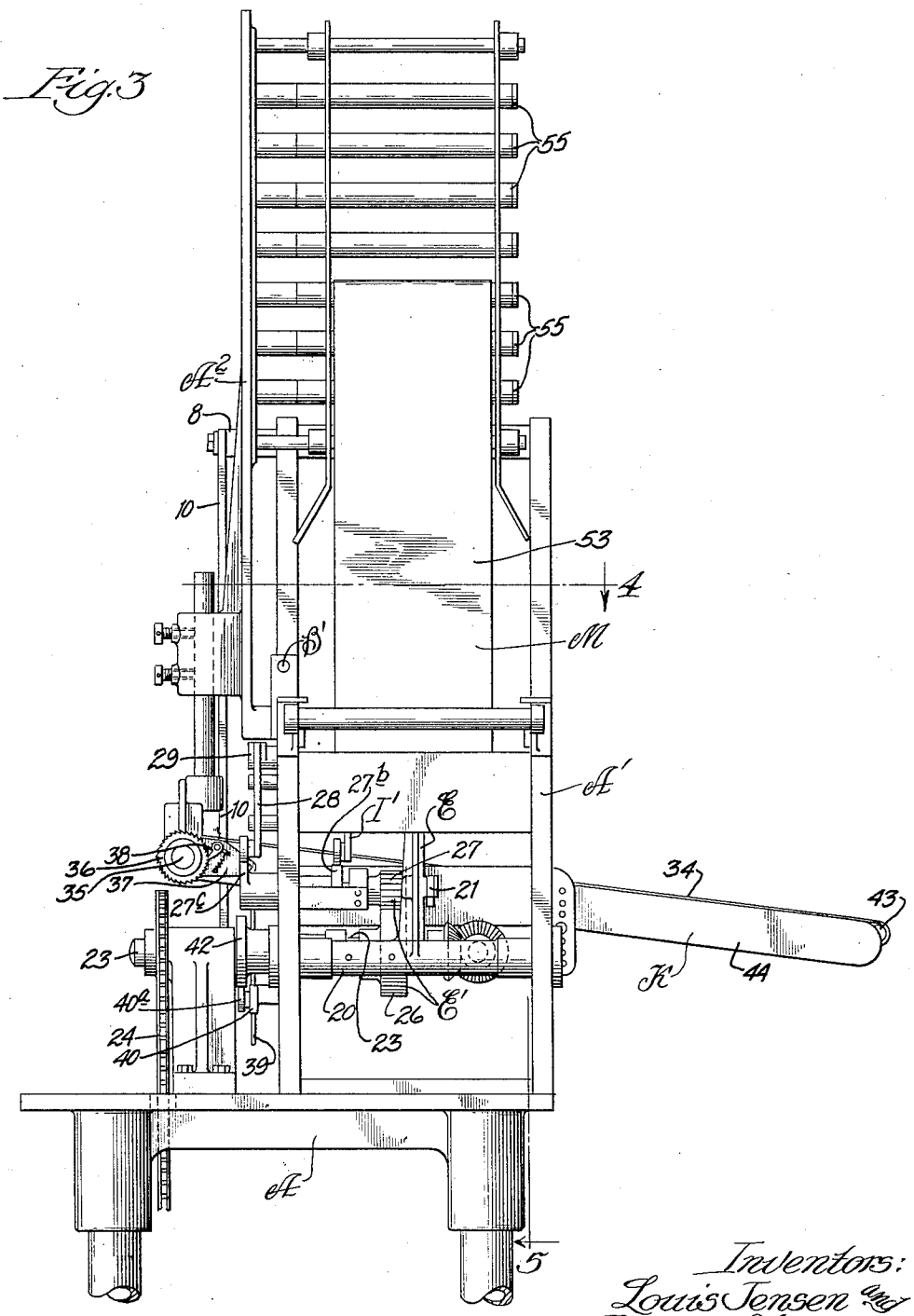
Inventors:
Louis Jensen and
Charles Winters,
By Dyer, Holloway, Tibbetts & Hicks,
Attys.

Nov. 17, 1931. L. JENSEN ET AL 1,832,557

WEB FOLDING MECHANISM

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Fig. 3



Inventors:
Louis Jensen and
Charles Winters,
By Dyrenforth, Lee, Chritton & Wiles.
Attys.

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WEB FOLDING MECHANISM

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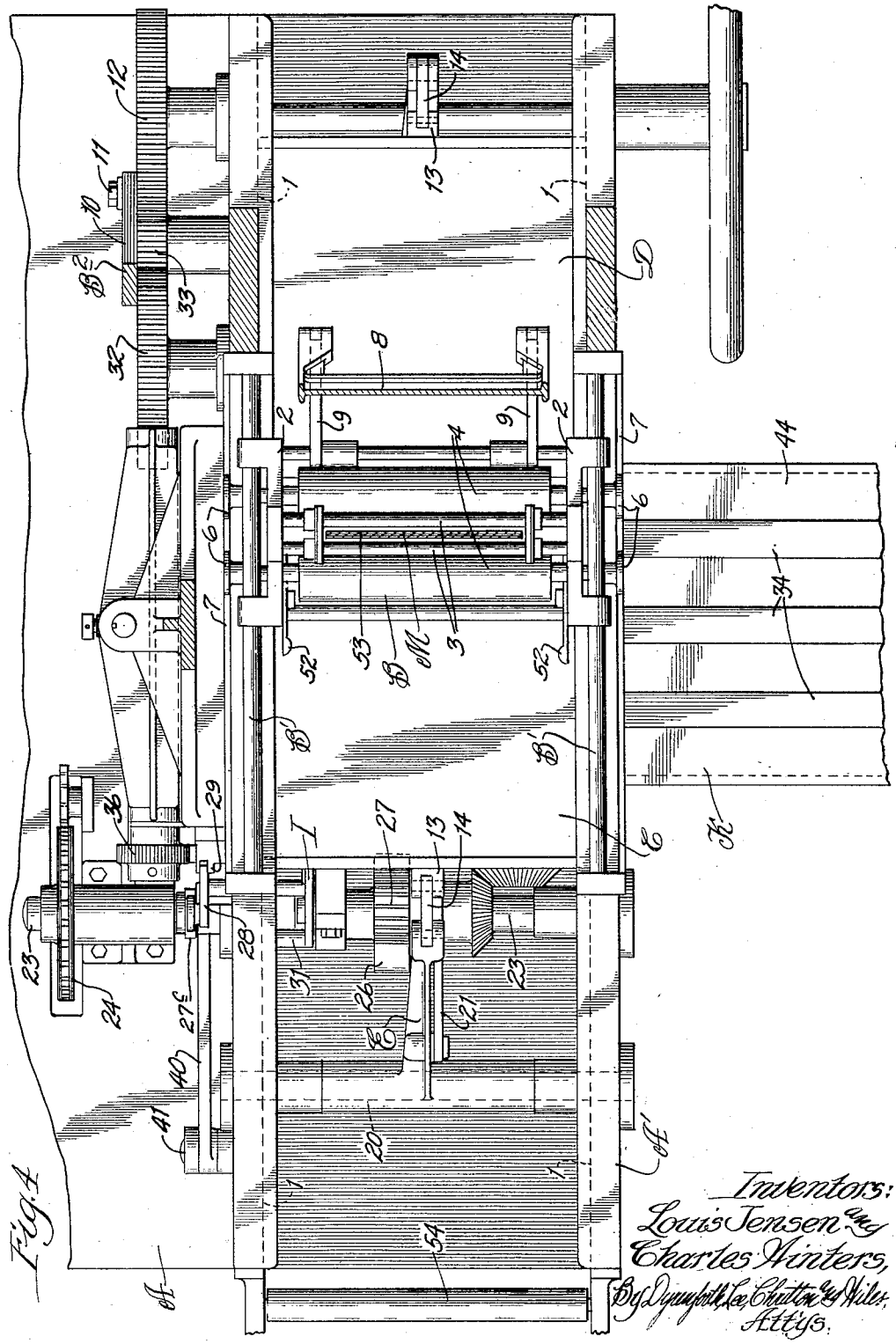


Fig. 4

Inventors:
Louis Jensen and
Charles Winters,
By Dyrenforth, Lee, Chritton & Wiles,
Attys.

Nov. 17, 1931. L. JENSEN ET AL 1,832,557

WEB FOLDING MECHANISM

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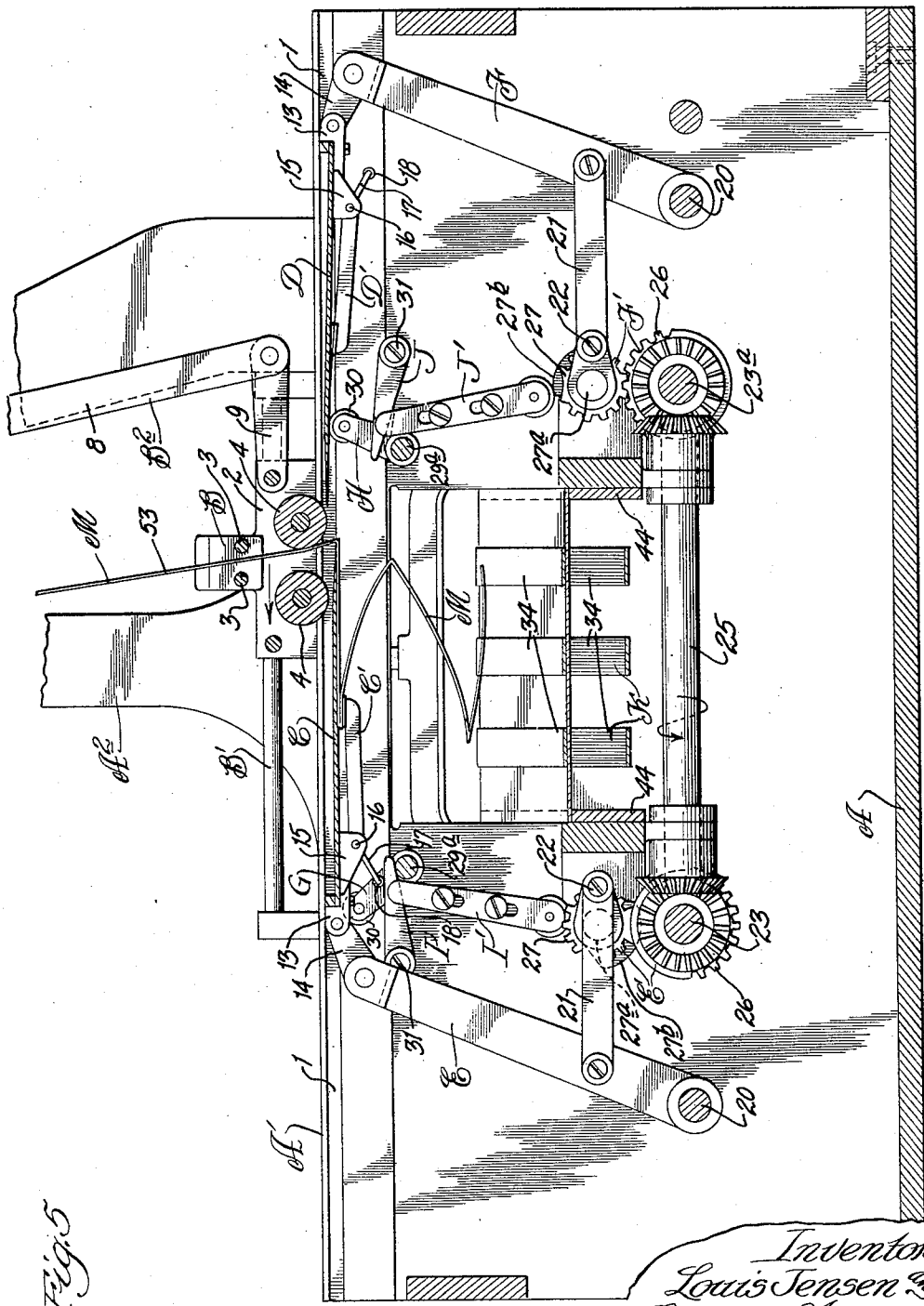


Fig. 5

Inventors:
Louis Jensen and
Charles Winters,
By Dyrenforth, Lee, Chrisman & Miles
Attys.

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WEB FOLDING MECHANISM

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Fig. 6

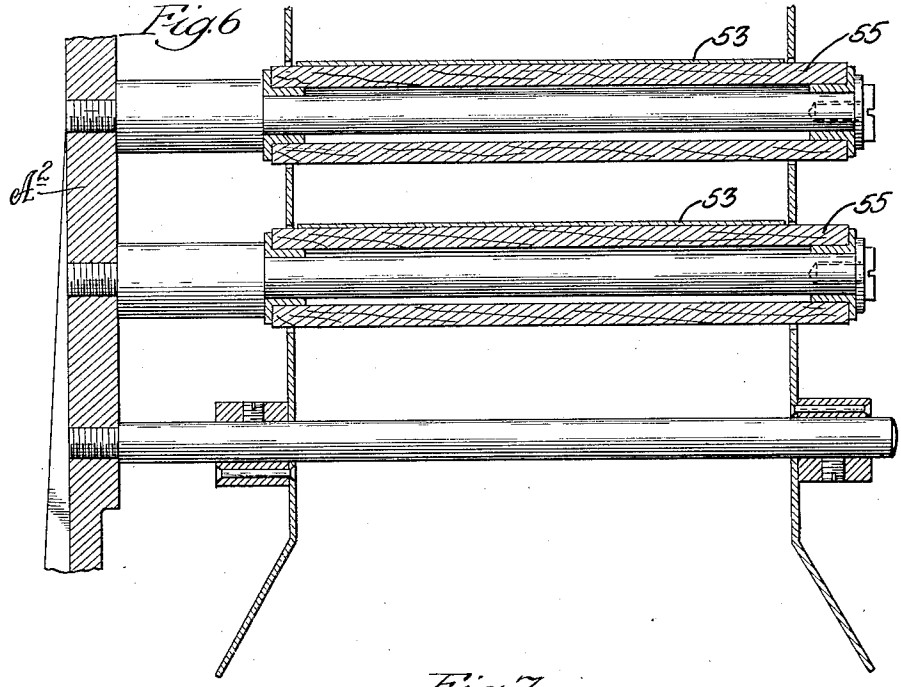
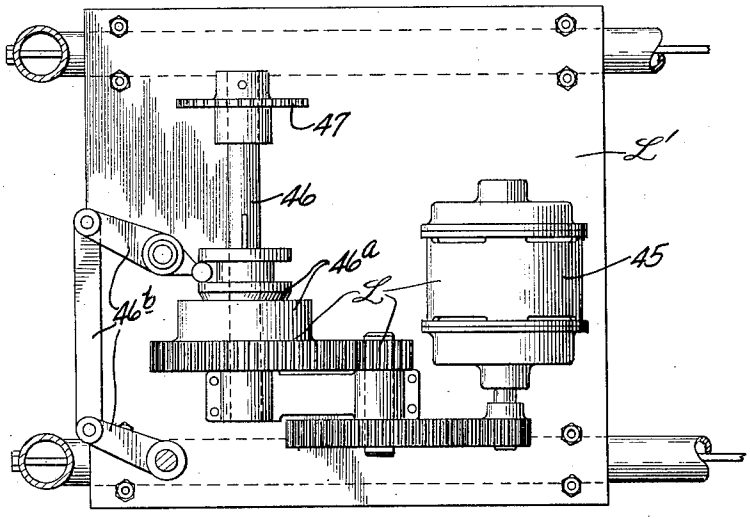


Fig. 7



Inventors:
Louis Jensen and
Charles Winters,
By Dyrenforth, Lee, Chritton & Wiles
Attys.

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Fig. 8

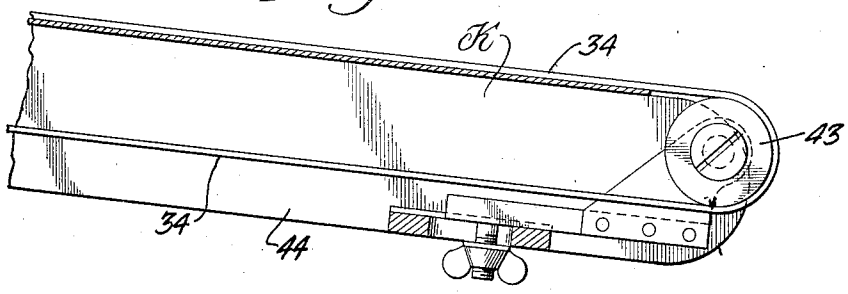


Fig. 9

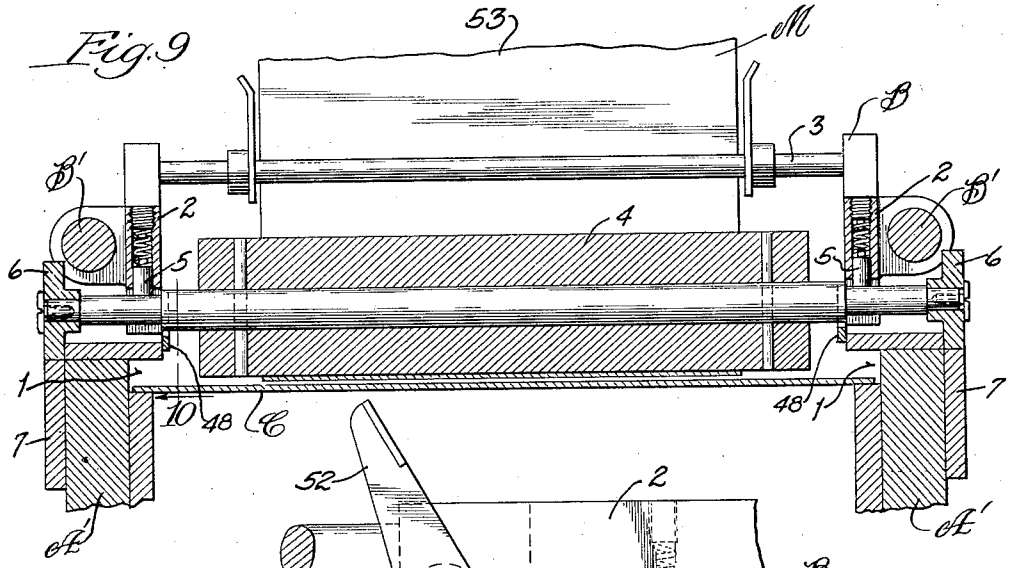
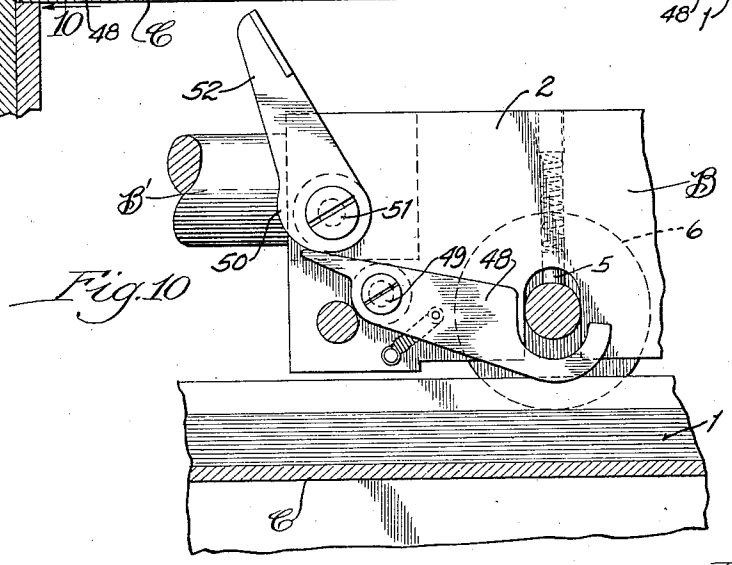


Fig. 10



Inventors:
Louis Jensen and
Charles Winters,
By Dyer, Holt, Esch, Chittick & Kirkpatrick,
Attys.

Nov. 17, 1931. L. JENSEN ET AL 1,832,557

WEB FOLDING MECHANISM

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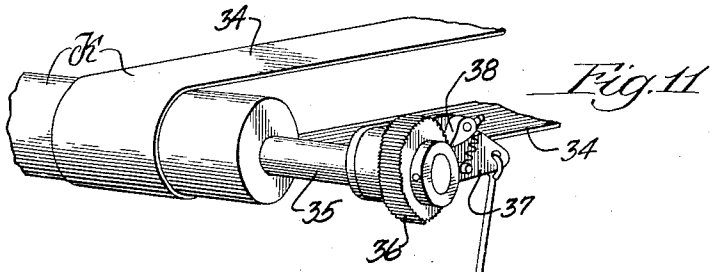


Fig. 11

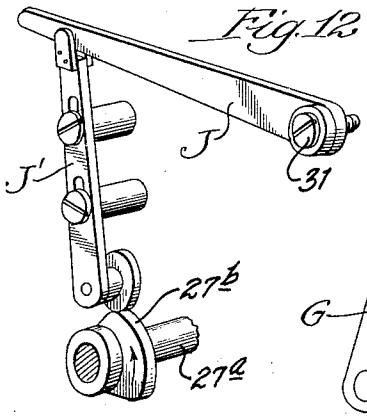
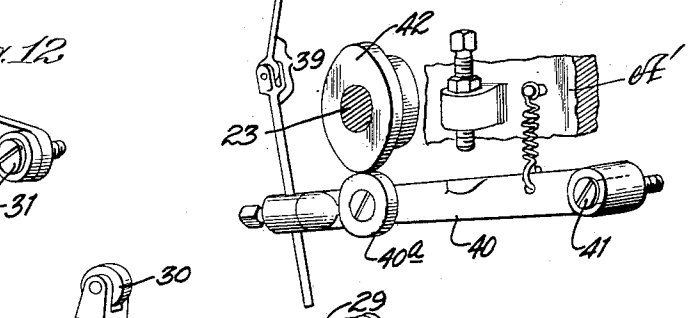


Fig. 12



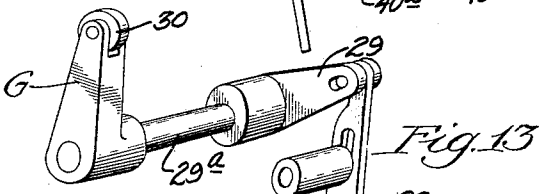
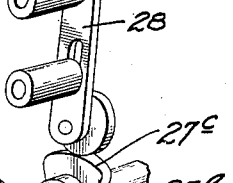


Fig. 13



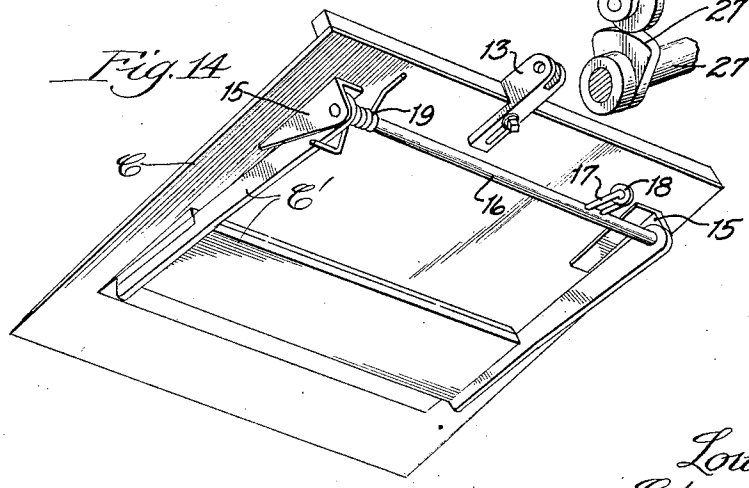


Fig. 14

Inventors:
Louis Jensen and
Charles Winters,
By Dyrenforth, Lee, Chritton & Wilkes,
Attys.

Patented Nov. 17, 1931

1,832,557

UNITED STATES PATENT OFFICE

LOUIS JENSEN AND CHARLES WINTERS, OF CHICAGO, ILLINOIS, ASSIGNORS TO UNITED AUTOGRAPHIC REGISTER CO., OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

WEB FOLDING MECHANISM

Application filed July 12, 1929. Serial No. 377,803.

This invention relates particularly to folding mechanism adapted to the purpose of folding a web, or strip, in zig-zag fashion to produce a packet in which the strip has transverse zig-zag folds.

The present application is for a modification of the invention disclosed in our application Serial No. 377,802, filed of even date herewith.

The primary object of the present invention is to provide a simple form of machine which is capable of being operated at high speed. The machine is well adapted to the folding of a limited number of plies of paper, say from three to nine plies.

Such a machine may be usefully employed for folding multiple-ply manifolding strips, such as are used in autographic registers, or other duplicating machines. Such manifolding strips usually are provided with printed forms. These forms may be printed in parallel rows upon a web of paper passing through a printing machine; the web may then be folded longitudinally in zig-zag fashion to bring the strips into superposed relation; and the multiple-ply strip may then be passed through the present machine for producing transverse folds in the multiple-ply strip. If desired, the web may be cut into strips as it passes through the printing machine and these strips may be brought into superposed relation, thus producing a multiple-ply strip.

The present invention is illustrated in the accompanying drawings as embodied in a machine adapted to fold strips which have been severed from each other during their passage through the printing machine. It will be understood, however, that the invention is not limited to the folding of a manifolding strip in which the various duplicates have been severed from each other.

In the drawings, illustrating a preferred embodiment—

Fig. 1 is a side elevational view, partly broken, of the improved machine; Fig. 2, an opposite side elevational view; Fig. 3, an end elevation, viewing the end from which the strips are fed into the machine; Fig. 4, a broken plan section taken as indicated at line 4 of Fig. 3; Fig. 5, a broken longitudinal vertical section taken as indicated at line 5 of Fig. 3; Fig. 6, a broken transverse vertical section taken as indicated at line 6 of Fig. 1; Fig. 7, a plan section taken as indicated at line 7 of Fig. 1; Fig. 8, a broken sectional view of a conveyor employed, the section being taken as indicated at line 8 of Fig. 1; Fig. 9, a broken transverse vertical section taken as indicated at line 9 of Fig. 1; Fig. 10, a broken detail sectional view taken as indicated at line 10 of Fig. 9; Fig. 11, a fragmentary perspective view illustrating the manner in which the conveyor is actuated; Fig. 12, a broken perspective view illustrating the manner in which a cam-lever which serves as a track is actuated; Fig. 13, a broken perspective view illustrating a folder-plate lifter; and Fig. 14, a rear bottom perspective view of one of the folder-plates employed.

In the embodiment illustrated, A designates a main frame which is equipped with a bed A′ which serves as a guide, and which is also equipped with standards A^2 which serve to support guide-rolls; B, a web-distributor in the form of a carriage movable on guides B′ disposed above the bed A′, the carriage B being actuated by mechanism B^2; C and D, a pair of opposed folder-plates working in a plane beneath the distributor B and having associated therewith, respectively, grippers C′ and D′; E and F, folder-plate actuators, actuated, respectively, by Geneva movements E′ and F′; G and H, plate-lifters associated, respectively, with the folder-plates C and D and actuated by devices of the character shown in Fig. 13; I and J, movable cam-arms, or tracks, adapted to actuate the grippers C′ and D′, respectively, these members being actuated by devices I′ and J′, respectively, (Fig. 12); K, a lateral delivery conveyor extending transversely through the frame of the machine in a plane below the folder-plates; and L, drive mechanism mounted on a base L′ with which the frame is equipped near the floor.

The frame A may be of any suitable construction. As appears from Figs. 5 and 9, the bed A′ is provided with longitudinal guides 1 which are adapted to support the

lateral edges of the folder-plates, but permit limited lifting of the plates to enable them to be brought successively into superposed position.

The distributor B is shown as a carriage comprising slides 2 which are rigidly connected together by means of cross-rods 3 which afford guides for the multiple-ply strip, or web; and ironing rollers 4 which, as appears from Fig. 9, are vertically movable in bearings 5 with which the members 2 are provided. The roller-shafts are equipped at their extremities with small wheels 6 which travel on tracks 7. The web may lift the ironing roller slightly away from the track in the operation of the machine.

The distributor actuating means B^2 is shown as comprising a bell-crank lever 8 having one arm connected by a link 9 to the carriage B and having the other arm connected by a link 10 to a crank-pin 11 mounted on a wheel 12.

The folder-plates C and D are of the same construction, but reversed, so that their points are turned in opposite directions, as appears from Fig. 5. Fig. 14 shows one of the plates, for example, the plate C. It is provided at its base end with a lug 13 which is connected by a link 14 with the actuating device E. The lower side of the plate is also provided with lugs, or bearings, 15 in which is journalled a rock-shaft 16 to which the gripper C′ is rigidly attached. Rigidly connected with the shaft 16 is a short arm 17 equipped with a cam-roller 18 adapted to travel on the movable cam, or track, I. A spring 19 serves to throw the operative end of the gripper against the bottom surface of the folder-plate C. The construction at the folder-plate D and gripper D′ is the same and the parts are indicated by the same characters.

The folder-plate actuators E and F are alike. Each comprises a rock-arm pivotally supported at 20 and actuated through the medium of a link 21 which is connected to a crank-pin 22 with which the Geneva movement is provided.

The Geneva movements are actuated through the medium of a transverse shaft 23 (Figs. 1, 3 and 4) which, in turn, is actuated by a sprocket-chain 24 connected with the driving mechanism L. A countershaft 23^a, parallel with the shaft 23, is geared thereto through the medium of a longitudinal shaft 25 (Fig. 5).

The Geneva movements E′ and F′ comprise mutilated gears 26 on the shafts 23 and 23^a, and coacting mutilated gears 27 fixed on the shafts 27^a. The shafts 27^a are equipped with cams 27^b which serve to actuate the slides I′ and J′ in the manner shown in Fig. 12. The shafts 27^a are further equipped with cams 27^c which serve to actuate the folder-plate lifters G and H in the manner illustrated in Fig. 13. Associated with each of said cams is a slide 28 which is connected with an arm 29 secured on a rock-shaft 29^a. The lifters G and H are in the form of arms rigidly connected with the rock-shafts 29^a, these arms being equipped with rollers 30 adapted to engage lower sides of the folder-plates in the manner shown in Fig. 5.

The tracks I and J are mounted on pivots 31 and are adapted to be lifted by the slides I′ and J′.

The shaft 23^a is equipped at one end with a gear 32 which drives an idler 33 (Fig. 2) which serves to actuate the wheel 12.

The conveyor K comprises endless belts 34 mounted one end on a shaft 35 (Figs. 2 and 3) which is equipped with a ratchet-wheel 36. The ratchet-wheel is actuated in the manner shown in Fig. 11. The shaft 35 has pivoted thereon a swinging arm 37 which carries a pawl 38 engaging the ratchet-wheel. The swinging arm 37 is connected by links 39 to a cam-lever 40 which is pivotally supported at 41. The lever 40 is equipped with a cam-roller 40^a which engages a cam 42 (Fig. 3) fixed on the shaft 23.

The other ends of the belts 34 are mounted on adjustable wheels, or rollers, 43 (Fig. 8) carried by the frame 44 of the conveyor. The conveyor extends beneath the plane of the folding devices and projects laterally from the machine in the manner illustrated in Fig. 3. A suitable receptacle (not shown) may be provided to receive the folded strip.

The driving mechanism L (Figs. 1 and 7) is shown as comprising a motor 45 geared to a shaft 46 which is equipped with a sprocket-wheel 47 which serves to actuate the sprocket-chain 24. The operation of the shaft 46 is controlled by the clutch 46^a operated by a device 46^b equipped with a hand-lever 46^c.

As will be understood from Fig. 9, the guides 1 form the support for and permit limited swinging movement of the folder-plates.

In Fig. 10 is shown a device for lifting the roller 4. This device comprises lifters 48 supported on pivots 49 and adapted to be actuated by cams 50 mounted on pivots 51 and actuated by an end-piece 52. By depressing the member 52, the cam 50 raises the member 48 and lifts the roller 4, thus facilitating the threading of the strip of paper through the device.

The multiple-ply strip, as a whole, is designated M. In the illustration given, the strip M is composed of several strips 53 which are led to the machine over a guide 54 and pass about individual guides, or rollers, 55 (Figs. 1 and 6).

The operation may be described briefly. Assuming the multiple-ply strip M to have been introduced into the machine properly in the manner illustrated in Fig. 5, one of the folder-plates remains stationary and acts as a support for the strip. While the distributor B carries the strip longitudinally over the

folder and the other folder acts as a follower which closely follows the distributor. Thus, in Fig. 5, the folder-plate C remains stationary for a time while the carriage B moves in the direction indicated by the arrow and the folder-plate D is advanced to a superposed position over the plate C. During this movement, the gripper D′ is lowered to permit the point-edge of the plate C to enter between the gripper and the plate D. The track J is lowered at the proper time to permit the gripper D′ to grip the folded edge-portion of the paper between the gripper and the plate D. The folder-plate C is then withdrawn and the plate D is permitted to drop to a horizontal position and remain stationary while the folder C is advanced and tilted so that the plate C will then ride over the plate D, it being noted that during this latter action the carriage B moves in the direction opposite of that indicated by the arrow. The appropriate roller 4 of the distributor may exert a mild pressing action upon the paper as it travels over the stationary folder-plate. This ironing action tends to produce a sharp crease at the fold, and the strip is further given a "set" by the gripper, as will be understood from the left-hand portion of Fig. 5. Thus, it will be understood that the folder-plates serve, in alternation, first as a stationary supporting-plate and then as a follower-plate.

The Geneva movement and the various cams are properly timed to effect the folding operation illustrated. The folded portions of the strip drop upon the moving conveyor K and are delivered laterally from the machine.

The improved machine is simple in construction and action and capable of being operated at high speed.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

What we regard as new, and desire to secure by Letters Patent, is:

1. In combination: opposed reciprocable and tiltable folder-plates; individual actuators connected therewith; and means for conducting a web to said folder-plates.

2. The mechanism specified in claim 1 in combination with a distributor adapted to fold the web on the folder-plates.

3. In combination: opposed tiltably mounted folder-plates; mechanism for reciprocating the plates and lifting them in alternation; and means for conducting a web to the folder-plates.

4. The mechanism specified in claim 3 in combination with a reciprocating distributor through which the web is delivered to the folder-plates.

5. In combination: a frame provided with guides; folder-plates reciprocable in said guides and capable of rising and falling movement; actuators for reciprocating said folder-plates; and lifters associated with said folder-plates.

6. In combination: opposed reciprocable and tiltable folder-plates; actuators for said plates; and grippers associated with said plates.

7. Mechanism of the character set forth in claim 6 in which the grippers are disposed beneath and carried by the folder-plates and have their operative ends disposed back of the operative ends of the folder-plates.

8. Mechanism as specified in claim 6 in which the grippers are pivotally mounted on the lower sides of the folder-plates.

9. In combination: slidable, tiltable opposed folder-plates; and actuators for said plates serving to alternately shift and advance the plates.

10. Mechanism as specified in claim 9 in combination with grippers reciprocating with said plates.

11. Mechanism as specified in claim 9 in combination with grippers moving with said plates; and a web-distributing device coacting with said plates.

12. In combination: alternately raised and lowered reciprocating folder-plates; grippers pivotally mounted on the lower sides of said plates; cam devices serving to actuate said gripping devices; and a web-distributor reciprocating in a plane above said plates.

13. In combination: a pair of opposed folder-plates; actuating mechanisms for said plates timed to hold each plate stationary while the other plate advances; grippers associated with the lower surfaces of said plates; and a web-distributor operating in a plane above said plates.

14. In combination: a frame provided with longitudinal guides; folder-plates loosely mounted in said guides; oscillating actuators for said plates; lifters associated with said plates; and grippers pivotally suspended from said plates and having their operative ends disposed back of the operative ends of said plates.

15. Mechanism as specified in claim 14 in combination with a reciprocating web-distributor disposed over the plane of said plates.

16. In combination: opposed reciprocating folder-plates; actuators timed to actuate said plates in alternation; lifters timed to lift said plates in alternation; grippers associated with said plates; and devices timed to open said grippers in alternation.

17. In combination: opposed reciprocable folder-plates; means for advancing said plates and lifting them in alternation; grippers pivotally suspended from said plates and equipped with actuating-arms; and mov-

able tracks co-acting with said actuating-arms.

18. In combination: a pair of reciprocable opposed folder-plates; rock-arms adapted to actuate said plates; lifters associated with said plates; and a pair of Geneva movements geared together and serving to actuate said rock-arms and said lifters.

19. Mechanism as specified in claim 18 in combination with grippers pivotally suspended from said plates; and cam devices serving to actuate said grippers and actuated by said Geneva movements.

20. In combination: a pair of tiltable, reciprocable folder-plates; mechanisms for actuating and lifting said plates in alternation; and a web-distributor comprising a carriage equipped with rollers co-acting with said folder-plates.

21. The method of folding a web, which comprises: making a fold in the web at one edge of a folder-plate and bringing a companion folder-plate into superposed position over said first-mentioned plate, and gripping the fold in the web while withdrawing the first-mentioned plate.

22. The method of folding a web, which comprises; folding and gripping a web beneath a folder-plate and folding another portion of the web over said plate.

23. The method of folding a web, which comprises: alternately employing two oppositely acting folder-plates as members over which the web is folded and ironed.

24. The method of folding a web, which comprises: alternately employing two oppositely acting folder-plates as members over which the web is folded and ironed; shifting the plates alternately into superposed position; and independently distributing the web over each plate after it has served to iron the web on the lower plate.

LOUIS JENSEN.
CHARLES WINTERS.