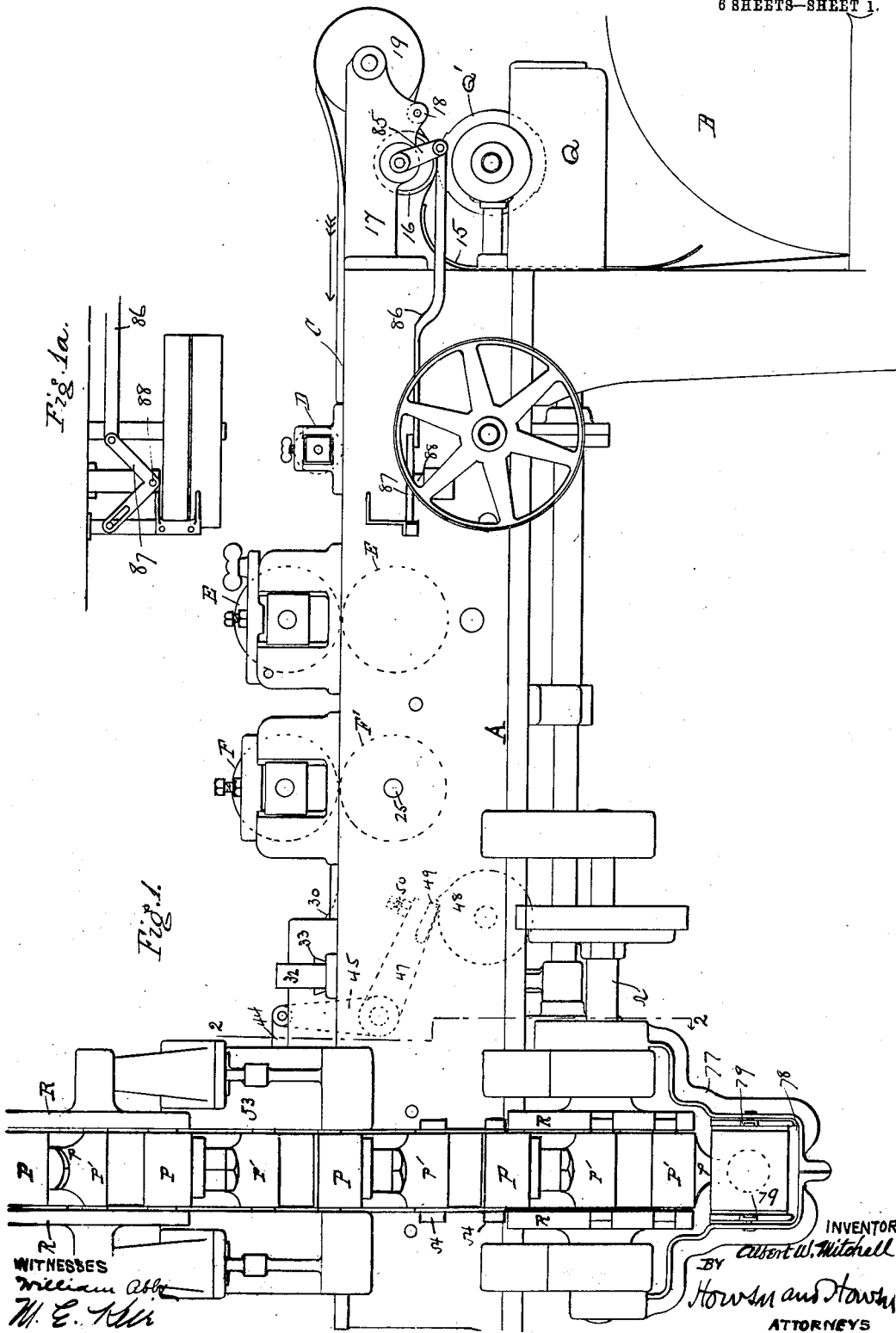


No. 852,974.

PATENTED MAY 7, 1907.

A. W. MITCHELL.
PAPER BOX MACHINE.
APPLICATION FILED JUNE 6, 1906.

6 SHEETS—SHEET 1.

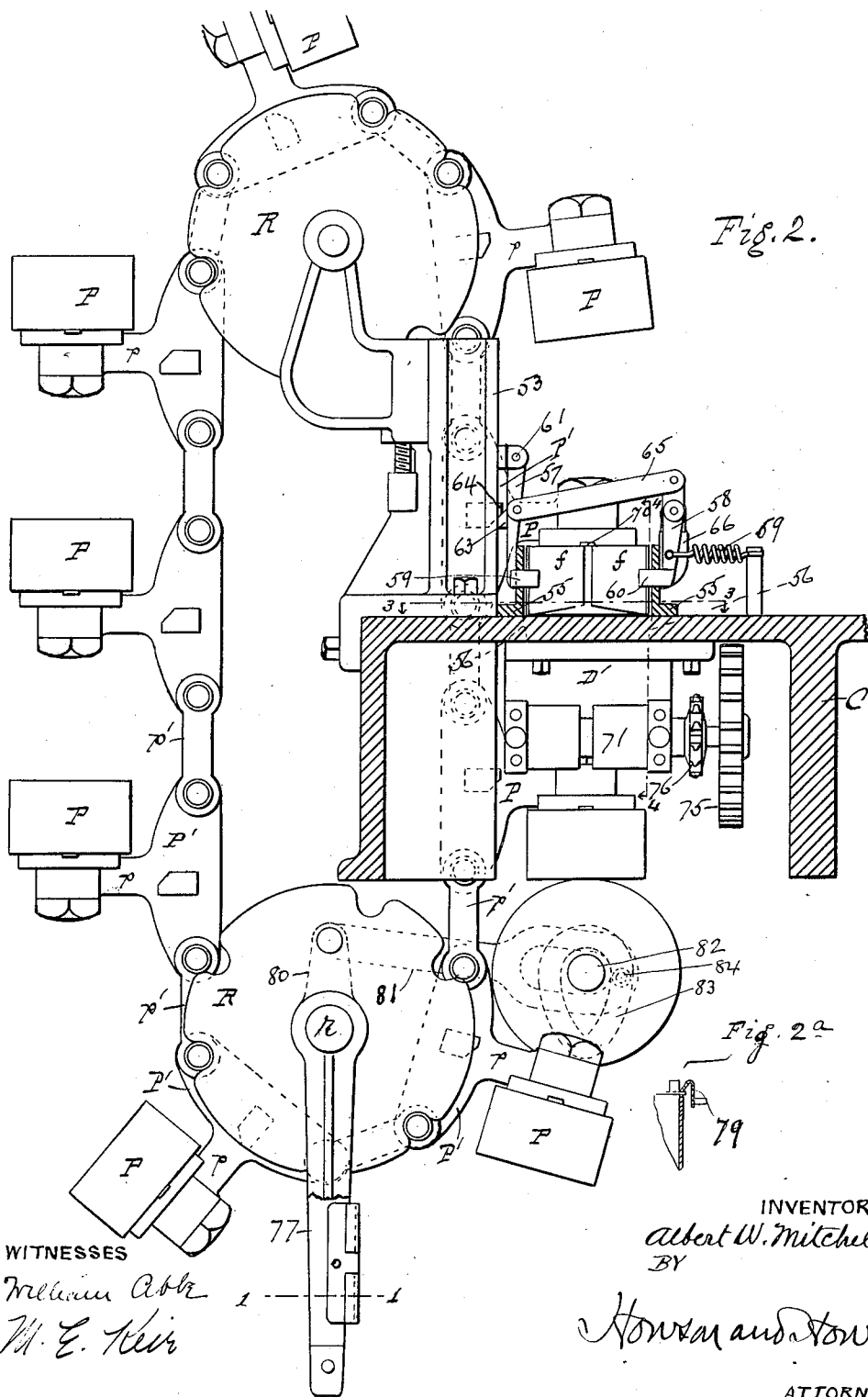


No. 852,974.

PATENTED MAY 7, 1907.

A. W. MITCHELL.
PAPER BOX MACHINE.
APPLICATION FILED JUNE 6, 1906.

6 SHEETS—SHEET 2.



No. 852,974.

PATENTED MAY 7, 1907.

A. W. MITCHELL.
PAPER BOX MACHINE.
APPLICATION FILED JUNE 8, 1906.

6 SHEETS—SHEET 3.

Fig 3

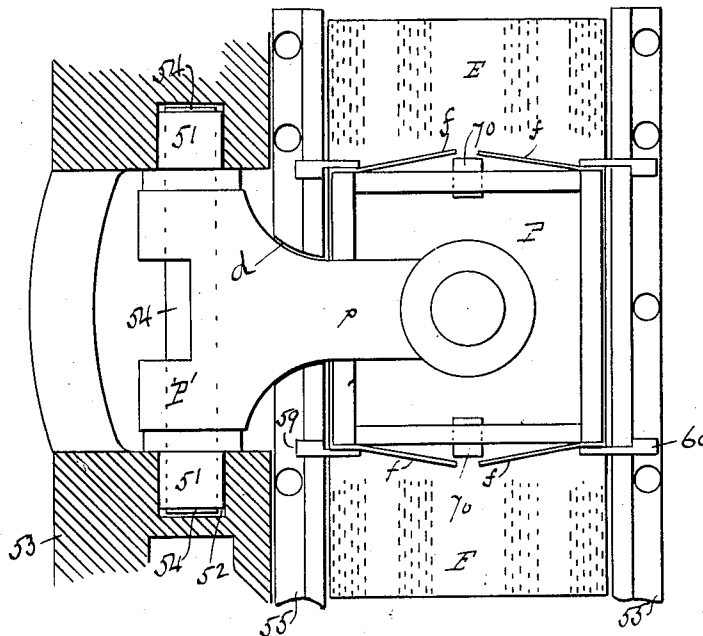
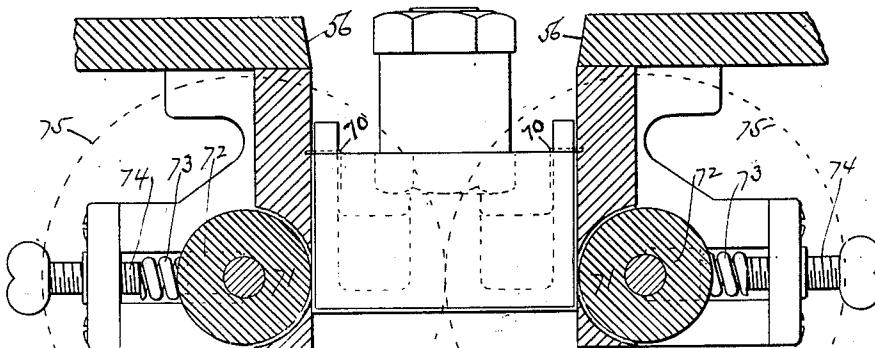


Fig. 4



WITNESSES

William Abbe
M. E. Kier

INVENTOR

Albert W. Mitchell
BY

Howden and Howden
ATTORNEYS

No. 852,974.

PATENTED MAY 7, 1907.

A. W. MITCHELL.
PAPER BOX MACHINE.
APPLICATION FILED JUNE 6, 1906.

6 SHEETS—SHEET 4.

Fig. 5.

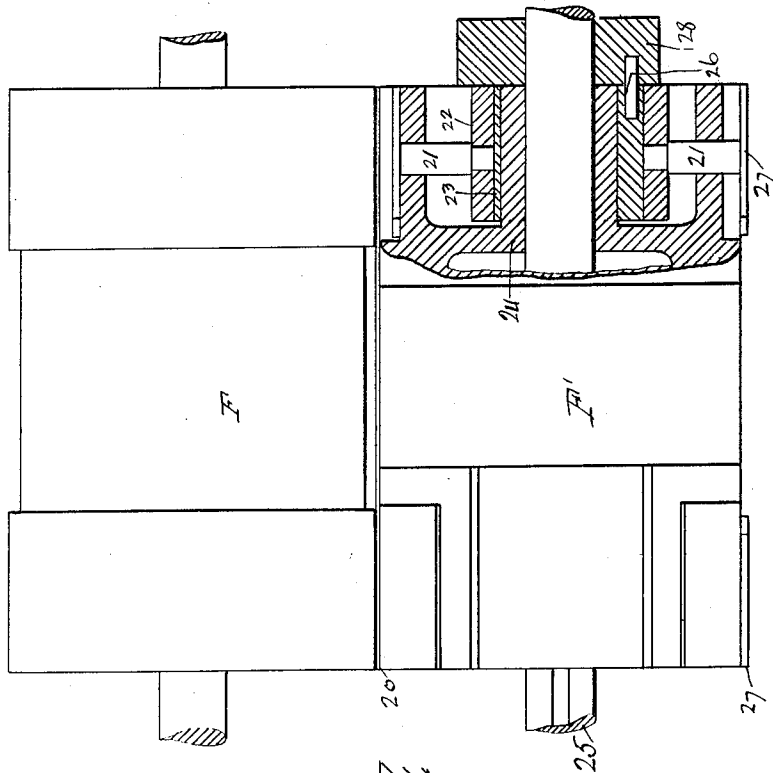
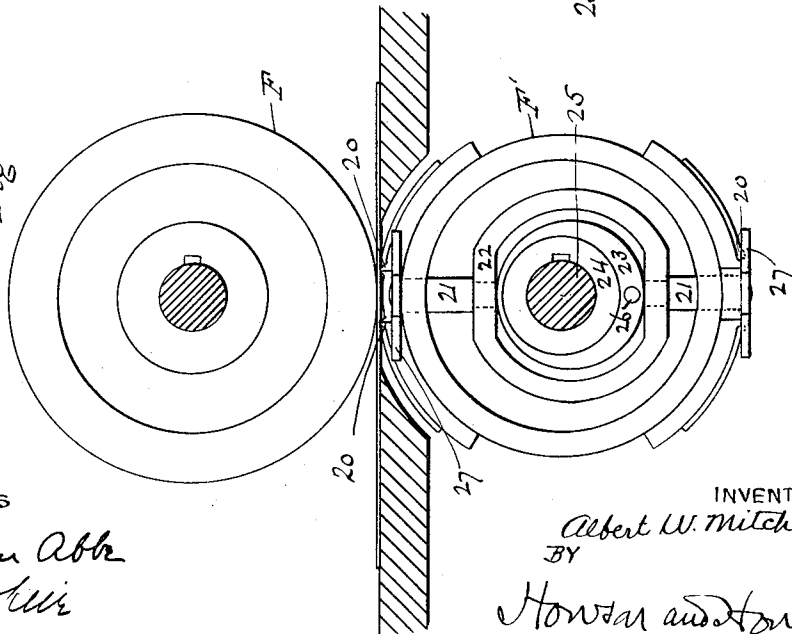


Fig. 6.



WITNESSES

William Abbe
M. E. Lee

INVENTOR

Albert W. Mitchell
BY

Howson and Howson

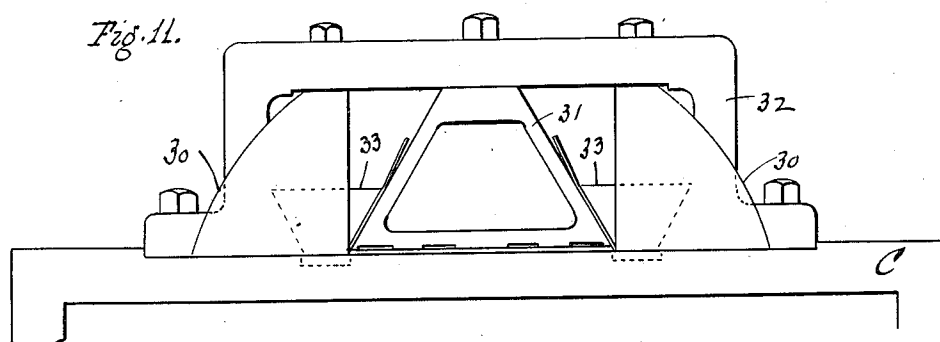
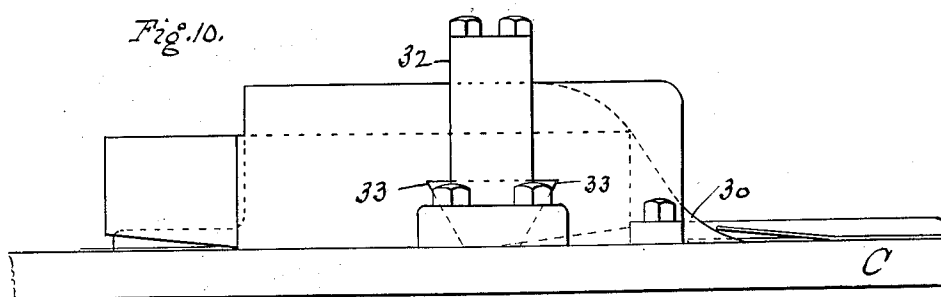
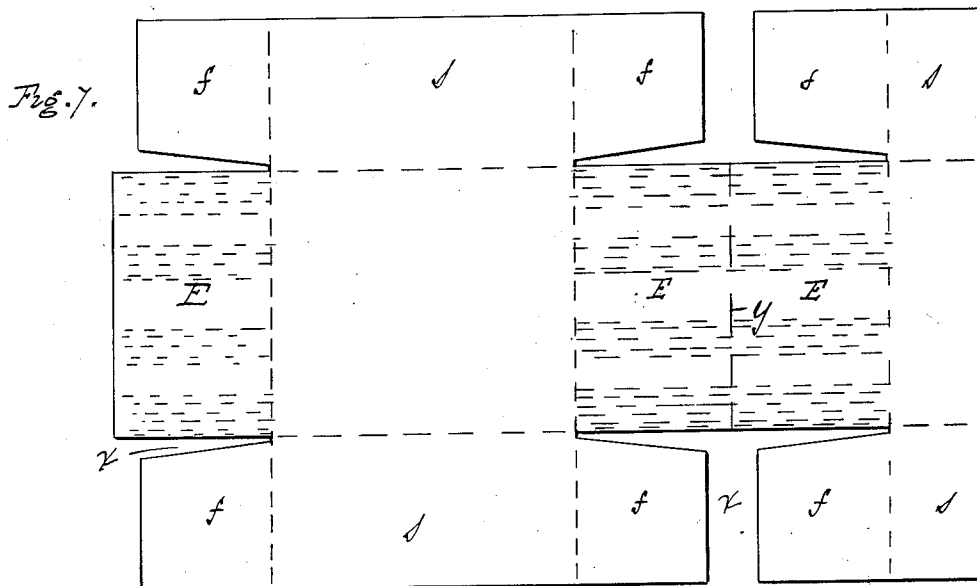
ATTORNEYS

No. 852,974.

PATENTED MAY 7, 1907.

A. W. MITCHELL.
PAPER BOX MACHINE.
APPLICATION FILED JUNE 6, 1906.

6 SHEETS—SHEET 5.



WITNESSES

William Robt
M. E. Kerr

INVENTOR

Albert W. Mitchell
BY

Howson and Howson

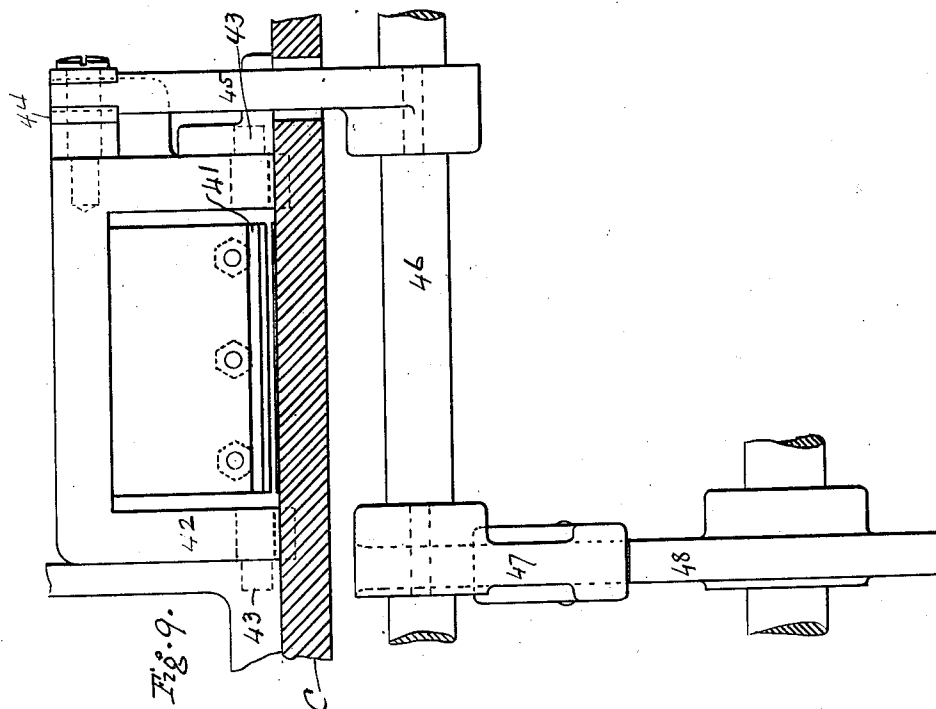
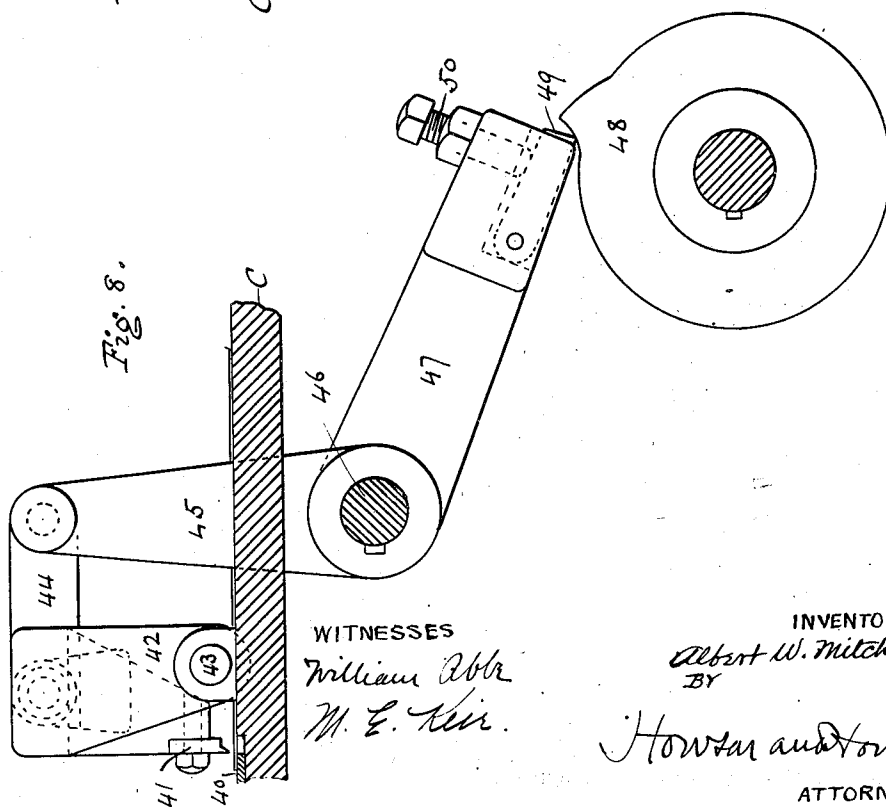
ATTORNEYS

No. 852,974.

PATENTED MAY 7, 1907.

A. W. MITCHELL.
PAPER BOX MACHINE.
APPLICATION FILED JUNE 6, 1906.

6 SHEETS—SHEET 6.



WITNESSES

William Able
M. E. Kerr.

INVENTOR

Albert W. Mitchell
BY

Howden and Howden
ATTORNEYS

UNITED STATES PATENT OFFICE.

ALBERT W. MITCHELL, OF NEW HAVEN, CONNECTICUT, ASSIGNOR, BY
MESNE ASSIGNMENTS, TO JOHN N. LEONARD, TRUSTEE, OF NEW
HAVEN, CONNECTICUT.

PAPER-BOX MACHINE.

No. 852,974.

Specification of Letters Patent.

Patented May 7, 1907.

Application filed June 6, 1906. Serial No. 320,486.

To all whom it may concern:

Be it known that I, ALBERT W. MITCHELL, a citizen of the United States of America, residing in the city of New Haven, in the county of New Haven, State of Connecticut, have invented certain new and useful Improvements in Paper-Box Machines, of which the following is a full, clear, and exact specification.

My invention relates more particularly to that class of machines using dies and plungers, which are adapted to make paper boxes from a strip or sheet of paper or pasteboard which is pasted, scored, and cut, and is fed to the forming means, by which the sides of the blank are bent or folded up, and the ends folded together.

The main object of my invention is to so construct such a machine as to increase its capacity and the speed of production of the boxes, to improve the quality of that product, and to simplify the construction of the machine.

One of the main features of my machine whereby these objects are accomplished consists in combining with a stationary die a series of plungers, continuously traveling and passing through the die in succession, as will be hereinafter described.

In the accompanying drawings: Figure 1 is a side elevation of a machine constructed in accordance with my invention; Fig. 1^a is a view of a detail; Fig. 2 is a vertical section on a larger scale on the line 2—2, Fig. 1; and Fig. 2^a is a sectional view on the line 1—1, Fig. 2; Fig. 3 is a sectional plan view on a larger scale on the line 3—3, Fig. 2; Fig. 4 is a section on the line 4—4, Fig. 2; Fig. 5 is a view of the rotary cutting devices for notching the edges of the strip; Fig. 6 is an end view of the same; Fig. 7 is a view illustrating the part of the strip from which the notches have been cut; Fig. 8 is a view of the devices for cutting off the blanks from the strips; Fig. 9 is a view at right angles to Fig. 8; and Figs. 10 and 11 are views of the means for folding the sides of the blank as it passes to the die and plunger.

Referring to Fig. 1, A is the frame of the machine, which may be of any suitable construction, and B is the roll of paper or pasteboard from which the blanks for the boxes are to be cut. From the roll B the web of paper passes up through a guiding space left

between the end of the frame and the pasting tank Q, and thence over a curved metal guide 15 and under an adjustable depressing roller 16 immediately over the pasting roller Q¹. The shaft upon which the guide roller 16 turns is mounted eccentrically in bearings in the side brackets 17, so that by turning the shaft in these bearings the roller may be depressed to the position shown in Fig. 1 to bring the paper into contact with the pasting roller Q¹, or the roller 16 may be raised to allow the web of paper to free itself from contact with the pasting roller. From this depressing roller 16 the web passes over a guide roller 18 and then up over a roller 19 at the end of the machine whence the web is turned in the direction of the arrow, Fig. 1, over the surface of the table C under the scoring roller D, and between the feeding and scoring rollers E. Thence the web of paper passes between the two rollers F and F¹ which serve to cut from the opposite edges of the web the notches x, shown in Fig. 7. The construction of these rollers will be understood by reference to Figs. 5 and 6.

The upper roller F is a cylinder of metal with a plain surface. The roller F¹ carries at its opposite end knives 20, preferably two pairs, of a shape corresponding with the notches x to be cut out of the edges of the sheet. Within each of these knives is an ejector 27 mounted on a stem 21 guided in a hole in the roller. Each stem 21 is mounted on a yoke 22, embracing an eccentric 23, within which turns the hub 24 of the roller F¹. This eccentric 23 is held from turning by suitable means, such as by a pin projecting from the fixed bearing 28 (Fig. 5) of the shaft 25 of the roller F¹, this pin projecting into an opening 26 (Fig. 6) in the eccentric. The eccentric is so mounted that at the upper side of the roller where the cutters contact with the upper roller F (Fig. 6) the ejector 27 will be withdrawn into the roller, while the ejector 27 at the bottom or under side will be projected. The result will be that as the two rollers F, F¹, revolve in unison, the cutters 20 as they pass in contact with the upper roller F will cut out from the opposite edges of the web of paper pieces of the shape of the notch x (Fig. 7), and such cut-out pieces will stay within the cutter as the roller F¹ turns until the ejector 27 as the roller turns, is forced outward by the eccentric 23

and ejects the cut-out pieces from between the knives. The paper web thus notched then passes to the devices for folding up the sides *s, s*, of the blank (Fig. 7) on the score lines already put onto the paper by the scoring rollers. These side folding guides are best illustrated in Figs. 10 and 11, and comprise the curved side pieces 30, which at the entrance end flare outwardly in the usual manner, but beyond the flaring end they stand substantially vertical. Between these two side guides 30 I mount a central wedge-shaped guide 31, which is suspended with its wider edge down from a yoke 32 mounted on the table. The under side of this wedge-shaped guide 31 stands at a slight distance above the surface of the table C (Fig. 11) for the free passage of the web of paper and the under surface of the guide is grooved for clearance of the pasted lines on the surface of the paper. On each side of this wedge-shaped guide 31 I mount on vertical spindles conical guide rollers 33 which project through suitably shaped openings in the side walls of the guides 30 to press the bent-up sides of the blank against the inclined walls of the guide 31, and thereby insure sharp bends between the bottom and sides of the blank.

When the forward end of the web has been fed forward to the die and plungers the web of paper thus pasted, scored, and notched, and with its side walls folded, receives a transverse cut along the line *y* (Fig. 7), thus severing the blank from the web. For this purpose, I make use of the cutting devices more fully illustrated in Figs. 8 and 9. On the bed of the table C I mount a fixed cutting blade 40, in conjunction with which acts a blade 41 carried by the vibrating piece 42 pivoted at 43 to the frame. To the upper end of this vibrating piece 42 I connect by a link 44 an arm 45 fixed to a cross shaft 46. On this cross shaft 46 is an arm 47 which is acted upon by a cam 48 suitably rotated from a moving part of the machine.

In order to insure the accurate working of the cutting blade in spite of wear, I may provide on the bearing end of the arm 47 a pivoted piece 49 adjustable by a screw 50 as will be readily understood.

All the devices so far described are actuated intermittently, that is to say, the feed rollers *E, E*, are so operated by suitable means from the driving shaft of the machine that they feed forward the web of paper intermittently and for a distance each time equal to the length of the blank, and the pasting rollers and scoring rollers and a cutter 41 are correspondingly actuated at intervals, so that a complete fresh blank is presented to the die to intervals, and with the sides of the blank already turned up, as described.

As I have already said, the machine is provided with one stationary die, with which co-

operate a series of plungers passing through the die. These successive plungers are preferably arranged in an endless series, as by mounting them in the form of an endless chain, certain links of which carry plungers. As illustrated in Figs. 2 and 3, *P, P* are the plungers, which in the drawings are shown of rectangular outline for the formation of a rectangular box. Each plunger is carried by the laterally projecting arm *p* of a link *P*¹. These several links *P*¹ are connected into a chain by pairs of short links *p*¹. The endless chain thus formed passes over suitable chain wheels *R*, which are in pairs mounted in bearings in the frame above and below the table C. To one or other set of chain wheels, preferably the lower set, a continuous rotary motion is imparted from some moving part of the machine, so that the endless chain of plungers will travel continuously through the forming die *D* formed in and under the table C. In the edge of the die opening is formed a notch *d* for the passage of the shanks or arms *p* which carry the plungers, as seen in Fig. 3. While passing downward to and through the die, I prefer to guide the endless chain as by having anti-friction rollers 51 on the projecting ends of the first pairs 54 of the chain links in guide grooves 52 in the standards 53 of the frame.

On opposite sides of the mouth of the die I mount on the table C (Fig. 2) in line with the guide 30 side plates 55 which are in effect continuations of the guides 30 to maintain the bent up sides of the blank in position. The mouth of the die *D* is made flaring at its opposite ends as illustrated at 56 by dotted lines in Fig. 2 and by full lines in Fig. 3. This flaring part of the die may conveniently be formed in the thickness of the table and below this flaring part the die is continued in the form of a box *D*¹ of a cross section substantially that of the external dimensions of the box, as seen in Fig. 4.

In conjunction with the guide 55, I provide devices for folding in on the ends of each plunger the end flaps *f* of the sides of the blank (Fig. 7). These folding devices are best illustrated in Fig. 2, and comprise at each end of the box, levers 57 and 58, carrying fingers 59 and 60 adapted to be projected through slots in the side walls 55. The two levers 57 are fixed to a shaft 61 in bearings in the standard 53 and one of the levers 57 has an inclined projection 63 adapted to be acted on by an inclined projection 64 mounted on each of the links *P*¹. Each lever 57 is connected to a lever 58 by a link 65, and these levers 58 are pivoted to a bracket 66 on the outer side plate 55 and are acted upon by a spring or springs 69 so as to normally tend to draw the finger ends of both pairs of levers 57 and 58 from within the plates 55. In Fig. 2, I have shown the projection 64 as acting upon the projection 55 to push the finger ends of these levers 57, 58, inwardly against the

action of the spring 69 and thus to turn or fold the flaps at the ends of the side pieces of the blank against the ends of the descending plunger P. (Figs. 2 and 3) These projections 63 and 64 are made of such form that they will hold the fingers 59 and 60 in their inwardly pressed positions until as the plunger descends it has carried the box blank well down into the die and thereby pressed up the ends *e* of the box over the flaps *f* of the sides (Fig. 7).

On each side of the plunger P against which the flaps *f* are to be pressed, I provide a projection 70 (Figs. 2 and 3) in such a position that when the face of the plunger has reached the box blank, or rather that part of it which is to form the bottom of the box, this projection 70 will come to bear on the upper edges of the inwardly turned flaps *f* of the sides of the blank, as shown in Fig. 2, to insure their being held true, that is parallel with the bottom of the box. In the formation of boxes of this character, there has heretofore been found a difficulty in the tendency of these flaps of the side pieces to tilt upward at their adjacent ends when folded. These truing projections 70 overcome this difficulty.

In the lower part of the box portion D¹ of the die, I mount spring-pressed feed rollers 71 in positions to bear against and press the end flaps firmly up against each other, so that their pasted surfaces will be caused to firmly adhere. These rollers 71, as shown in Fig. 4, have the ends of their shafts acted on by half bearings 72 and springs 73 with adjusting screws 74. I prefer to extend the shafts of these rollers out at one end (Fig. 2) and to mount thereon gear wheels 75, so that the two rollers shall turn exactly at the same speed. Motion may be imparted to either one of the shafts continuously by any suitable means from a moving part of the machine, as by a chain passing over a chain wheel 76, Fig. 2. By thus applying positive motion to the rollers 71, they help to feed the box and plunger through, and the machine runs more smoothly than if the box and plunger had to strike against rollers, which are not rotated.

It will be seen that the plungers carry the blanks right through the die, and after passing through the die the blanks are in the form of finished box bodies or box lids, the pasted ends *e* having been caused to closely adhere to the flaps *f* by the pressure of the rollers, as described.

I now provide means for stripping the finished box bodies or covers from the plungers. For this purpose, I prefer to mount upon the axis *r* of the lower pair of chain wheels R a rocking frame 77 of the form illustrated in Fig. 1, this frame having at the bottom an open rectangular part 78 a little larger than the width of the box. Within the inner faces of this open rectangular part 78 I

mount a pair of bent spring plates or claws 79 (Figs. 1 and 2^a). This rocking frame has an upwardly extending arm 80 with a rod 81 connected to it. The opposite end of this rod 81 is slotted and guided upon the shaft 82 carrying a cam 83 which acts upon a pin 84 on the rod 81. This shaft 82 is driven to rotate continuously at a speed greater than say three times that of the shaft *r* of the chain wheels, so that the rocking frame 77 is vibrated backward and forward rapidly, and its movement in the direction in which the plungers travel around the lower chain wheels R is more rapid than the travel of the plungers, but from the same center. As the frame 77 vibrates in a direction the opposite to that in which a plunger travels, the spring edges of the plates 79 will slide over the folded ends of the blank until that spring edge slips beyond what will be the top of a box body, as indicated in Fig. 2^a. Then as the yoke begins its return movement, that is to say, in a direction the same as that in which the plunger is traveling, around the axis *r*, these edges of the spring plate engaging the edge of the box and traveling more rapidly than the plunger, will strip the finished box from the plunger.

I have heretofore referred to the fact that the web-depressing roll 16 over the pasting roller Q¹ can be raised or lowered by reason of the eccentric mounting of its shaft. I prefer to so connect this mounting with the stop motion of the machine that the stopping of the machine will cause the roller 16 to be raised to free the web from contact with the pasting roller Q¹, as the leaving of the web in contact with the pasting roller while the machine is stopped is always liable to cause trouble. For this purpose, I mount on the end of the shaft of the roller 16 a lever 85 to the outer end of which is connected a rod 86 connected as shown in Fig. 1^a to the arm of a bell crank lever 87 pivoted at 88 to a fixed part of the frame. The other arm of the bell crank lever is to be connected to the belt shifter, so that when the latter moves the belt over from the fast to the loose pulley to stop the machine, the bell crank lever 87 will through the rod 86 draw the arm or lever 85 from the position shown by full line in Fig. 1 to the position shown in dotted line in that figure, and accordingly by the eccentric mounting of the shaft of the roller 16 the latter will be raised and the web of paper freed from contact with the pasting roller Q¹.

It will be understood that some features of my invention, more particularly the intermittent feed, stationary die, and series of plungers passing through the die, and means for stripping the formed devices from the plungers after they have passed through the die may be applied to the formation of other things than paper boxes, and therefore in the following claims, I use the term "paper box

machine" merely in a descriptive sense, except where the combinations specified are applicable only to the manufacture of paper boxes.

5 I claim as my invention

1. A paper box machine provided with means for folding the sides and side flaps of the paper box in combination with a die and a series of plungers adapted to pass through
10 the die and thereby fold the ends over the side flaps in carrying the blank through the die.

2. A paper box machine provided with means for folding the sides and side flaps of
15 the paper box in combination with a die and an endless series of plungers adapted to pass through the die and thereby fold the ends over the side flaps in carrying the blank through the die.

3. A paper box machine provided with means for feeding blanks to the die and for folding the sides and side flaps of the paper
20 box in combination with a die and a series of plungers adapted to pass through the die and thereby fold the ends over the side flaps in carrying the blank through the die.

4. A paper box machine provided with means for folding the sides and side flaps of the paper boxes in combination with a die
30 and an endless chain of plungers adapted to pass through the die and thereby fold the ends over the side flaps in carrying the blanks through the die.

5. A paper box machine provided with a
35 die and means for intermittently feeding blanks to the die, means for folding the sides and side flaps of the paper boxes in combination with an endless chain of plungers and means for imparting continuous motion to
40 the chain to pass the plungers successively through the die and thereby fold the ends over the side flaps in carrying the blanks through the die.

6. A paper box machine, having a die and
45 means for feeding blanks to the die with the sides folded up, means for folding in the end flaps of the sides, with a series of plungers adapted to pass through the die, and thereby fold the ends over the side flaps in carry-
50 ing the blank through the die.

7. A paper box machine, having a die and means for folding the sides and end flaps in combination with a plunger having projec-
tions to true the end flaps.

8. A paper box machine, having a die and
55 a series of plungers and means for passing them through the die in succession, in combination with means for intermittently feeding the web of paper to the die, means
60 for folding the sides of the blanks and cutting devices between the said folding means and the die for severing the blank from the web when presented to the die.

9. A paper box machine, having a die, an
65 endless chain of plungers, means for im-

parting continuous motion to said endless chain of plungers, in combination with means for intermittently feeding the web of paper to the die, means for folding the sides of the blank, and cutting devices between the said
70 folding means and the die for severing the blank from the web when presented to the die.

10. A paper box machine, having a die and a series of plungers, and means for pass-
75 ing them through the die in succession, in combination with means for intermittently feeding the web of paper to the die, means for scoring and notching the web, and for folding up the sides of the blank and means
80 for severing the blank from the web when presented to the die.

11. A paper box machine, having a die and an endless chain of plungers, and means
85 for causing the plungers to pass through the die successively, in combination with means for stripping the formed boxes from the plungers, said stripping means comprising a vibrating frame having spring claws to en-
90 gage the edge of the formed box.

12. A paper box machine, having a die with flaring mouth, a series of plungers to
pass through the die, means for pasting the blank and feeding the same to the die, and
95 means for folding the sides and flaps of the blank.

13. A paper box machine, comprising means for pasting and feeding a paper web, scoring means, rotary cutting devices to
100 notch the edges of the web, means for folding the sides of the blank and for severing the latter from the web, flap-folding devices, and a die and plungers to carry the blank through the die.

14. A paper box machine, having pasting
105 and feed mechanisms, and die and means for folding the sides of the box blank and their flaps, with a plunger to pass the blank through the die, positively driven feed rollers to press the ends of the blank against the
110 side flaps, and springs to press the feed rollers to their work.

15. A paper box machine having pasting
and cutting mechanisms, an intermittent
115 paper feed and means for folding the sides of the blank as it is fed forward, in combination with a die, an endless chain of plungers, devices for folding the side flaps against the plunger and means for imparting motion to the chain to pass the plungers successively
120 through the die and thereby fold the ends over the side flaps in carrying the blanks through the dies.

In testimony whereof I have signed my name to this specification, in the presence of
125 two subscribing witnesses.

ALBERT W. MITCHELL.

Witnesses:

FRANK A. LEDDY,
FREDK. G. COOPER.