No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 1.

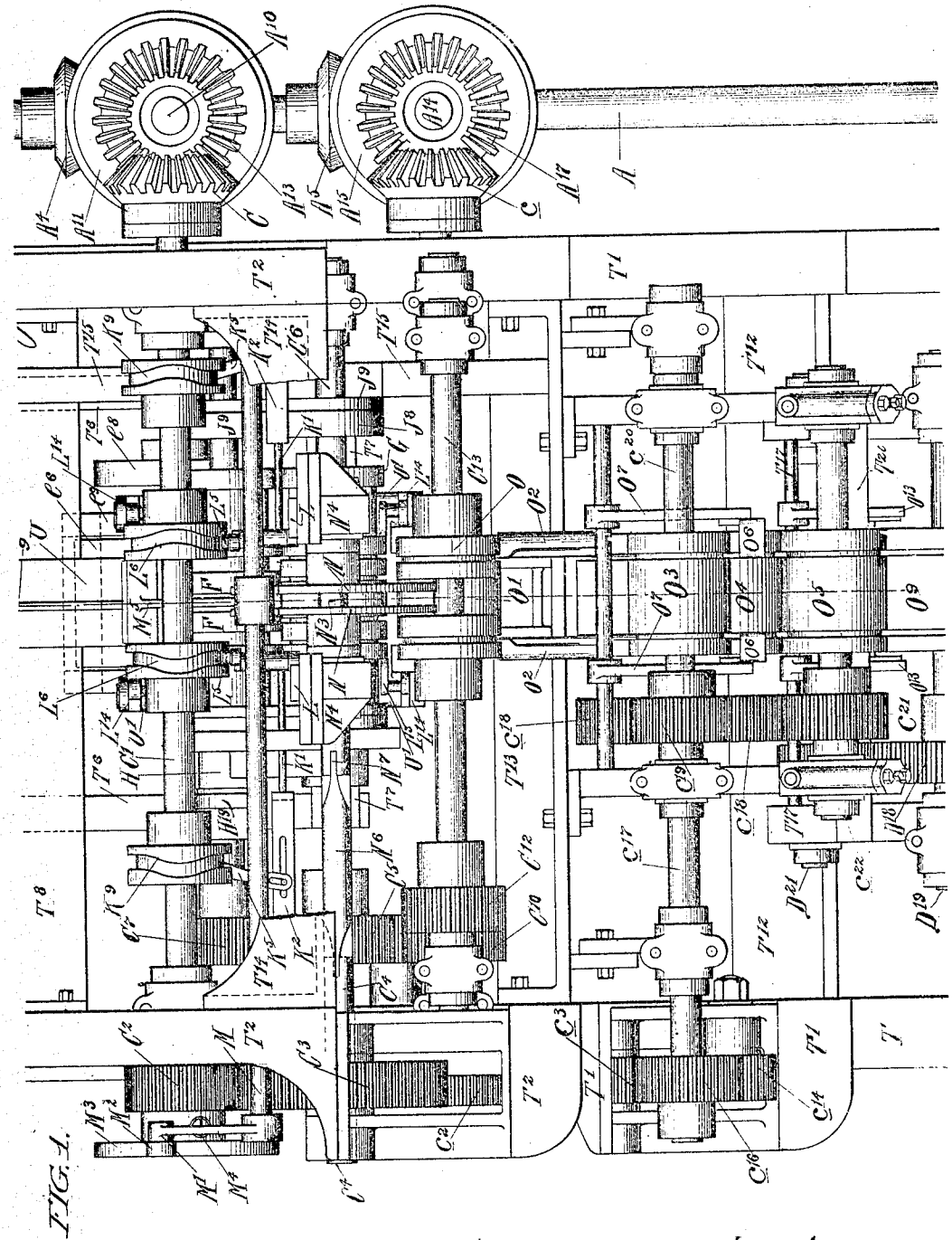


FIG. 1.

Witnesses:

H. Howard

A. Williams

Inventor:

Charles B. Stilwell

by his atty

Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 2.

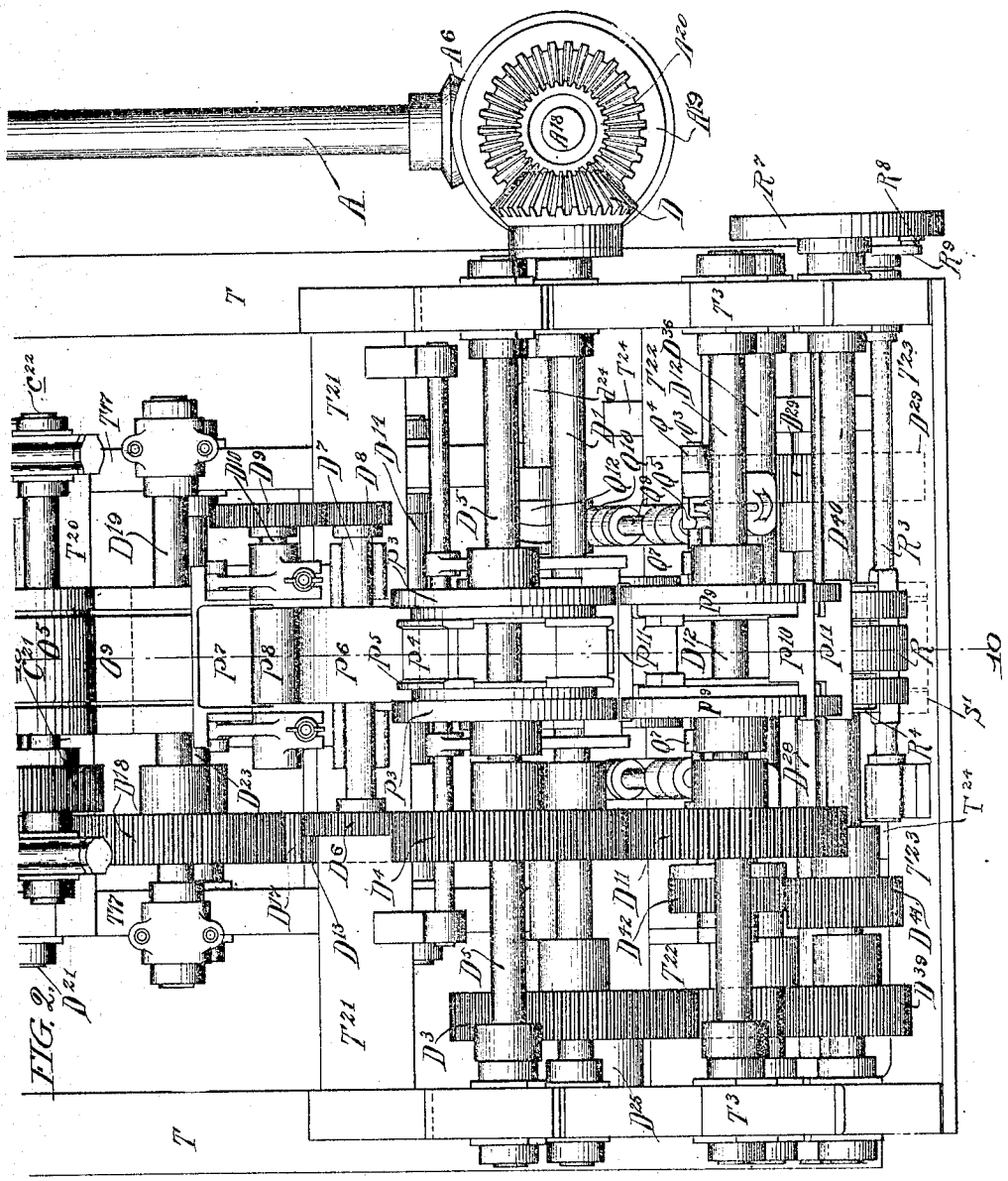


FIG. 2.

Witnesses:
H. Thurston
D. S. Williams

Inventor:
Charles B. Stilwell
by his atty.
Francis D. Chamberlain

No. 870,801. PATENTED NOV. 12, 1907.

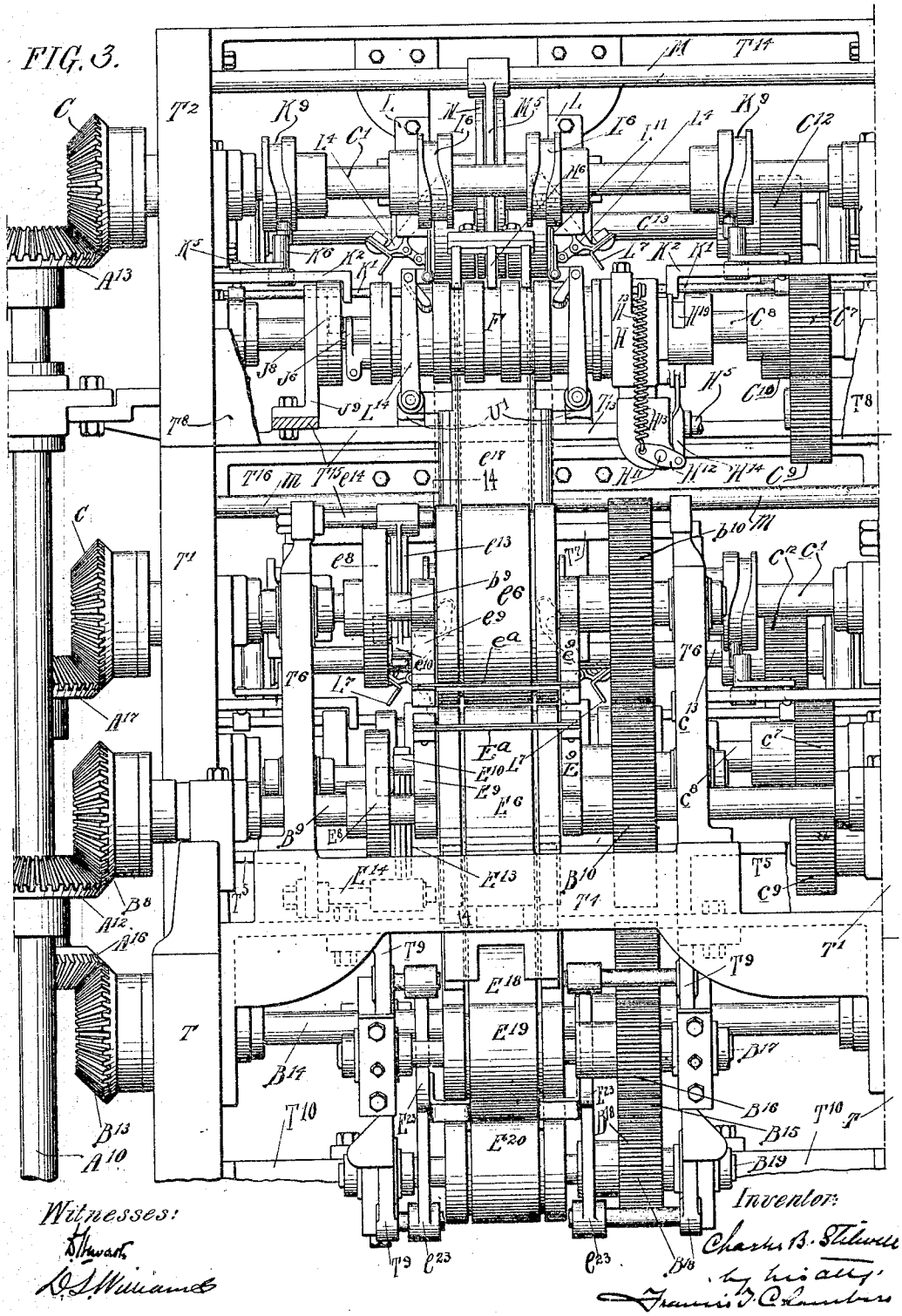
C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 3.

FIG. 3.



Witnesses:
D. Howard
D. S. Williamson

Inventor:
Charles B. Stilwell
by his atty
Francis B. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

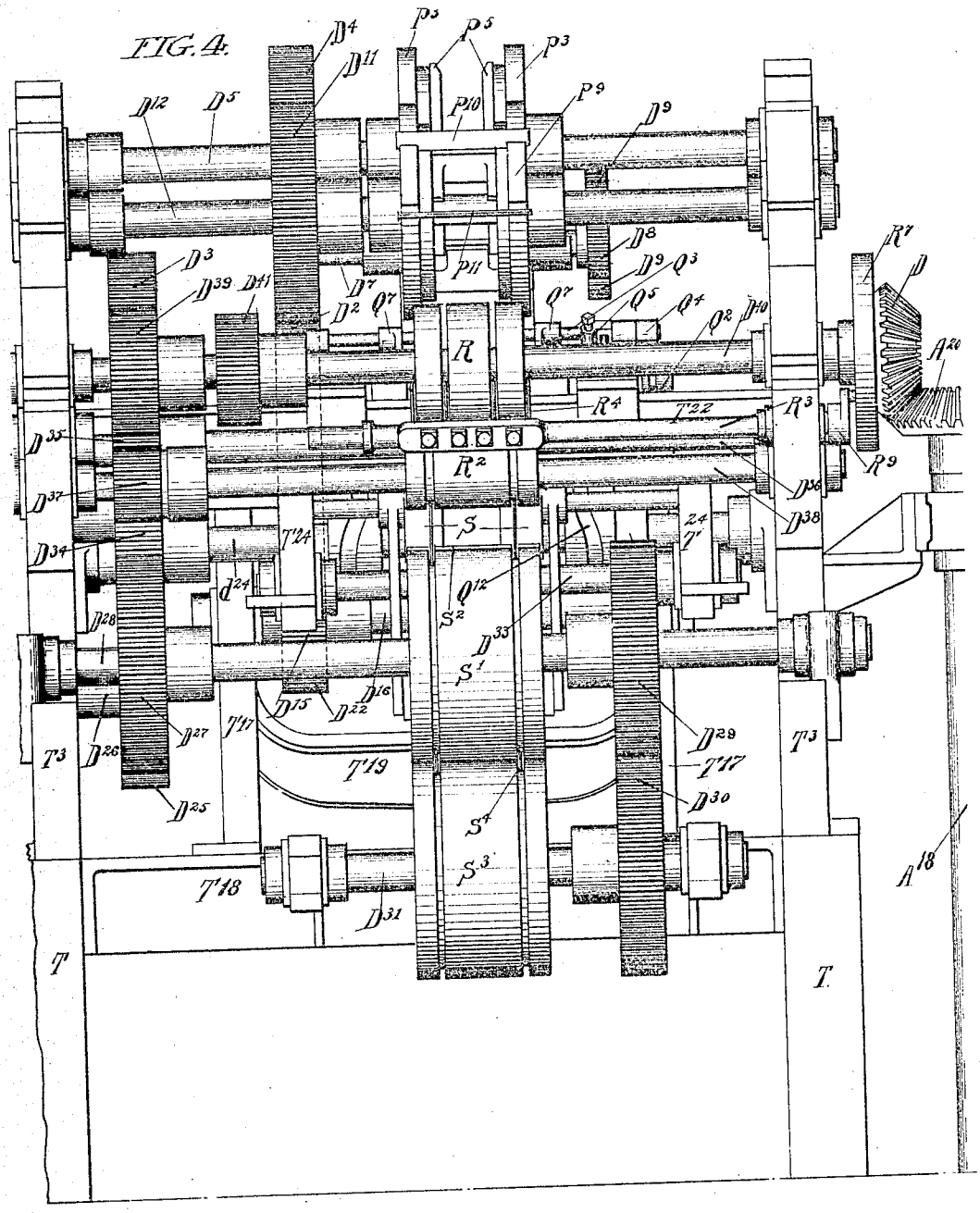
C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 4.

FIG. 4.



Witnesses:

A. Hunt

A. D. Williams

Inventor:

Charles B. Stilwell

by his atty

Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

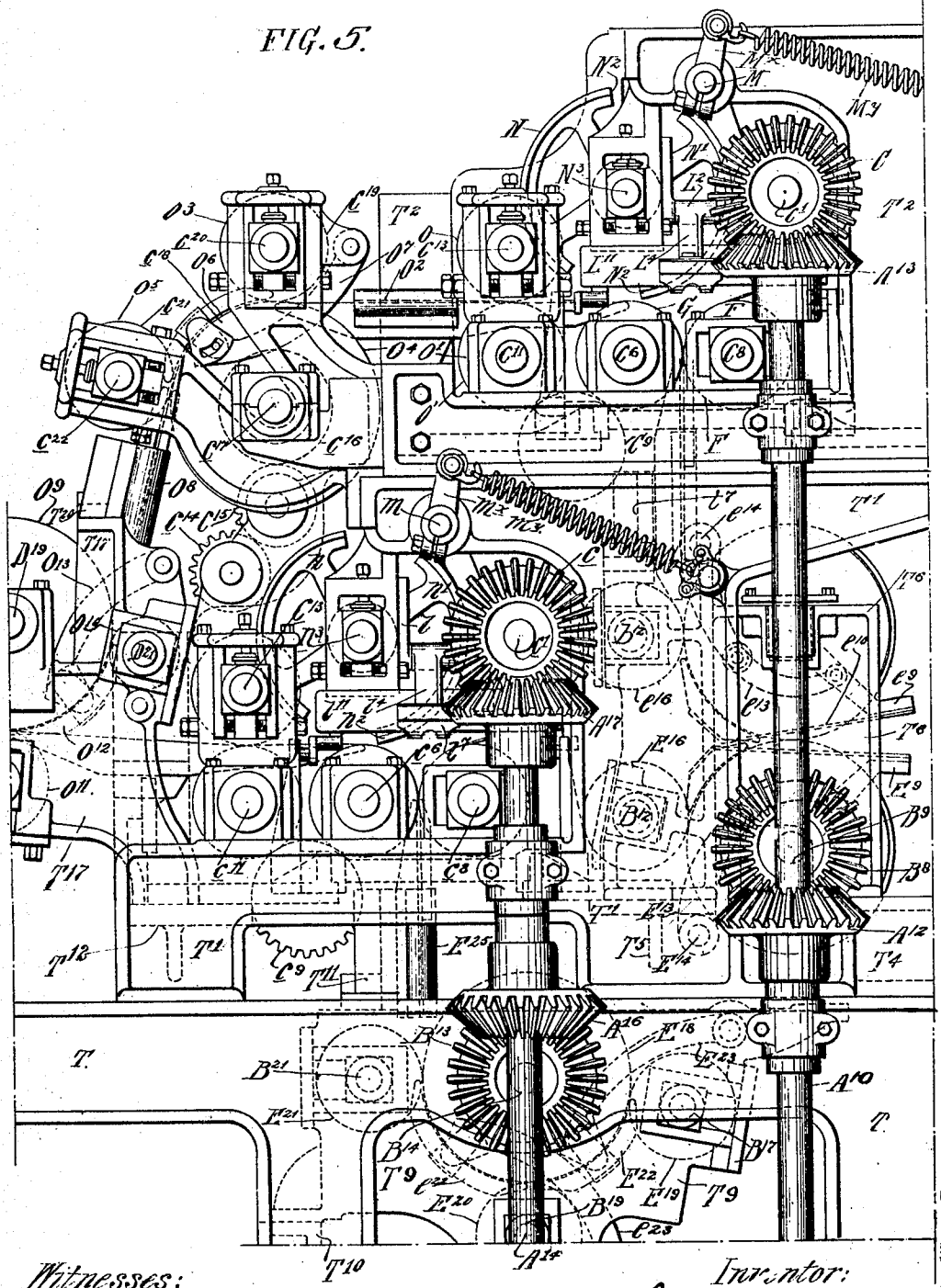
C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 5.

FIG. 5.



Witnesses:
H. Howard
D. S. Williamson

Inventor:
Chas. B. Stilwell
by his atty
Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

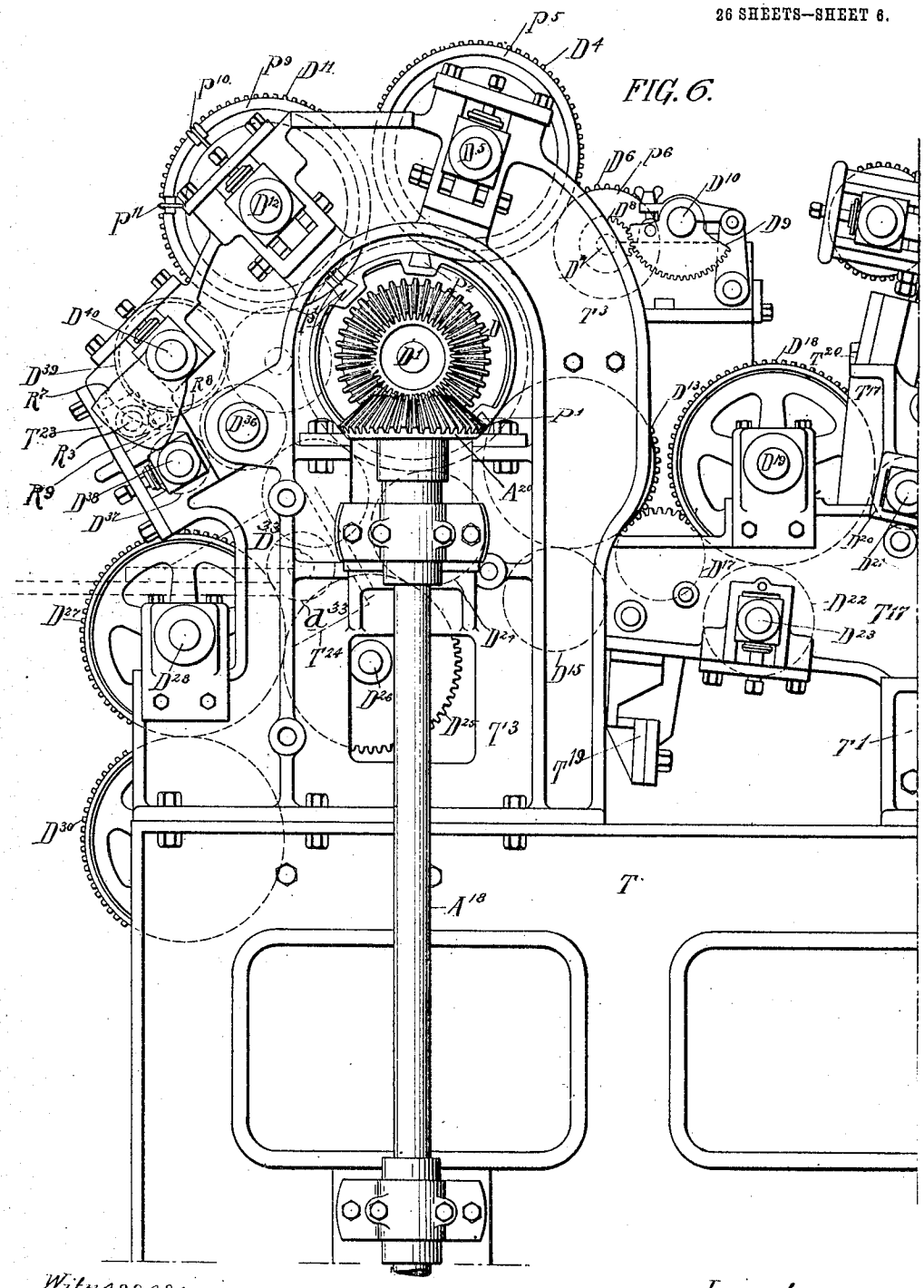
C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 6.

FIG. 6.



Witnesses:

Thurst

D. T. Williams.

Inventor:

Charles B. Stilwell

by his atty

Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

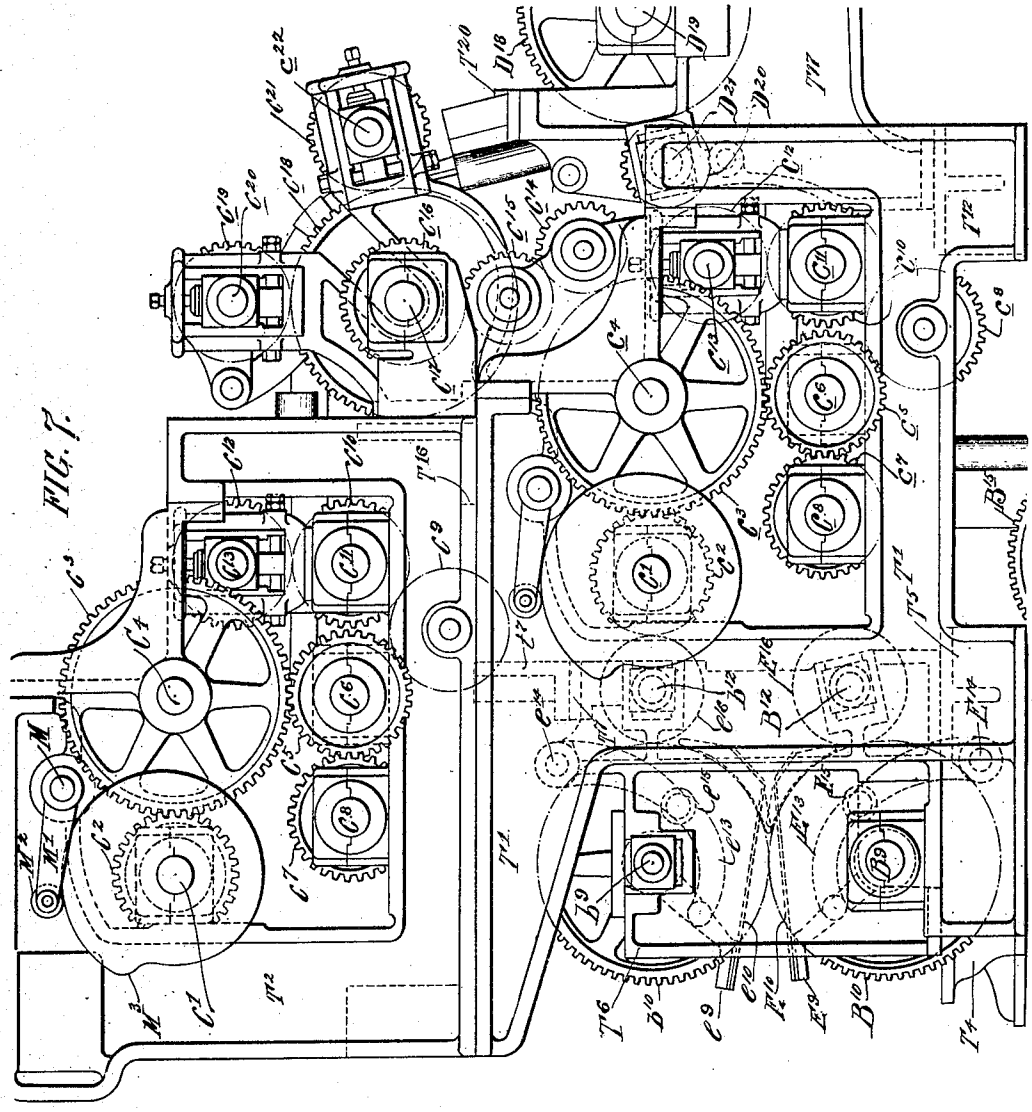
C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 7.

FIG. 7.



Witnesses:
H. Thurwanger
D. S. Williams

Inventor:
Charles B. Stilwell.
by his atty.
Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

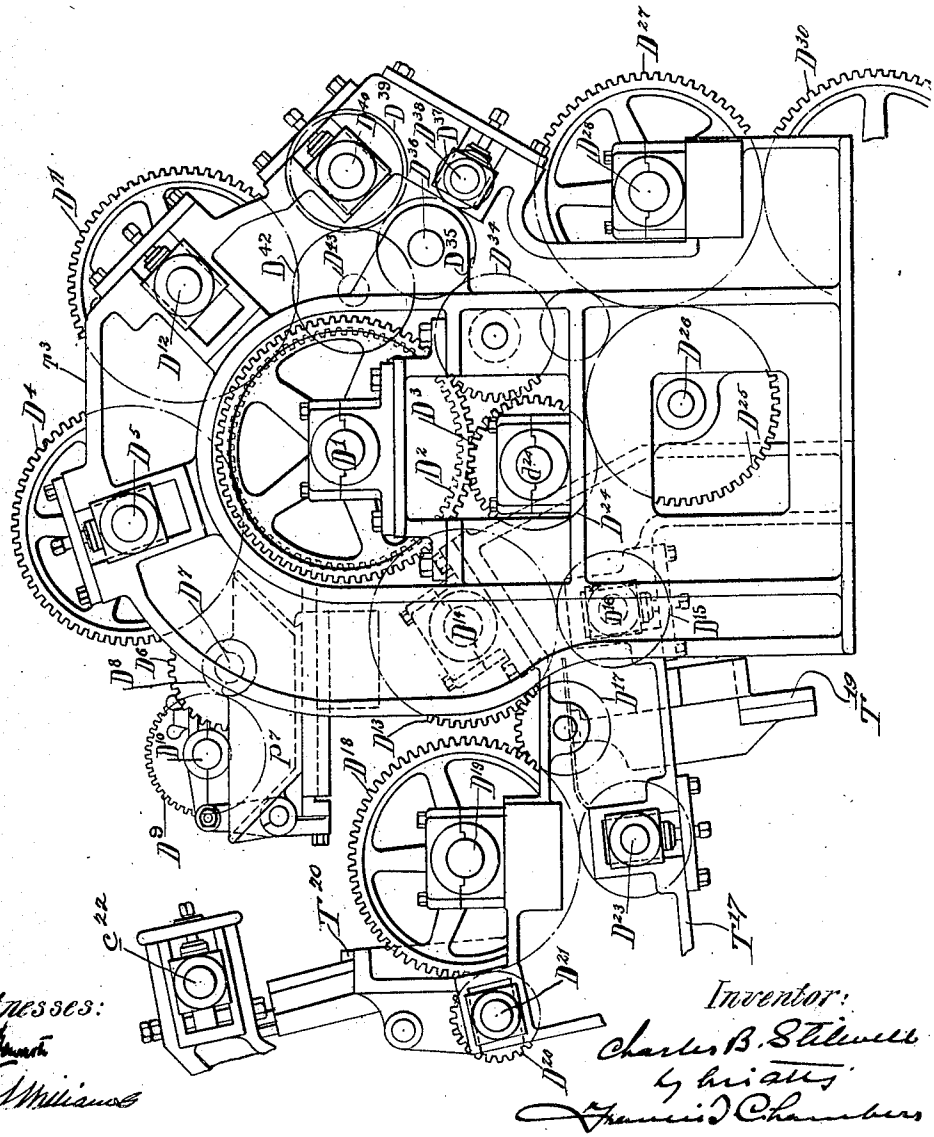
C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 8.

FIG. 8.



Witnesses:

Inventor:

Charles B. Stilwell

by his atty

Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

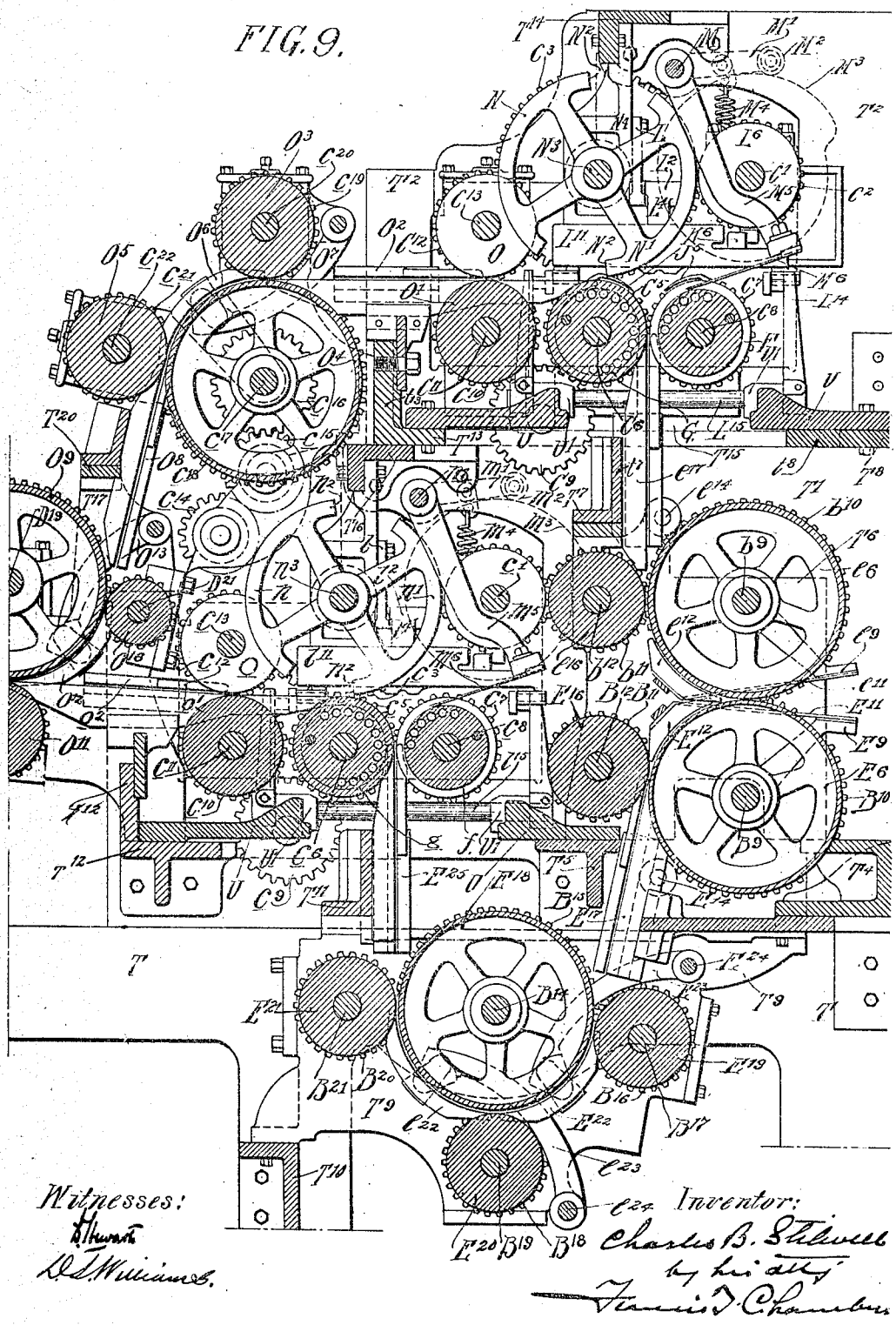
C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 9.

FIG. 9.



Witnesses:
A. Thurston
D. T. Williams.

Inventor:
Charles B. Stilwell
by his atty
Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

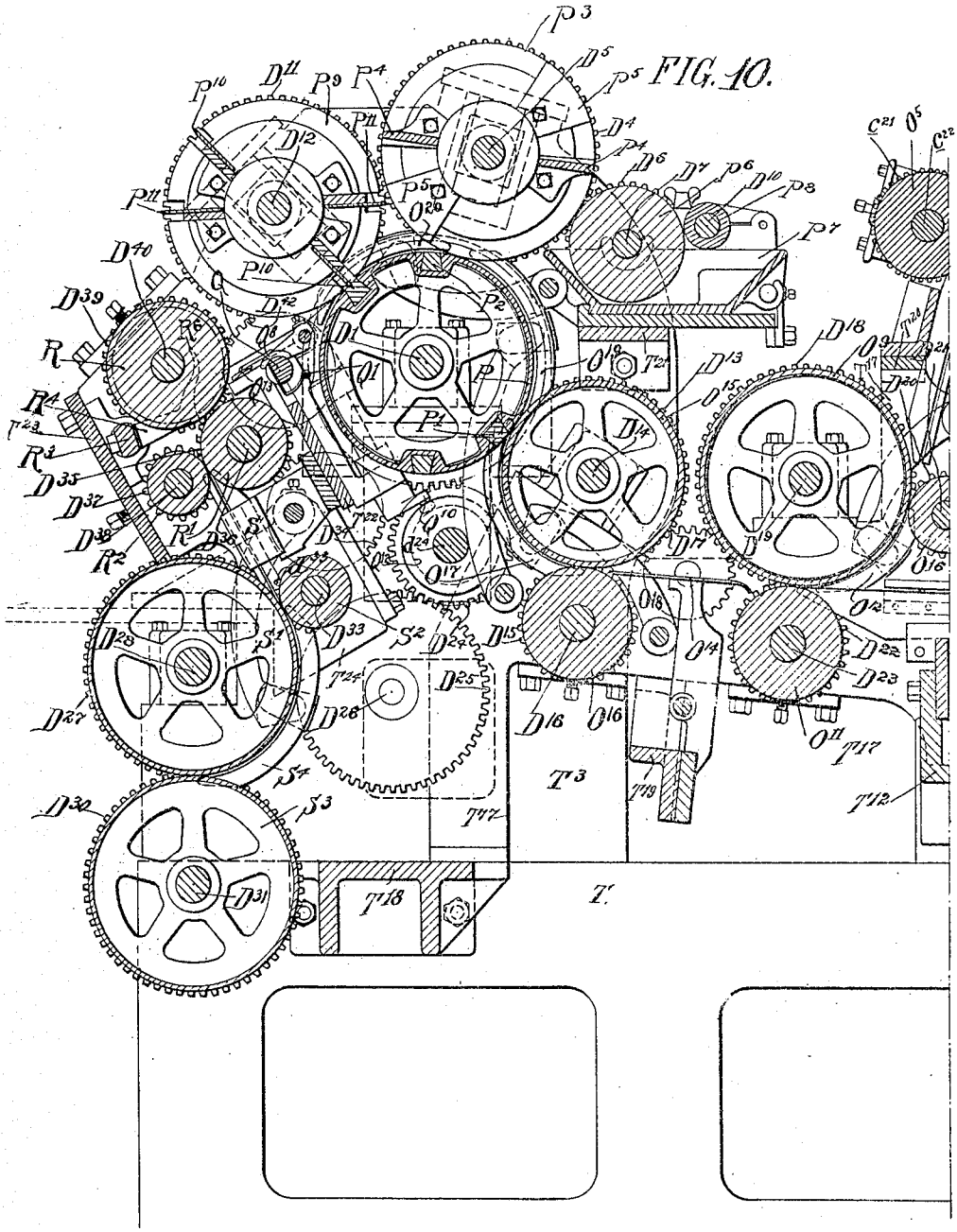
C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 10.

FIG. 10.



Witnesses:

D. Hunt

D. H. Williamson.

Inventor:

Charles B. Stilwell

by his atty.

Francis D. Chambers

No. 870,891. PATENTED NOV. 12, 1907.

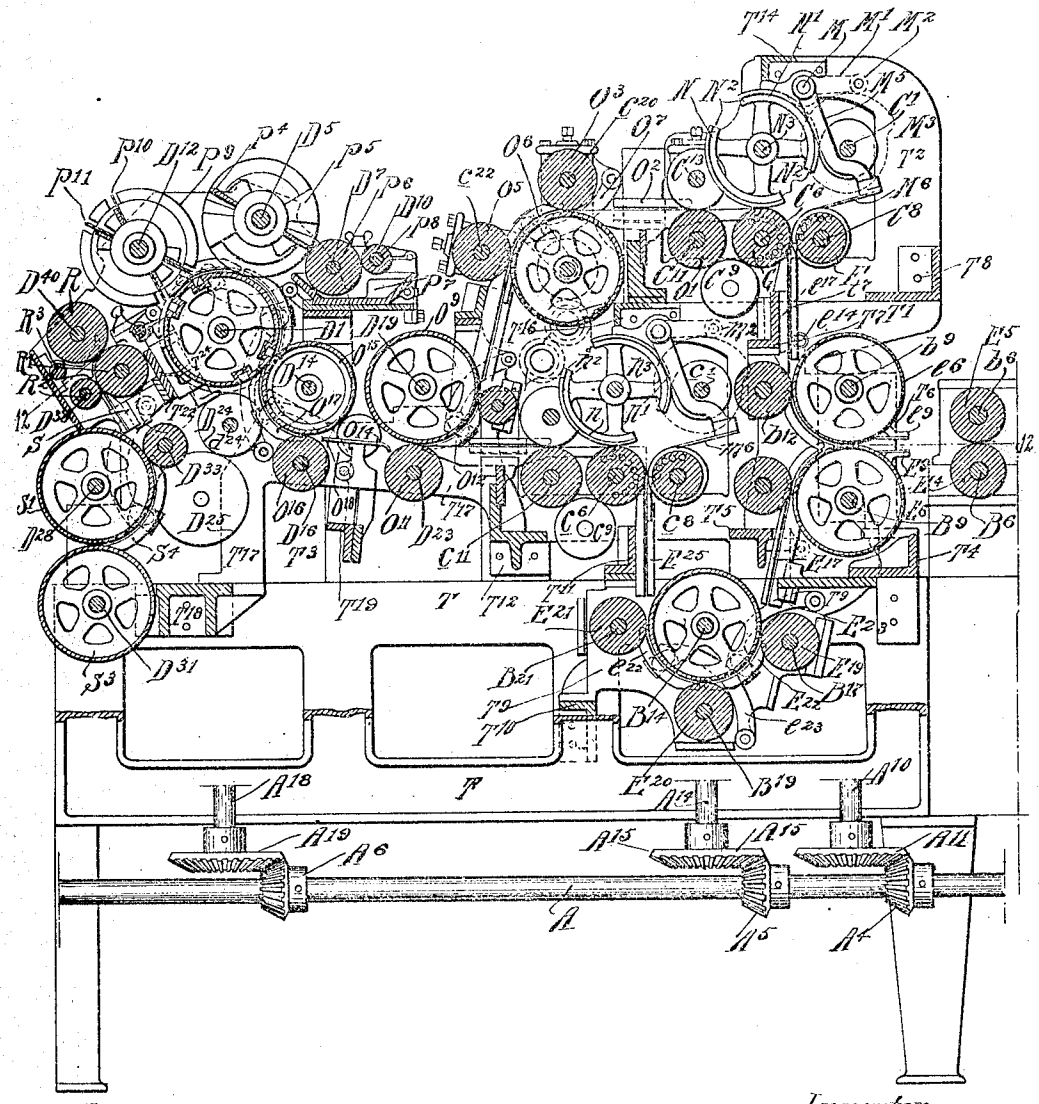
C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 11.

FIG. 11.



Witnesses:

D. Stewart

A. S. Williamson

Inventor:

Charles B. Stilwell

by his Atty.

Francis D. Chamberlain

No. 870,801. PATENTED NOV. 12, 1907.

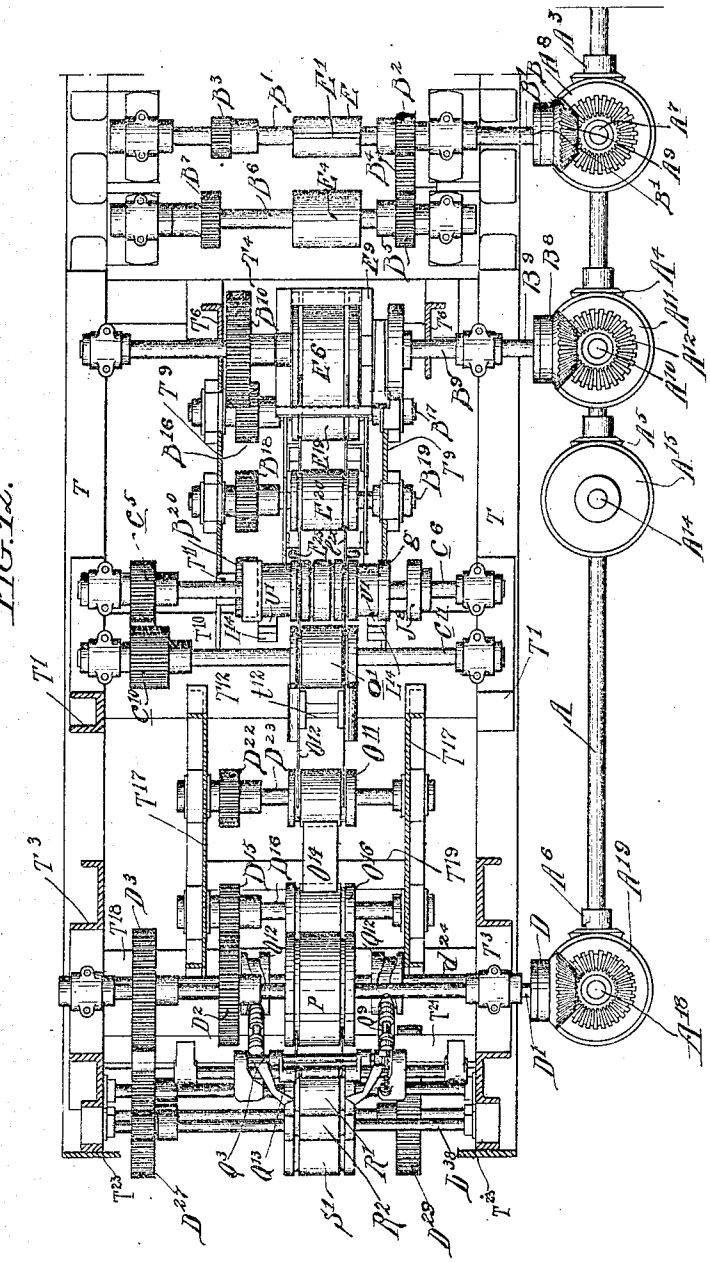
C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 12.

FIG. 12.



Witnesses:
D. Hunt
D. S. Williams

Inventor:
Charles B. Stilwell
by his atty
Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 13.

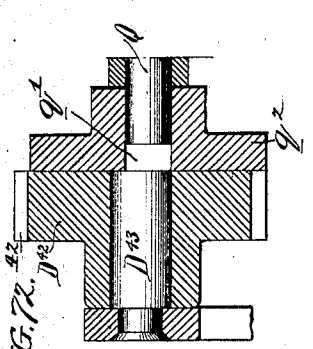


FIG. 72.

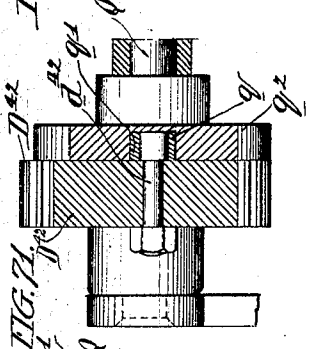


FIG. 71.

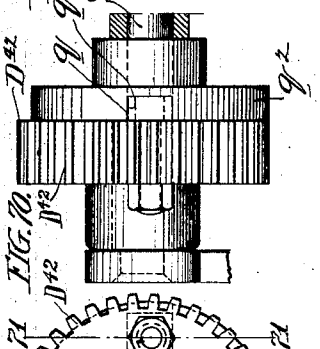


FIG. 70.

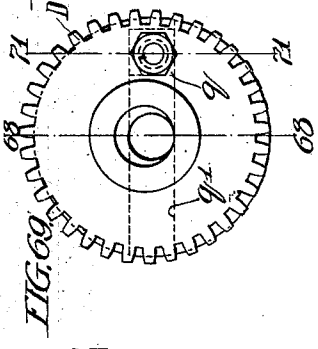


FIG. 69.

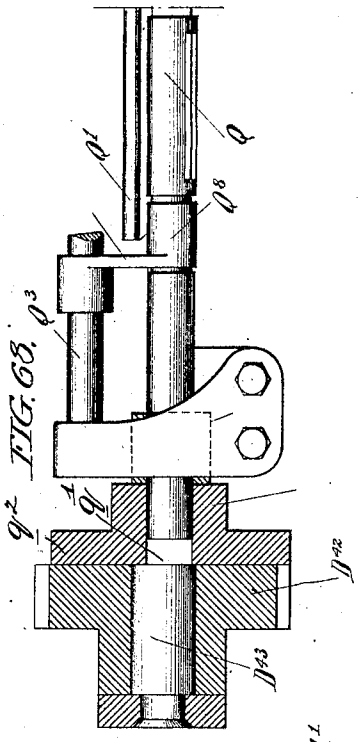


FIG. 68.

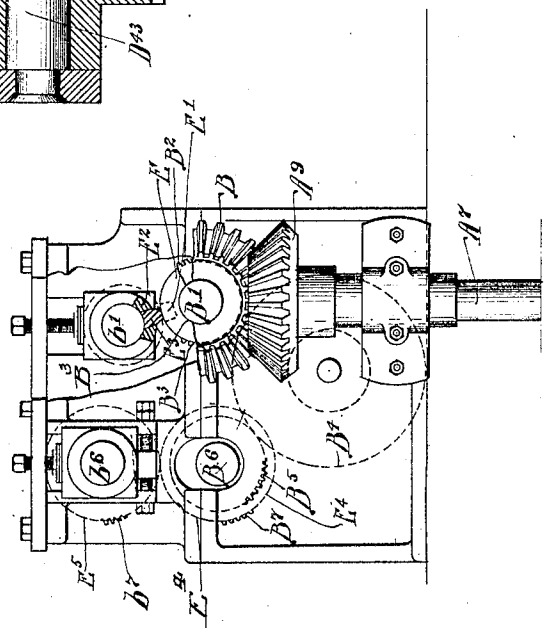


FIG. 13.

Witnesses:

H. Thurston

H. S. Williamson

Inventor:

Charles B. Stilwell

by his atty

Francis J. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 14.

FIG. 15.

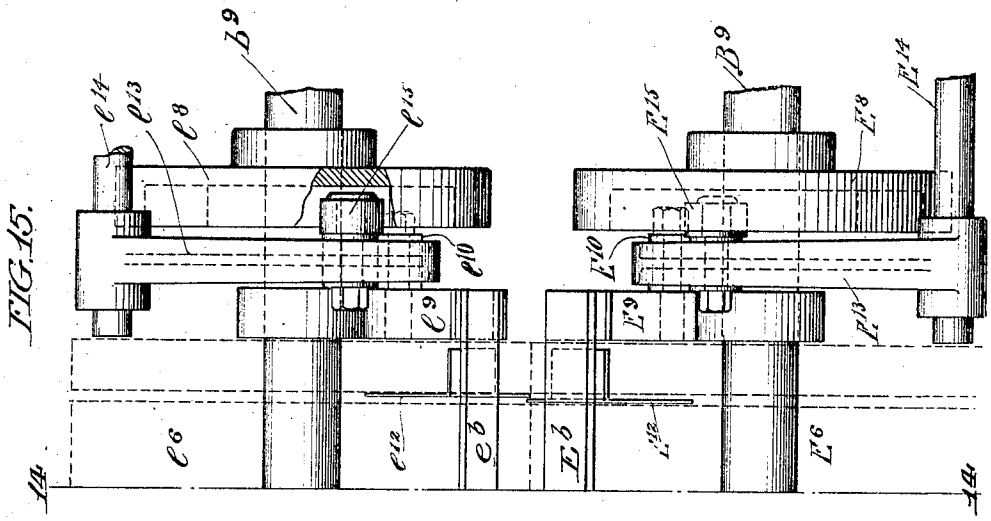
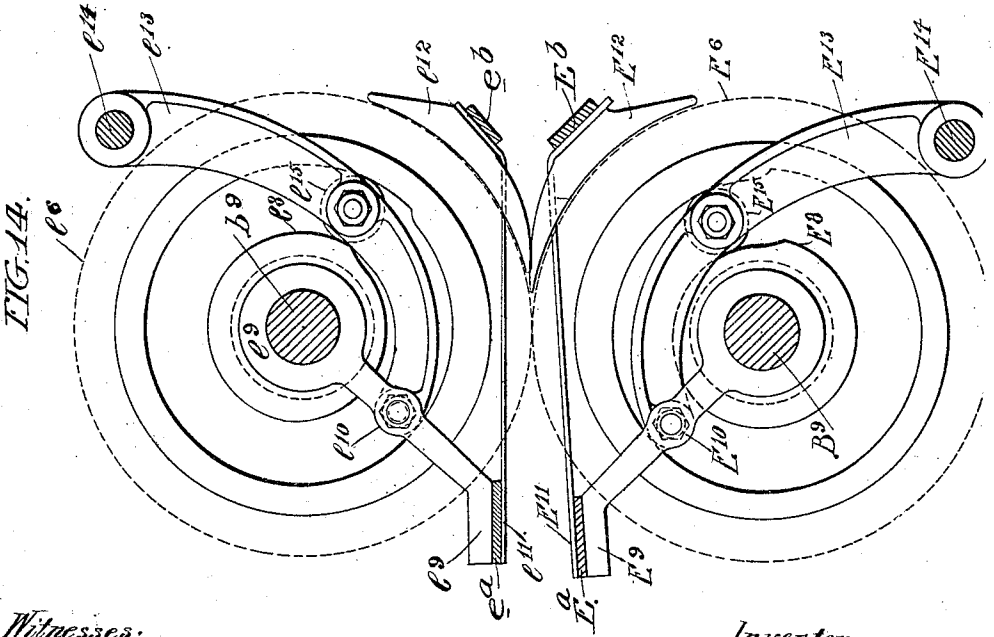


FIG. 14.



Witnesses:

H. Hewett

A. S. Williamson.

Inventor:

Charles B. Stilwell

by his atty

Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 15.

FIG. 17.

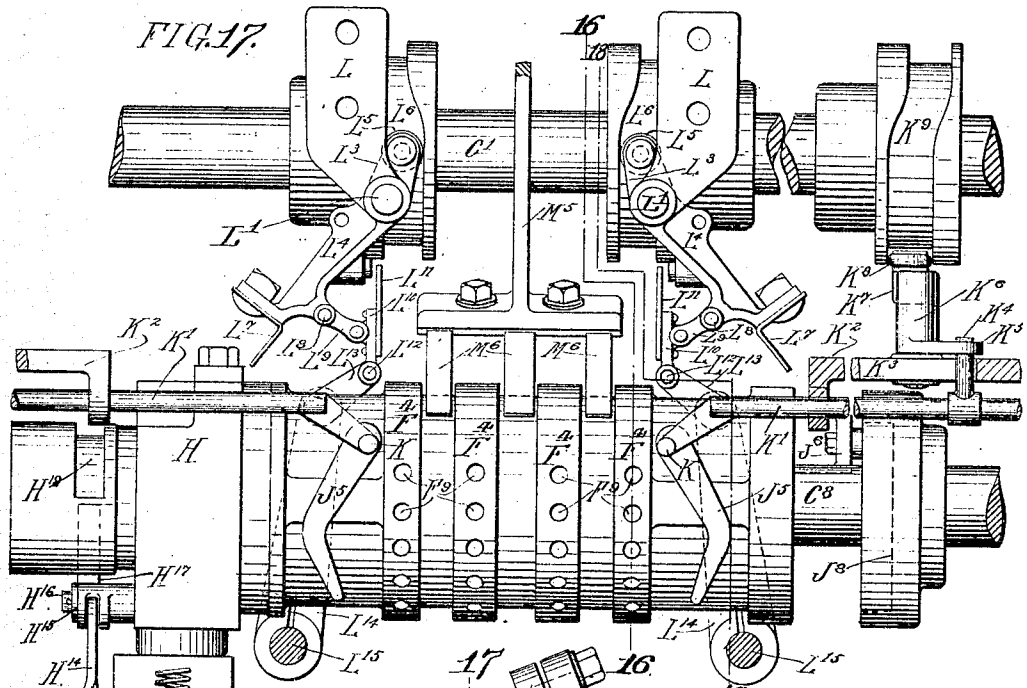
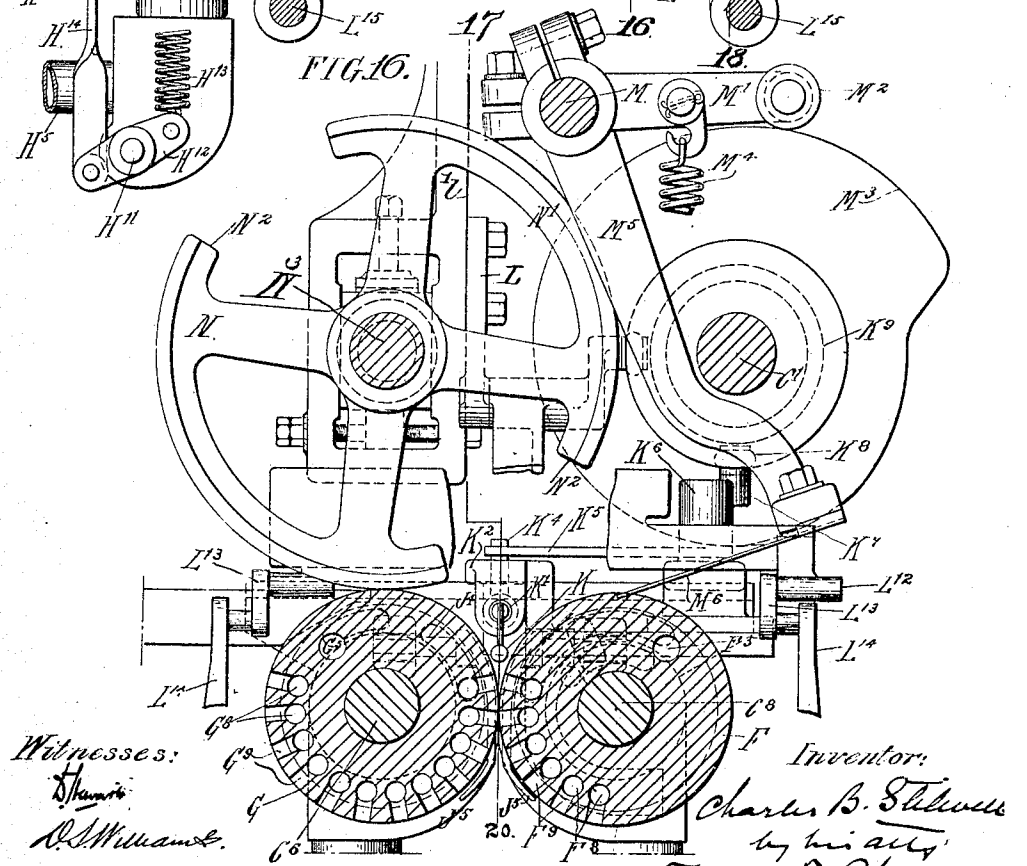


FIG. 16.



Witnesses:

D. Thomas

A. S. Williamson.

Inventor:

Charles B. Stilwell

by his atty

Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 18.

FIG. 19.

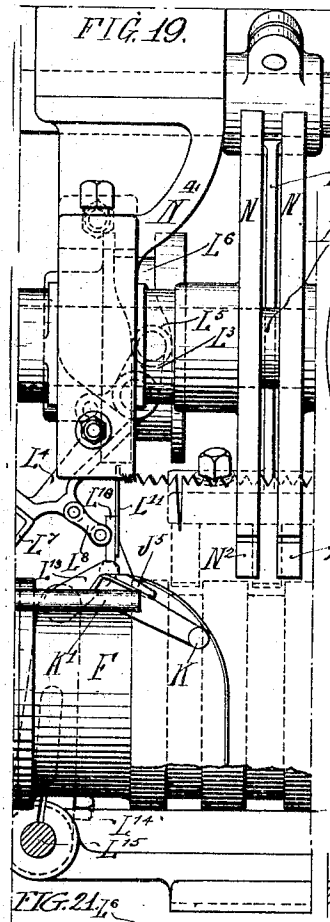


FIG. 18.

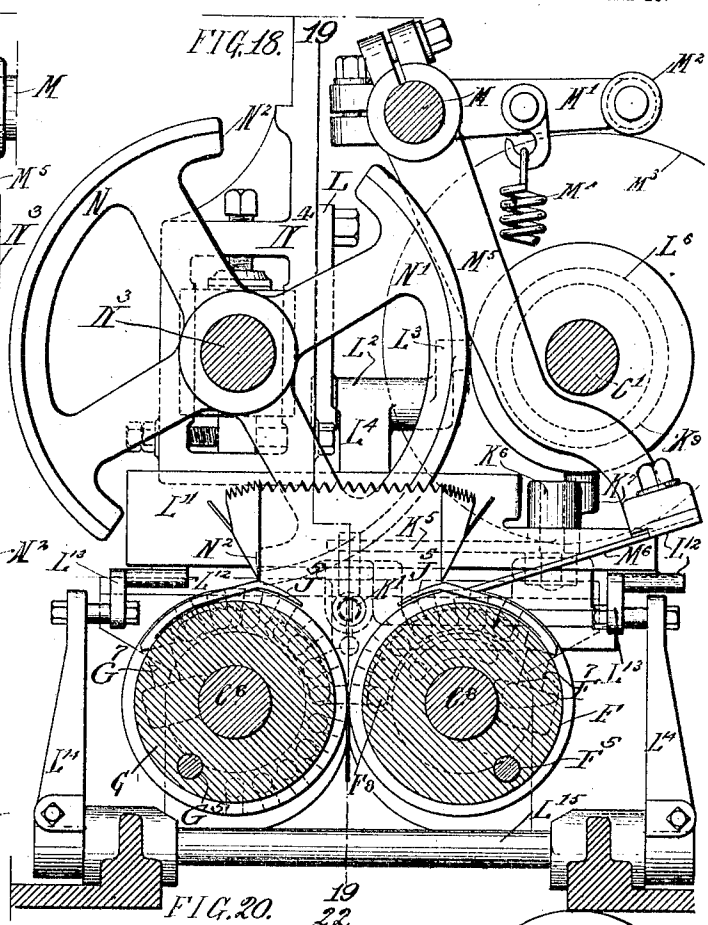


FIG. 21.

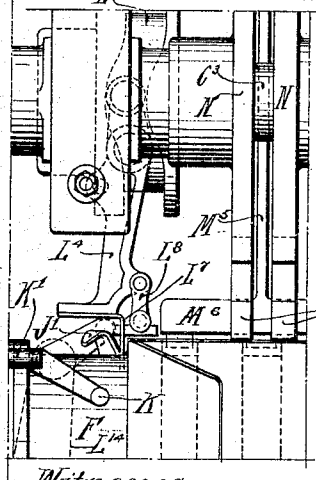
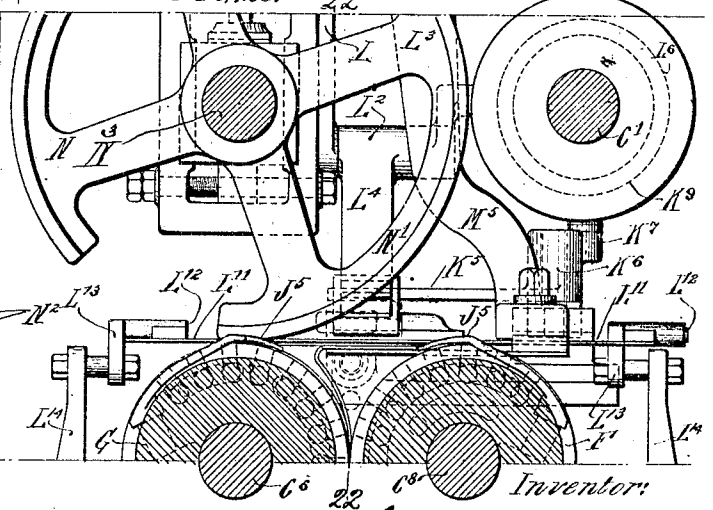


FIG. 20.



Witnesses.

W. Stewart

W. S. Williams

Inventor:

Charles B. Stilwell

by his att'y

Francis J. Chambers

No. 870,801.

C. B. STILWELL. PATENTED NOV. 12, 1907.

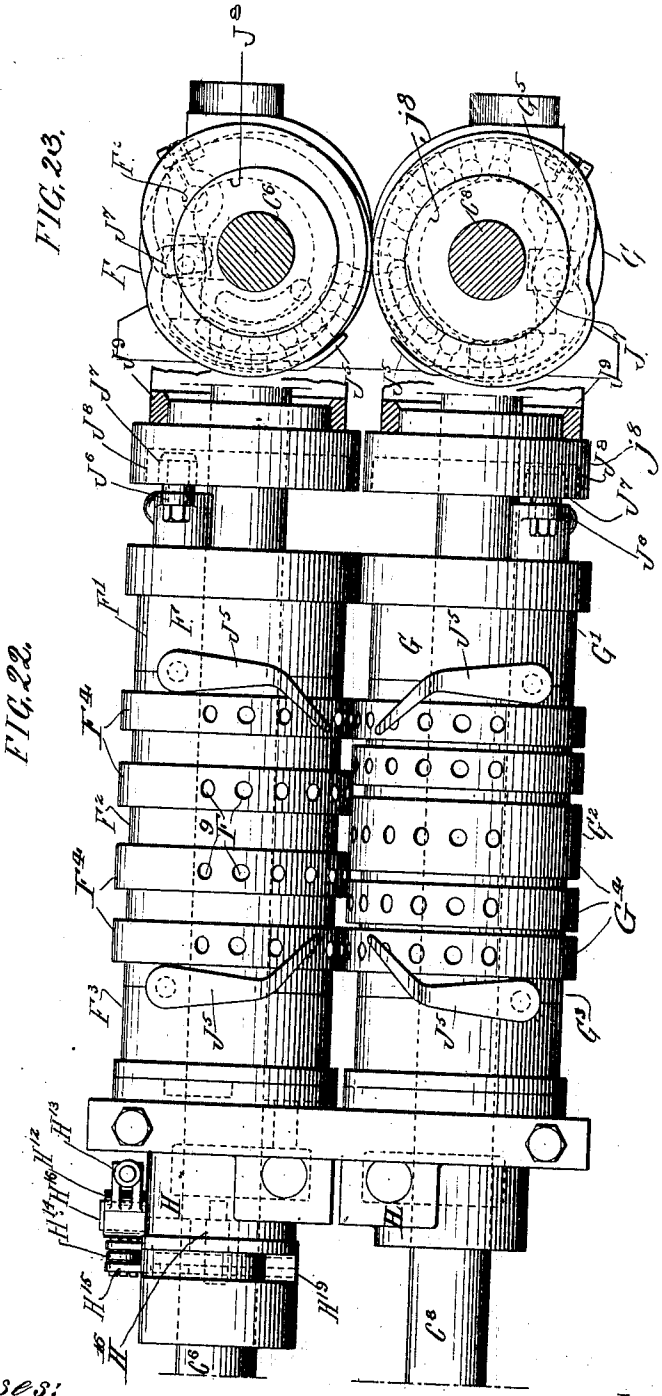
PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 17.

FIG. 23.

FIG. 22.



Witnesses:

D. S. Williams.

Inventor:

Charles B. Stilwell

by his atty.

Francis D. Chambers

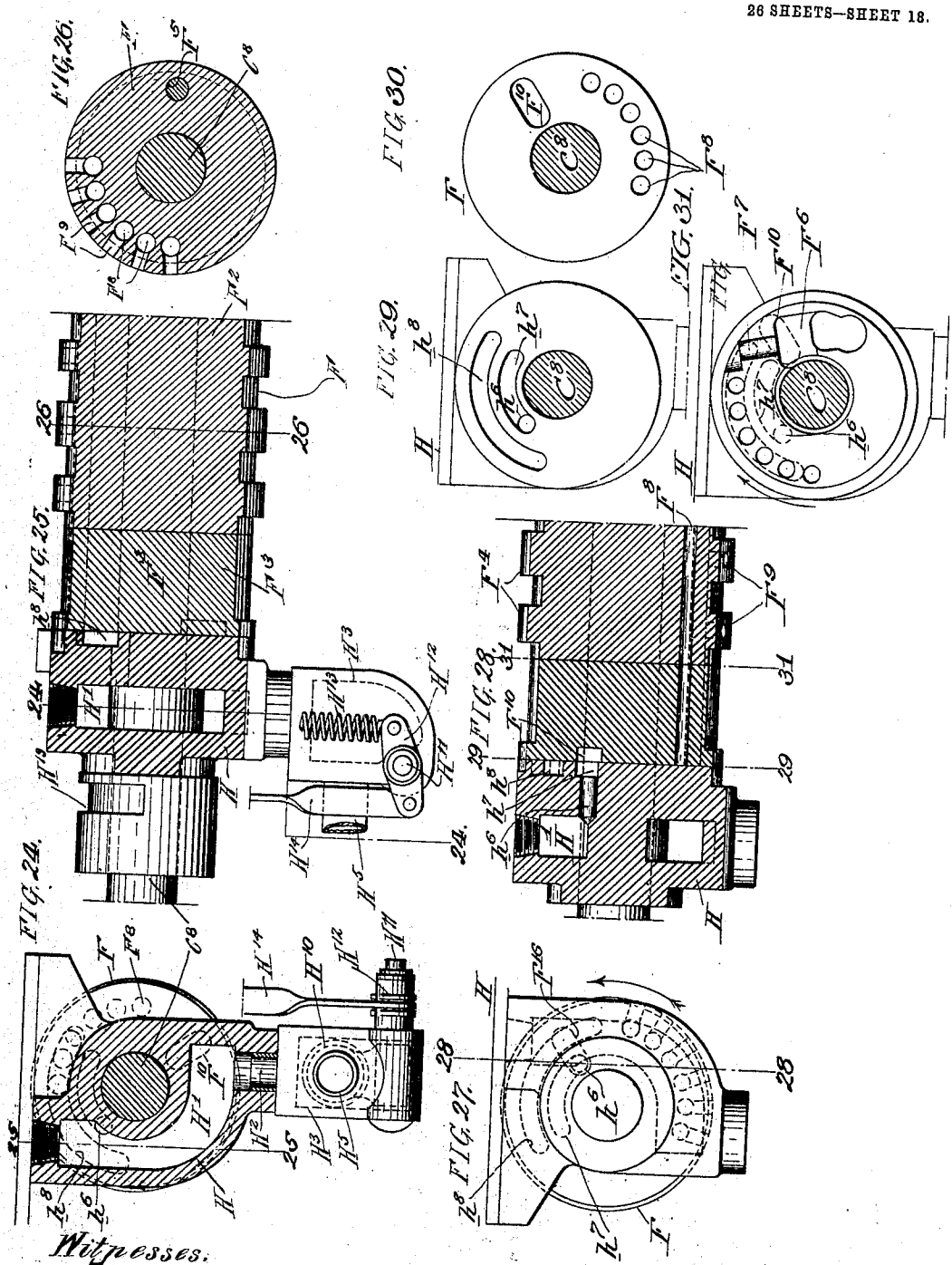
No. 870,801.

C. B. STILWELL. PATENTED NOV. 12, 1907

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 18.



Witnesses.

Inventor:
Charles B. Stilwell
by his Atty.
Francis D. Chambers

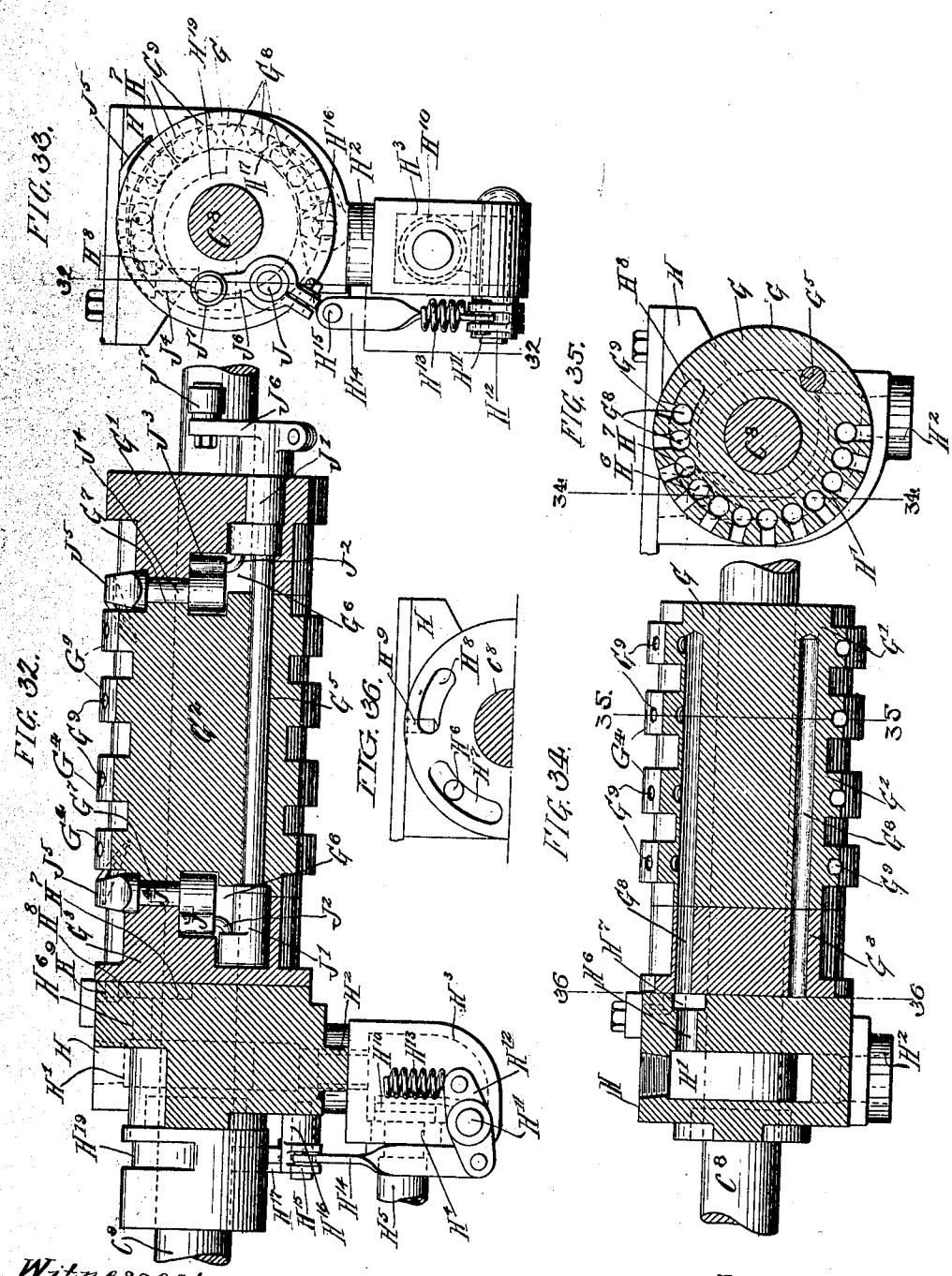
No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 19.



Witnesses:

D. Hunt

D. S. Williamson

Inventor:

Charles B. Stilwell

by his atty

Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 20.

FIG. 41.

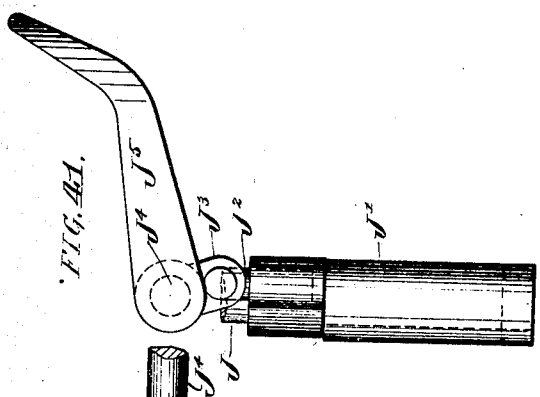


FIG. 42.

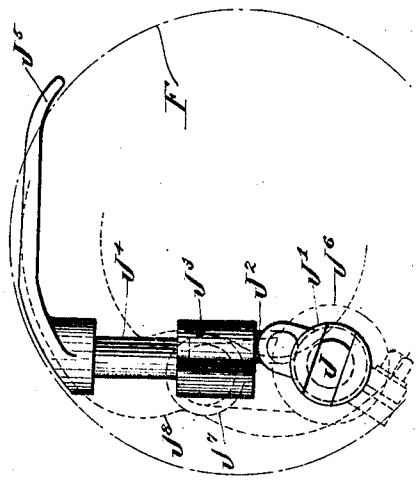


FIG. 40.

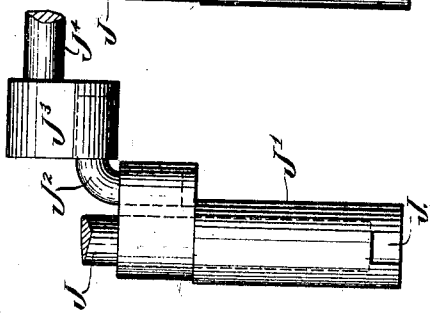


FIG. 38.

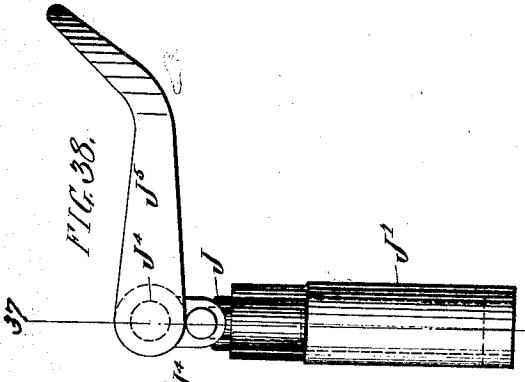


FIG. 39.

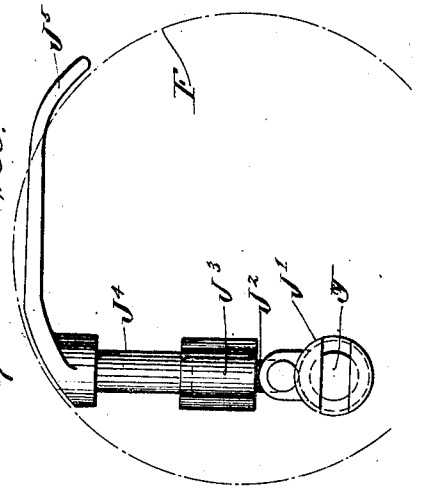
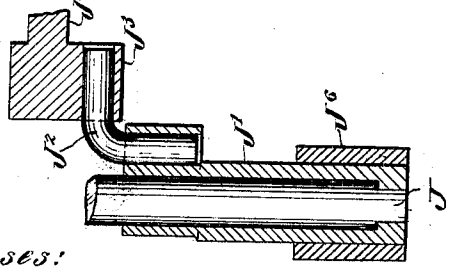


FIG. 37.



Witnesses:

H. Hamer

D. S. Williamson

Inventor:

Charles B. Stilwell

by his atty

Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 21.

FIG. 44.

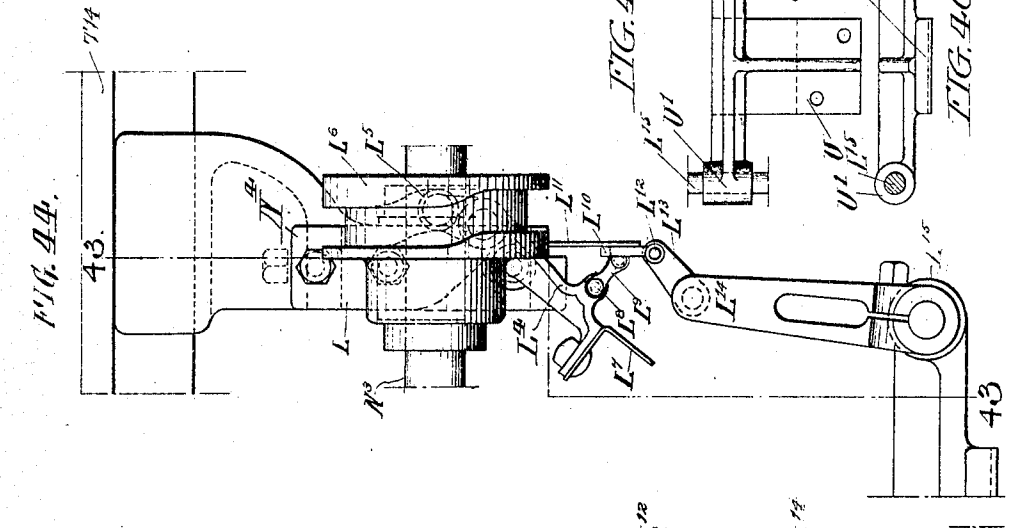
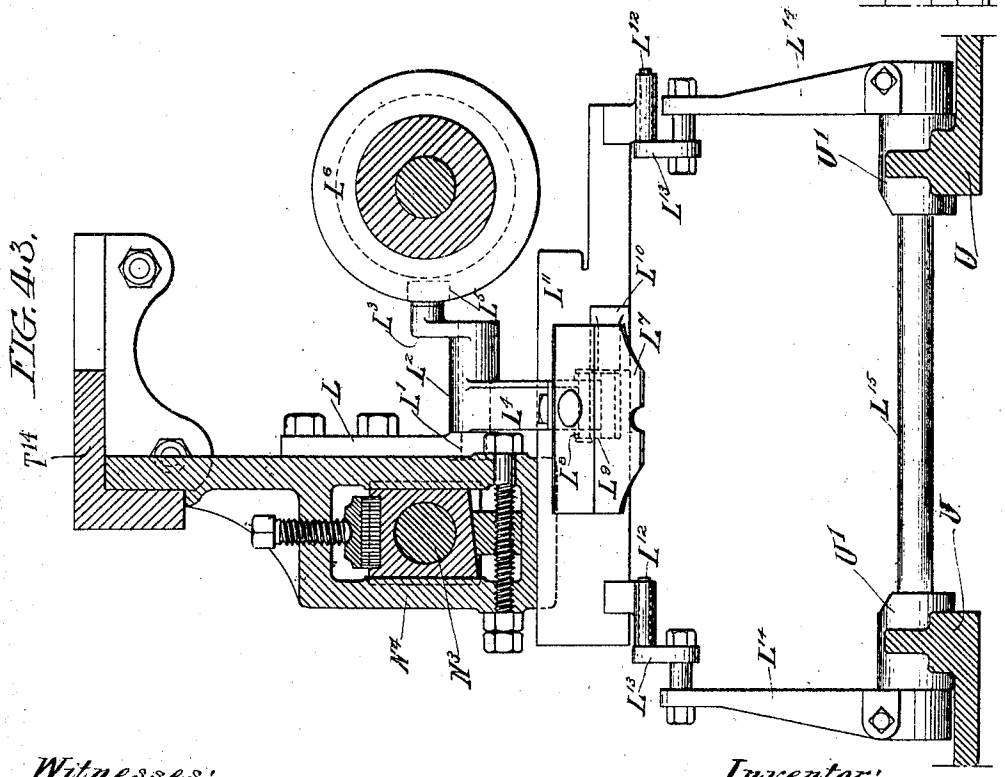


FIG. 45.

FIG. 46.

FIG. 43.



Witnesses:

D. Thompson

W. S. Williamson

Inventor:

Charles B. Stilwell

by his atty.

Francis D. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 22.

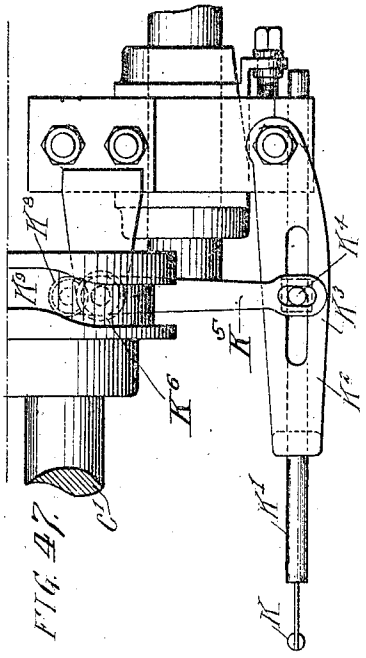


FIG. 47.

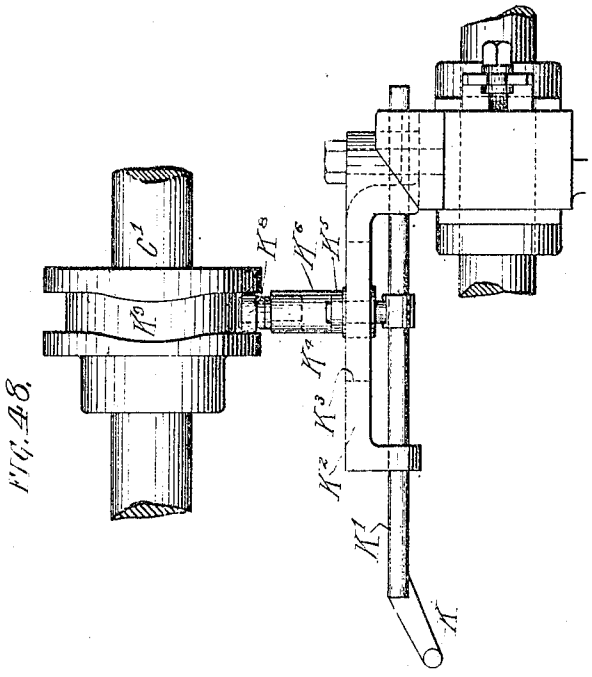


FIG. 48.

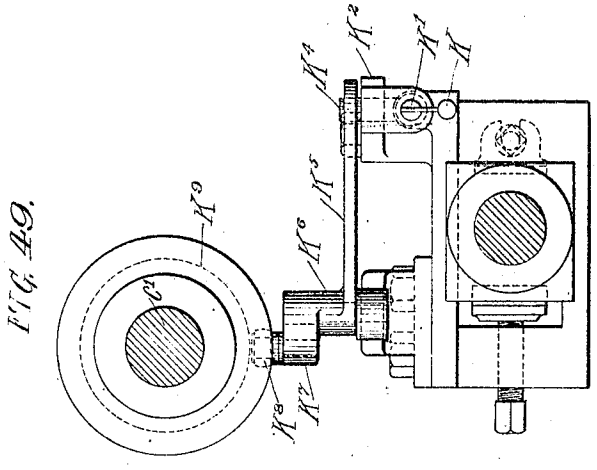


FIG. 49.

Witnesses:
Stewart
D. A. Williams

Inventor:
Charles B. Stilwell
by his atty
Francis J. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 23.

FIG. 50.

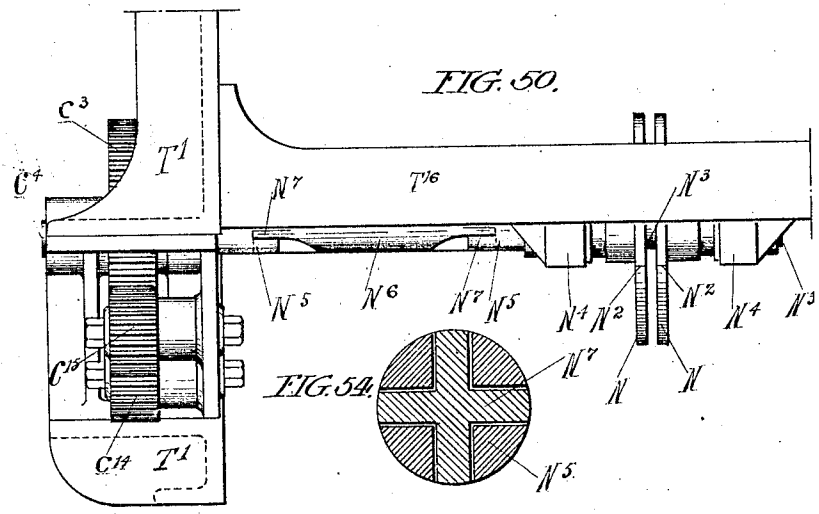


FIG. 54.

FIG. 51.

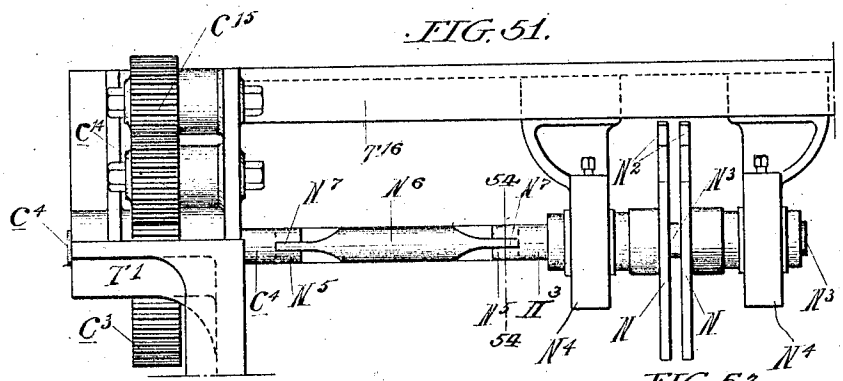


FIG. 52.

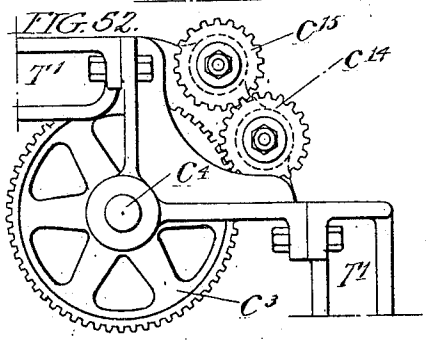
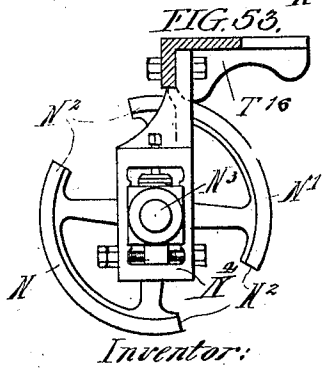


FIG. 53.



Witnesses.

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by his atty

Francis J. Chambers

No. 870,801. PATENTED NOV. 12, 1907.

C. B. STILWELL.

PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 24.

FIG. 55.

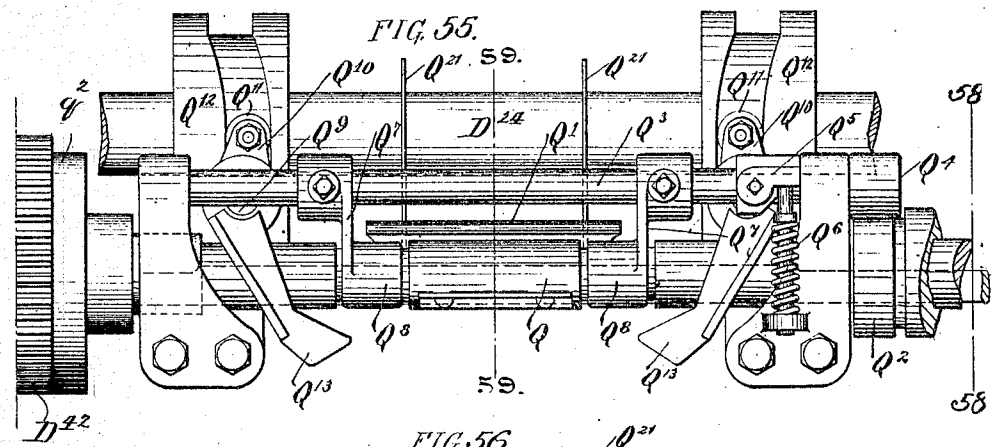


FIG. 56.

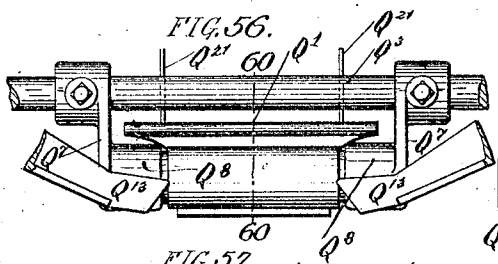


FIG. 58.

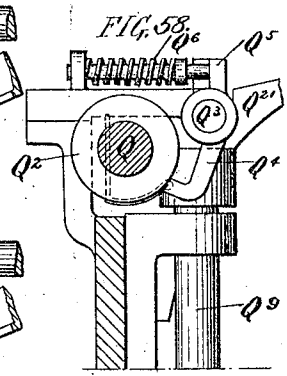


FIG. 57.

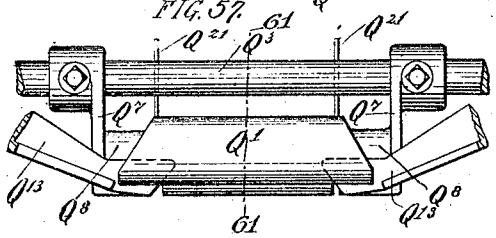


FIG. 61.

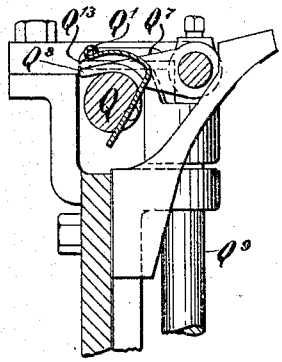


FIG. 60.

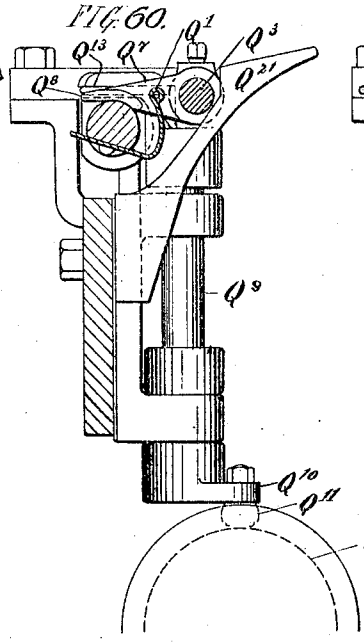
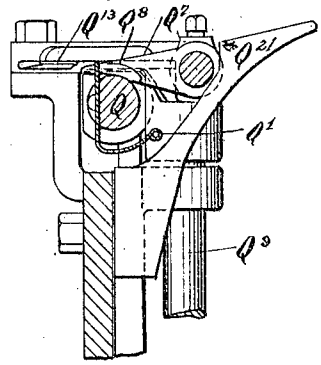


FIG. 59.



Witnesses.

S. Kennett

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No. 870,801. PATENTED NOV. 12, 1907.

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PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 25.

63.

FIG. 62.

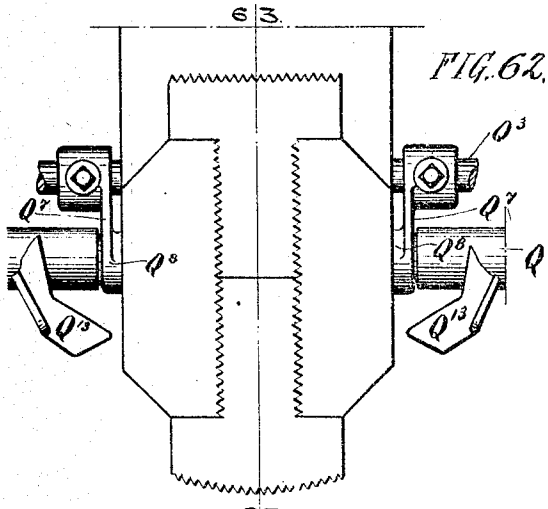
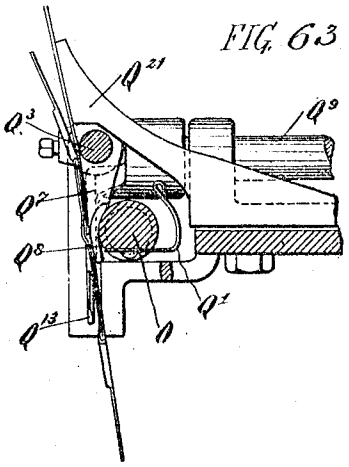


FIG. 63



63.

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FIG. 64.

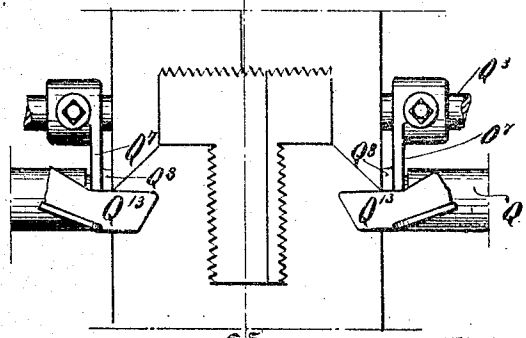
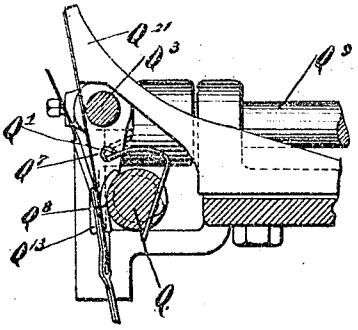


FIG. 65.



65

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FIG. 66.

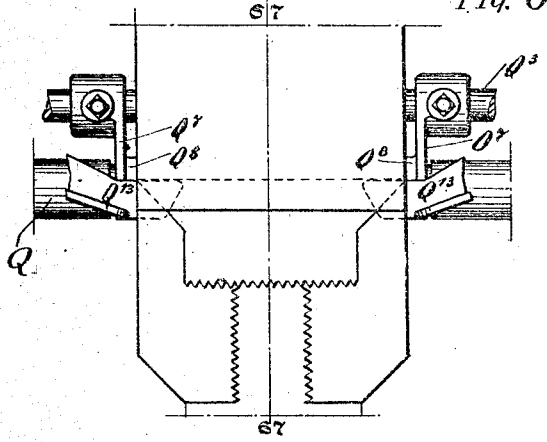
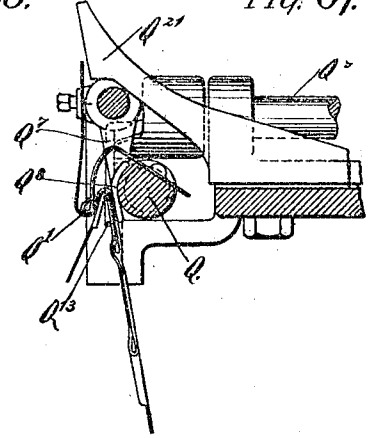


FIG. 67.



67

Witnesses:

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PAPER BAG MACHINE.

APPLICATION FILED AUG. 16, 1902. RENEWED JUNE 7, 1907.

26 SHEETS—SHEET 26.

FIG. 73

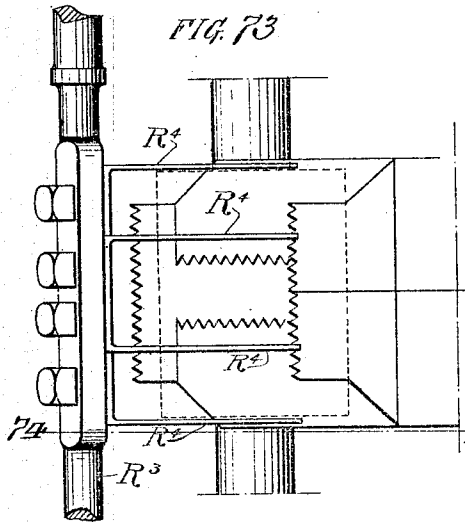


FIG. 74.

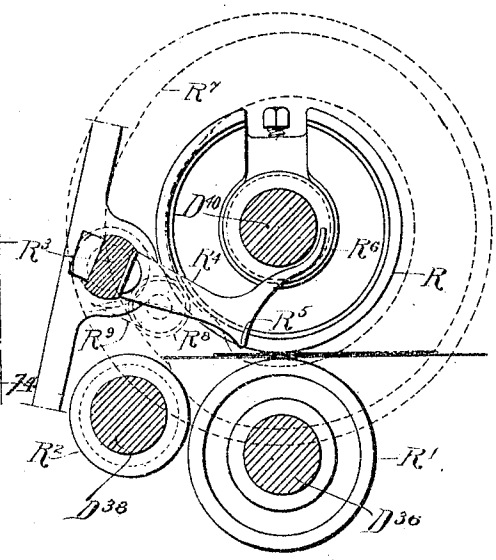


FIG. 75.

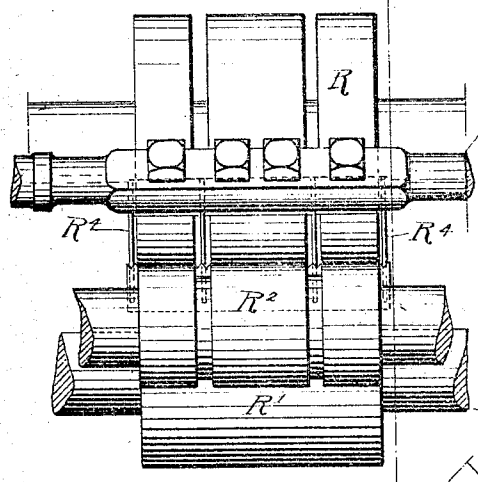
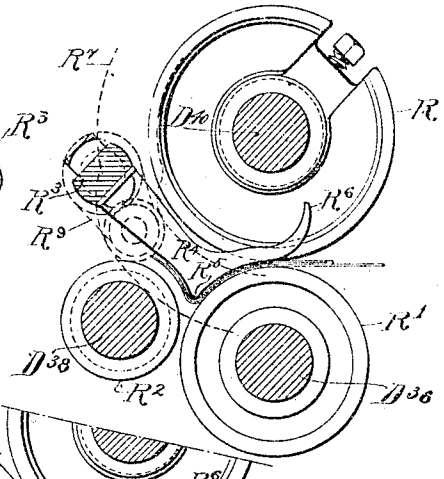


FIG. 76.



76.

FIG. 77.

Witnesses:
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D. S. Williams.

Inventor:
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by his atty
Thomas D. Chambers

UNITED STATES PATENT OFFICE.

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PAPER-BAG MACHINE.

No. 870,801. Specification of Letters Patent. Patented Nov. 12, 1907.

Application filed August 16, 1902. Serial No. 119,942. Renewed June 7, 1907. Serial No. 377,700.

To all whom it may concern:

Be it known that I, CHARLES B. STILWELL, a citizen of the United States of America, residing in Wayne, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Paper-Bag Machines, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to machinery for making paper bags and particularly to the mechanism for forming the bottom on the end of the bellows folded bag blank. my invention comprising novel mechanism both for forming the "diamond fold" and also folding in the end flaps of the diamond fold to complete the bag.

The object of my invention is to provide mechanism of great nicety and precision of operation for forming and perfecting the folds and also to so combine and construct the mechanism as to provide for a high degree of speed in the operation of the machine as a whole, my machine being intended to operate in connection with mechanism acting to form and feed the bellows folded blanks at great speed.

The nature of my improvements will be best understood as described in connection with the drawings in which they are illustrated and in which

Figures 1 and 2 are collectively a plan view of my machine. Fig. 3 is an elevation of the front end of the machine into which the blanks are fed. Fig. 4 is an elevation of the rear end of the machine. Figs. 5 and 6 are collectively a side elevation of the machine. Figs. 7 and 8 are collectively a side elevation of the opposite side of the machine to that shown in Figs. 6 and 7. Figs. 9 and 10 are collectively a longitudinal sectional elevation of the machine, the section being taken on lines 9—10 of sheets 1 and 2. Fig. 11 is a sectional elevation similar to that shown in Figs. 9 and 10, but shows on one half the scale of the said figures. Fig. 12 is a plan view of the machine sectioned on the line in which the lower line of bag blanks pass through the machine, the beginning and end of said line being indicated at 12—12 in Fig. 11. Fig. 13 is an elevation on a small scale and with parts broken away to show the general construction of the feed mechanism by which the blanks are delivered to my machine as shown in the other drawings. Fig. 14 is an elevation of the switching devices by which the alternate blanks are deflected to the upper and lower sections of the machine, the said elevation being taken on the section line 14—14 of Fig. 3 looking toward the lefthand side of the feed rolls indicated in dotted lines. Fig. 15 is a rear elevation of the parts shown in Fig. 14. Fig. 16 is a side sectional elevation of the mechanism for distending the diamond fold on the blanks, the view being taken on the line 16—16 of Fig. 17. Fig. 17 is an elevation of the mechanism shown in Fig. 16 taken on the section line 17—17 of said Fig. 16 and looking toward the right. Fig. 18 is a view of the same mechanism shown in Figs. 16 and 17, taken on the section line 18—18 of Fig. 17, the blank being shown in the process of having the diamond fold opened. Fig. 19 is a fragmentary elevation on the section line 19—19 of Fig. 18 showing the center of the apparatus and the parts to one side of the center which act upon the blank. Fig. 20 is a sectional elevation on the same line as Fig. 18 showing the position of the parts when the diamond fold is completed. Fig. 21 is a view similar to Fig. 19 showing the parts in the position they occupy in Fig. 20. Fig. 22 is a plan view of the suction rolls used in opening the bottom of the blank for the formation of the diamond fold. Fig. 23 is an end view of the rolls and connected appliances as shown in Fig. 22. Fig. 24 is a sectional elevation taken on the line 24—24 of Fig. 25 of the air box and valves connected with the suction roll F. Fig. 25 is a longitudinal section on the line 25—25 of Fig. 24. Fig. 26 is a cross-section on the line 26—26 of Fig. 25. Fig. 27 is a side elevation of a modified form of air box and valve construction to be used with the roll F. Fig. 28 is a longitudinal section on the line 28—28 of Fig. 27. Fig. 29 is a view taken on the section line 29—29 of Fig. 28 looking toward the left. Fig. 30 is a view taken on the same section line looking toward the right. Fig. 31 is a section on the line 31—31 of Fig. 28. Fig. 32 is a longitudinal section of the roll marked G taken on the line 32—32 of Fig. 33. Fig. 33 is an end view of the roll and its connections as shown in Fig. 32. Fig. 34 is a longitudinal section on the line 34—34 of Fig. 35 also showing the G roll. Fig. 35 is a cross-section on the line 35—35 of Fig. 34. Fig. 36 is a cross-section on the line 36—36 of Fig. 34 looking toward the left. Fig. 37 is a view of the finger actuating devices used in connection with the suction rolls taken on the section line 37—37 of Fig. 38. Fig. 38 is a side elevation of the same appliances. Fig. 39 is a plan view of the same devices shown in connection with the roll with which they operate. Fig. 40, 41 and 42 are views similar to Figs. 37, 38 and 39 except that Fig. 40 is not shown in section as in Fig. 37 and the position of the parts in the last three figures is shown as somewhat shifted. Fig. 43 is a side elevation of the mechanism actuating the wing folders which assist in the formation of the diamond fold, the parts being shown in section taken on the line 43—43 of Fig. 44. Fig. 44 is a front elevation of the same parts shown in Fig. 43. Fig. 45 is a plan view of the supporting device which sustains the bearings for the shafts L^5. Fig. 46 is an end elevation of these supporting devices. Fig. 47 is a plan view of the mechanism which operates one of the fingers K which assist in opening the end of the blank. Fig. 48 is a side ele-

vation of the same mechanism and Fig. 49 is an elevation of the same mechanism. Fig. 50 is a plan view of the mechanism for operating the segmental rolls U which operate in spreading out the ends of the diamond. Fig. 51 is an elevation of the same device. Fig. 52 is an end elevation of the same mechanism. Fig. 53 is an elevation of the opposite end of the same mechanism, and Fig. 54 is a cross-sectional view on the line 54—54 of Fig. 51 shown on an enlarged scale. Fig. 55 is a view of the mechanism which operates in forming the final folds, turning the ends of the diamond fold inward. Figs. 56 and 57 are similar views of the central part of the mechanism shown in Fig. 55, showing the shifting position of the parts during the operation on the blank. Fig. 58 is a sectional end elevation taken on the line 58—58 of Fig. 55. Fig. 59 is a cross-sectional view taken on the line 59—59 of Fig. 55. Fig. 60 is a cross-sectional view taken on the line 60—60 of Fig. 56. Fig. 61 is a cross-sectional view on the line 61—61 of Fig. 57. Figs. 62, 64 and 66 are views in all respects similar to Figs. 55, 56 and 57 except that they show the bag blank in connection with the machinery and in process of manufacture. Fig. 63 is a cross-sectional view on the line 63—63 of Fig. 62. Fig. 65 a cross-section on the line 65—65 of Fig. 64. Fig. 67 a cross-section on the line 67—67 of Fig. 66. Fig. 68 is a plan view of the mechanism for actuating the shaft Q and its attachments, partly in section on the line 68—68 of Fig. 69. Fig. 69 is a side elevation of the gearing for actuating the shaft Q. Fig. 70 is another elevation of the said gearing, Fig. 71 a section on the line 71—71 of Fig. 69. Fig. 72 a section through the gearing on the line 68—68 of Fig. 69, being the same as shown in Fig. 68. Fig. 73 is a plan view of the mechanism which makes the final fold at the front end of the diamond. Fig. 74 an end view taken on the section line 74—74 of Fig. 73. Fig. 75 is a side elevation of the same mechanism shown in Fig. 73 and 74 in a somewhat different operative position. Fig. 76 is a sectional view on the line 76—76 of Fig. 75 and Fig. 77 a view showing the parts in the same position as Fig. 76 but with the feed rolls represented as having fed the blank further forward.

In the drawings, A represents the power shaft from which motion is communicated to the various moving parts of the machine. As shown, this shaft has secured to it bevel gear wheels, indicated at A^3, A^4, A^5 and A^6; the bevel gear A^3 drives a vertical shaft A^7 (see Figs. 12 and 13) through a bevel gear indicated at A^8, the shaft A^7 having at its top another bevel gear A^9 which, through a bevel gear B, actuates the shaft B′, said shaft in turn, through a gear wheel B^2, an intermediate gear B^4, actuating the gear wheel B^5 secured to the shaft B^6. The shaft B′ has also secured to it another gear wheel B^3 which engages and drives a similar gear wheel secured on the upper shaft b'; the shaft B^6, through a gear wheel B^7 engaged by a similar gear wheel b^7 on the shaft b^6, drives said last mentioned shaft. The shaft B′ has secured to it a roller, indicated at E, having a clamping bar E′ extending longitudinally across its face and the shaft b' has secured to it the hub E^2 and outwardly extending finger E^3 which, at each revolution of the shaft, comes in contact with the clamping bar E′ gripping and holding the paper at this point and this device being particularly provided for coaction with a blank severing device and operating in the rear of the parts of the machine shown and forming no part of my present invention. The shafts B^6 and b^6 have secured to them the feed rolls E^4 and E^5 which owing to the gears described move with somewhat greater speed than the speed mechanism at their rear thus acting to separate the severed blanks as they are fed forward by the clamping devices operating in connection with the shafts B′ and b'. This or some other mechanism which will deliver the blanks to the following operative devices, with a proper interval between them is of importance in connection with the operation of my switching mechanism to be described and by means of which alternate blanks are diverted to different parts of the machine.

Returning to the mechanism directly actuated by the shaft A, the gear wheel A^4 on said shaft actuates the vertical shaft A^{10} through the bevel gear A^{11} secured to the bottom of said shaft and through the bevel gears A^{12} and A^{13}. The shaft A^{10} operates first the bevel gear B^8 and through it the shaft B^9 and second the bevel gear C and through it the shaft C′. Through its bevel gear A^5 and the bevel A^{15} the driving shaft actuates the vertical shaft A^{14} having secured to it the bevel gears A^{16} and A^{17} the first of which, through the bevel gear B^{13}, operates the shaft B^{14}, while the other, through the bevel gear c, actuates the shaft c′ and lastly through its bevel gear A^6 the driving shaft through the bevel gear A^{19} operates the vertical shaft A^{18} having at its top the bevel gear A^{20} which, by its engagement with the bevel gear D, operates the shaft D′, the said horizontal shafts B^9, C′, B^{14}, c′ and D′ communicating motion to all the operative parts of the machine.

Before describing the operative mechanism, I will note that the base frame of the machine is indicated at T T, T′ T′ indicating frame sections supported on the base frame at the front end of the machine, using the term front in the sense of the part of the machine to which the blanks are first delivered and supported on the frame portions T′ is the upper frame sections indicated at T^2 T^2. T^3 T^3 indicate frame sections supported on the rear end of the base frame.

T^4 and T^5 are cross-girders connecting the front bottom portions of the frame sections T′ T′ and supporting the intermediate frame sections indicated at T^6 T^6. T^7 is also a cross girder having the outwardly extending central flange indicated at t^7. Cross girders are also shown at T^8, Figs. 3, 9 and 11; T^{10}, Figs. 3, 9 and 11; T^{11}, Fig. 9; T^{12}, Figs. 7, 9 and 10; T^{13}, Figs. 3 and 9; T^{14}, Figs. 3, 9 and 11; T^{16}, Figs. 3, 7, 50, 51 and 53; T^{17}, Figs. 2, 7, 9 and 11; T^{18} and T^{19}, Figs. 10 and 11; T^{20}, Figs. 7, 9 and 10; T^{21} Figs. 2 and 10; T^{23} Figs. 2, 10 and 11; and at T^{17} T^{17} I have shown vertical intermediate frames which support a considerable part of the gearing.

Before describing the working parts of the machine I will briefly note the gear connections as follows: The bevel gear A^{12} through the bevel B^8 drives the shaft B^9 which by a gear wheel B^{10} engages and drives the gear b^{10} secured to the shaft b^9 and the gears B^{10} b^{10} respectively engage and drive the gears B^{11}, b^{11}, on the shafts B^{12} b^{12}. The upper bevel gear A^{13} on shaft A^{10} drives through bevel C the shaft C′, which, see Fig. 1, has secured to it the gear C^2, which engages the gear C^3, of twice its diameter, and through it drives shaft C^4. The gear

C^3 also engages and drives gear C^5 on shaft C^6, and gear C^5 actuates gear C^7 of shaft C^8 and also, through the intermediate gear C^9 the gear C^{10} of shaft C^{11}, said gear C^{10} engaging and driving gear C^{12} of shaft C^{13}. The bevel gear A^{16} of shaft A^{14} drives, through bevel B^{13}, the shaft B^{14} having on it the gear B^{15} which, through gears B^{16} B^{18} and B^{20}, actuates the shafts B^{17}, B^{19} and B^{21}. The bevel gear A^{17} of shaft A^{14} through bevel c actuates the shaft c' and a train of gears similar to those actuated by the shaft C', the parts being similarly marked except that the small letters are used instead of capitals. In addition to these similar parts, the gear c^3 through the intermediates c^{14} c^{15} and gear c^{16} drives shaft C^{17} to which is also secured gear c^{18} which through gears c^{19} and c^{21} drives shafts c^{20} and c^{22}. The bevel gear A^{20} on shaft A^{18} actuates through bevel D the shaft D' which has attached to it the gear D^2 and the somewhat larger gear D^3. The gear D^2 through the gears D^{11}, D^4 and D^{13} drives the shafts D^{12}, D^5 and D^{14}, and the gear D^4 through the gear D^6 actuates the shaft D^7 which in turn through a gear D^8 actuates gear D^9 on shaft D^{10} (see Fig. 8). The gear D^{13} through gear D^{15}, actuates shaft D^{16} and through intermediate D^{17} the gear D^{18} of shaft D^{19}; the gear D^{18} actuating gear D^{22} of shaft D^{23} and also gear D^{20} of shaft D^{21}. The shaft D', through its gear D^3, and the intermediates D^{24} and D^{25} of stud shafts d^{24} and D^{26} actuates gear D^{27} of shaft D^{28}, and gear D^{27} engages and actuates gear D^{30} of shaft D^{31} and gear d^{33} of shaft D^{33}. The gear D^3 also, through intermediate D^{34} actuates gear D^{35} of shaft D^{36}, said gear D^{35} through gears D^{37} and D^{39} actuating shafts D^{38} and D^{40}, and gear D^{39} in turn actuating gear D^{42} of stud shaft D^{43}.

Passing now to the operative parts of the machine, E^6 and e^6 are feed rolls secured on shafts B^9 b^9, and between which the blanks are fed from rolls E^4 E^5 of Figs. 11 and 13, these rolls coact as feeders and also operate in connection with the feed rolls shown at E^6 e^{16}, best shown in Fig. 9.

E^8, e^8 (see Figs. 3, 14 and 15) are cams secured on shafts B^9 b^9 in which run cam rolls E^{15} e^{15} of the lever arms E^{13} e^{13}, pivoted at E^{14} e^{14} and pivotally connected at E^{10} e^{10} to one of each of the rock levers E^9 E^9 e^9 e^9 pivoted on shafts B^9 b^9 and connected in pairs by the cross bars E^a e^a. From the bars E^a e^a extend the fingers E^{11} e^{11} which pass through slots in the feed rolls E^6 e^6 and support at their inner ends cross bars E^b e^b, which in turn support the switch guides E^{12} e^{12}. The setting of the cams E^8 e^8 being such as to alternately bring the switch guides into operative position to engage the successive blanks issuing from between the rolls E^6 e^6 so that they will alternately direct the blanks between the rolls E^6 E^{16} and e^6 e^{16} from which they pass through the guides E^{17} or e^{17}, in the first case, (see Fig. 9), through the feed system made up of the central roll E^{18} on shaft B^{14} and coacting rolls E^{19} E^{20} and E^{21} on shafts B^{17} B^{19} and B^{21} together with the guides E^{22} and e^{22} supported on arms E^{23} e^{23} fastened at E^{24} e^{24}, to the guideway E^{25} and through it to diamond folding forming mechanism, while the blanks selected by the switch e^{12} pass from guideway e^{17} direct to another diamond folding device.

The selective switching mechanism above described and whereby alternate blanks are delivered to different folding devices embodies certain features of invention irrespective of the character of the folding mechanism to which it makes delivery.

Passing next to the mechanism for distending and opening up the ends of the bellows folded bag blanks and forming diamond folds thereon; my machine, as shown, embodies two precisely similar sets of operating devices and I will describe that through which the blanks are delivered through guideway e^{17}, the duplicate mechanism being indicated by the same symbols except that the small instead of the capital letters are used.

The blanks pass from guideway e^{17} between the rolls F and G secured on shafts C^8 and C^8 said rolls acting as distending rolls, operating both by suction and mechanical engagement and presenting features of novelty in both modes of operation. For convenience in construction the rolls F and G are made up of three sections, F' F^2 F^3 and G' G^2 G^3 and their peripheries are made up of a series of collars F^4 and G^4 which partly lap on each other but so as not to obstruct the air pressure to the suction holes F^9 and G^9. As shown, and for reasons which will be understood later on, the spaces between the collars F^4 are broader than in the case of the collars G^4.

F^5 and G^5 are shaft bearing perforations formed in the rolls (see Figs. 16, 18, 20 and 32 to 35) from which open the joint chambers, such as are shown at G^6, Fig. 32, G^7 and F^7 indicating bearings extending from said chambers to the periphery of the rolls.

G^6 and F^8 are a series of longitudinal chambers formed in the rolls and opening through one end thereof, said chambers being connected to the periphery of the rolls by suction ducts G^9 F^9, and it will be noticed that the roll G has such ducts distributed over a wider surface than in the case of roll F.

H and H are air boxes from which the air is drawn by a suction fan, not shown, through chambers H', conduit H^2, valve box H^3 and port H^4 to conduit H^5. Each of the boxes has an air duct leading from chamber H' to the face of the air box against which the end of the roll F or G rests. In the case of the box H pertaining to roll G, this duct is indicated at H^6 and it enters a segmental chamber H^7, see Figs. 32 to 36, which in turn registers with the line of the air chambers G^8 G^8 etc., the chamber H^7 being long enough, as shown, to connect with four air chambers G^8 at once. This box H has also another segmental chamber H^8 placed in advance of chamber H^7, as shown in Fig. 36, and connected with the atmosphere by a duct H^9. In the case of air box pertaining to roll F, the air chamber H' is connected, in Figs. 24 to 31, by a duct h^6, with a segmental chamber h^7 placed inside of the line of the air chambers F^8 of roll F, the face of the box H in this case having a second segmental chamber h^8 in position to register with the air chambers in the roll and of length sufficient to connect all said chambers at once when the roll is in proper position. The suction in the box H is communicated to the chamber h^8, and through it to the air chambers of roll F by a duct F^{10}, see Figs. 24, 27, 30 and 31, formed in the face of roll F.

As shown, though this is not necessary, the air boxes H H are provided with valves for cutting off the suction from the pipes H^5 H^5 at determined intervals. These valves are shown at H^{10} H^{10} and are secured on

rock shafts H^{11} H^{11} to the outer ends of which are secured the levers H^{12} H^{12}. H^{13} H^{13} indicate springs acting on one arm of said levers to draw them in the direction to close the valves; the other arms of said levers are connected by rods H^{14}, H^{14}, see Figs. 22, 32, and 33, with pins H^{15} H^{15} of cam levers H^{17} H^{17} pivoted on bearings H^{16} H^{16} and resting on cams H^{19} H^{19} which rotate with shafts C^5 and C^8.

J J are shafts or spirals journaled in the bearings F^5 and G^5 of the rolls F and G, and connected to crank hubs J′ J′ having bearings, as shown in Figs. 37 to 42, for angled joint pins J^2 J^2, the other ends of which turn in bearings formed in crank extensions J^3 J^3 of shafts J^4 J^4 supported in bearings G^7 and F^7 and carrying at their outer ends the fingers J^5 J^5.

J^6 J^6 are levers connected to the outer crank hub, see Figs. 32 and 33, and carrying cam rolls J^7 J^7 at their ends which rolls run in the closed cams J^8 j^8 which surround the shafts C^6 and C^8 and are held in position by brackets indicated at J^9 J^9.

The operation of the rolls and their fingers is as follows: As the front end of a bellows folded blank is fed to the bite of the rolls F and G, the rolls are a little in advance of the position shown in Fig. 16, and, in reaching these positions, the leading air chambers F^8 of the roll F begin to come in registry with the chambers h^8 of the suction box so that as soon as the chamber F^{10} of the roll connects chambers h^7 and h^8 suction is communicated through the chambers F^8 and passages F^9 to the ply of paper in contact with the roll F causing it to adhere to said roll, the suction being continued until the roll has revolved to about the position shown in Figs. 18, 20, 22 and 23, when the chamber F^{10} passes beyond the rear ends of chambers h^7 and h^8 cutting off the suction from the chambers F^8 and releasing the ply of paper in contact with the roll. In the case of roll G, the leading air chambers G^8 begin to come into registry with the chamber H^8 of its suction box when the rolls are in the position shown in Fig. 16, the ply of the blank in contact with the roll G being held to it by the suction exerted through passages G^9 and the suction being maintained until after the air chambers successively pass the rear end of the chamber H^7 and, to some residual extent, until the air chambers G^7 come into registry with the chamber G^8 and are connected through port G^9 with the atmosphere, this occurring when the air chambers G^8 in turn reach the top of their rotary path. It will be noticed that the series of air chambers G^8 is much longer than the series F^8 and that therefore the under ply of the blanks is held to the roll G for a considerable time after the roll F has ceased to exert any suction on the blank and, as will be seen, after the blanks have left contact with roll F except where they pass between it and roll G.

In some cases, and particularly in connection with roll F, I have found it advisable to provide a cut off valve such as H^{10}, by which the suction can be cut off from box H instantly and at a predetermined period in the rotation of the rolls regulated by the setting of the cam H^{19}, but such a valve is not essential especially at a comparatively slow speed of the machine.

The function of the suction rolls is to open out the end of the blank approximately, as shown in Fig. 18, and, in my present arrangement, to then release it from roll F and deliver it over roll G, which retains its hold upon it after it is released from the suction of roll F, but always releasing that part which lies beyond the top of the roll.

The fingers J^5 J^5 etc., lie in retracted position during the greater part of the rotation of the rolls F and G and begin to move in, under the control of their cams J^8 j^8, just after their tips have passed the meeting line of the rolls, the fingers passing into the bellows folds of the blanks and reaching their innermost portions when the rolls are in the positions shown in Figs. 22 and 23. The shape of the cams J^8 j^8 is such that the fingers maintain their engagement with the paper until the rolls reach the position shown in Fig. 18 and such that the fingers on roll F are retracted slightly in advance of the fingers on roll G. The fingers supplement the action of the suction features of the rolls and particularly they act to sharply define the corners of the diamond fold in process of formation.

Passing now to devices which coact with the rolls in the preliminary distention of the ends of the blanks: K K, see Figs. 16 to 21 and 47 to 49, are fingers secured on reciprocating rods K′ K′ having bearings in the supporting guideways K^2 K^2 in the tops of which, as shown, are formed slots K^3 K^3 through which extend pins K^4 K^4 secured to rods K′ K′. These pins extend into the slotted ends of levers K^5 K^5 secured to rock shafts K^6 K^6 from which extend lever arms K^7 K^7 having cam rollers K^8 K^8 which lie in the closed cams K^9 K^9 on shaft C′. The action of the cams is to thrust the fingers K K into the partly distended bellows folds of the blank just after the rolls have passed the position shown in Figs. 16 and 17 and to withdraw said fingers just as the rolls pass the position shown in Figs. 18 and 19. The fingers serving to insure the parting of the plies on both sides of the bellows folds as the blanks pass up from the bite of the rolls F and G and thus aiding the action of the suction ducts and facilitating the correct entry of the fingers J^5 J^5 etc.

Considering next the devices which act to fold in and down the distended bellows folds of the blanks, and which are best shown in Figs. 16 to 21 and 43 to 45: L L are brackets supported by the frame of the machine, as shown, directly attached to housings N^4 N^4, and supporting bearing pins L′ L′ on which rock the sleeve shafts L^2 L^2 each having arms L^3 and L^4, the arms L^3 carrying cam rollers L^5 L^5 which enter the closed cams L^6 L^6. The arms L^4 have secured to them the edging plates L^7 L^7 and they also support the pivot pins L^8 L^8 to which are connected the links L^9 L^9 also pivotally connected to the heads L^{10} L^{10} which are provided with folder plates L^{11} L^{11} pivoted in turn at L^{12} L^{12} etc., to arms L^{13} L^{13} supported by the arms L^{14} L^{14} etc., secured in pairs to the fixed shafts L^{15} L^{15} which, in turn, are supported in the heads U′ U′ etc., of the brackets U U.

The operation of the folding and edging plates is shown in Figs. 18 to 21; the plates are normally in the positions shown in Figs. 18 and 19 and just after the blanks have been distended to the form shown in these figures the cams L^6 L^6 come into operation pressing the folder plates L^{11} L^{11} down against the distended sides of the blank so as to fold said sides down, the edging plates L^7 L^7 coming into operation as the folders approach a horizontal position and serving to aline and straighten the fold lines where the side creases are to be formed. I would note that the operation of the folder

plates is practically contemporaneous with the action of the tucker which I am about to describe and with the engagement of the lower ply of the blank by the segment wheel N N′, as is indicated in Figs. 20 and 21, and thus, it will be seen, the folder plates press the sides down against a base, partly made up of the tops of rolls F and G, and partly of the tucker plate M⁶. The tucker M⁶, which is normally stationary in position shown in Fig. 18, comes into operation while the rolls are moving from the position shown in that figure to that shown in Fig. 20, engaging and pushing rearward the upper ply of the paper below the fully distended portion and feeding it in toward the lower ply so as to make a fold, as shown in Fig. 20, which will ultimately form the transverse crease of the diamond fold. The tucker is secured to an arm M⁵, which is secured to the rock shaft M from which also extends the lever arm M′ carrying cam roller M² which rests in contact with the actuating cam M³ on shaft C′ and is held to the cam by the action of spring, such as M⁴.

Referring next to the action of the segmental feed roller N N′, best shown in Figs. 1, 9, 16 to 21 and 50 to 54, this roller is made up of the two pairs of segments N N and N′ N′ secured to the shaft N³ which is driven, as will be explained, by shaft C⁴. The tucker lever M⁵ passes between the segments and, in their rotation, the segments come successively into operation with the top of roll G to serve as feed rolls. The relative operation of the segmental roller with the suction rolls is well shown in Figs. 16 to 21 and, it will be observed, that the front end of the lower ply is permitted to project from the top of roll G, into the space between the segments N and N′, the ends N² N² of the segments coming into operative relation with the roll G at some distance back of the ends of the blanks. The shaft N³, see Figs. 43 and 44 and 50 to 54 is supported in adjustable bearings, best shown in Fig. 43, in the housings N⁴ N⁴, a projecting end of the shaft being transversely slotted as shown at N⁵., Figs. 50, 51 and 55, as is also the end of shaft C⁴, indicated by the same symbol, and these slotted ends are connected by a shaft section N⁶ having cruciform ends N⁷ N⁷ fitting in the slots. The device being, in effect, a universal joint which permits the adjustment of shaft N³ without interfering with the transmission of motion to it.

From the rolls G and N N′ the diamond folded blanks are fed between the feed rolls O and O′, on shafts C¹³ and C¹¹, through the guideway O² to the feed rolls O³ and O⁴ on the shafts X C c^{20} and c^{17}, thence over roll O⁴ and under guide O⁶ and feed roll O⁵ on shaft C²² to guideway O⁸ and thence to feed rolls O⁹ and O¹⁰ on shafts D¹⁹ and D²¹ and under roll O⁹ and over guide O¹² to the bite of rolls O⁹ and O¹¹, said last mentioned roll being secured to shaft D²³, and I would note that the feed of the diamond folded blank over roll O⁹ should be at least as rapid as the feed through the rolls E⁶ e^6. As shown, the increased speed is attained when the blanks are engaged by rolls O³ and O⁴, see gearing of Figs. 9 and 10.

As already noted, the alternate blanks coming through rolls E⁶ e^6 are switched downward through guideways leading to a second diamond folding mechanism in all respects similar to the one already described, the diamond folded blanks passing from feed rolls o o' through a guideway o^2 to the feed rolls O⁹ O¹¹ where they first receive their accelerated motion. The paths through which the diamond folded blanks are fed from both sets of folding devices to the bite of rolls O⁹ O¹¹ must be such as will result in their being presented alternately and at equal intervals so that the one blank has cleared the rolls O⁹ O¹¹ before the next is received by them. This is provided for in the construction illustrated and above described.

From the feed rolls O⁹ O¹¹, see Figs. 9 and 10, the blanks pass over the guide plate O¹⁴ to the feed rolls O¹⁶ O¹⁵ secured on shafts D¹⁶ and D¹⁴ and then following roll O¹⁵ they pass over the guide O¹⁷ to the bite of rolls O¹⁵ and P which last mentioned rolls form a part of the pasting and creasing mechanism which act preliminary to the formation of the final folds which complete the bag. From the bite of the rolls O¹⁵ and P the paper passes up over the roll P, being held to it by the guide O¹⁹ and also further in advance by the guide O²⁰. The roll P has secured across its face two sets of creasing cushions, indicated at P′ and P², and is secured to the shaft D′ the diameter of the roll being somewhat more than double the length of the blanks which are delivered to it.

P³ P³ are disks making the edges of the paste roll and serving in connection with the roll P to feed the blanks forward. Secured between the disks P³ and P³ are paste applying sections indicated at P⁴ and P⁵ which as the rolls revolve, the roll P³ being secured on the shaft D⁶, receive paste from a paste roller P⁶ secured on shaft D⁷ and running in a paste trough indicated at P⁷, P⁸ being a roller secured on the shaft D¹⁰ which operates in connection with the roller P⁶ to regulate the thickness and spread of the paste layer.

After having received the proper lines of paste on the diamond the blanks pass with a continued revolution of the roll P under the influence of the creasing roll secured on the shaft D¹² and made up as shown, see Figs. 2, 4 and 10, of two disks P⁹ P⁹, which act as feed rolls in connection with the wheel P and which support the creasing blades indicated at P¹⁰ and P¹¹ which operate in connection with the creasing cushions P′ and P² across the diamond on the transverse lines upon which the flaps of the diamond are folded to form the bottom of the bag.

After being pasted and creased the bags are delivered to the mechanism which form the final folds which mechanism embodies important features of novelty characteristic of my machine and is best shown in the detail drawings, Figs. 55 to 77 inclusive. Referring first to the mechanism shown in Figs. 55 to 72, Q is a shaft which is connected with the gear wheel D⁴² journaled on the shaft D⁴³ by the mechanism shown in Figs. 68 to 72, that is to say, the gear wheel D⁴² has secured to its face by a pin d^{42} a sliding block q which lies in a transverse groove q' extending across the middle of the face of a disk q^2 which disk is secured to the end of the shaft Q, the axial line of said shaft being, as shown, eccentric to the axial line of the stud shaft D⁴³. It will readily be seen that by this construction the shaft Q is driven by the gear wheel D⁴² but with differential speed and this or some other device for varying the speed of the shaft Q is important to the best operation of the machine.

The shaft Q has secured to it a hook like folding blade indicated at Q′ and it has also secured to it a cam indicated at Q² which operates upon a cam finger Q⁴ secured to the shaft Q³ extending in front of and

parallel with the shaft Q, the shaft Q^3 having also secured to it a finger Q^5 which is pressed outward by a spring Q^6 so as to hold the cam finger in contact with the cam.

Q^7 Q^7 are lever arms secured to the shaft Q^3 and supporting clamping fingers or plates indicated at Q^8 Q^8 which lie immediately above the shaft Q and which rock toward and away from the shaft by the action of the cam Q^2.

Q^9 Q^9 are shafts transverse to the shaft Q secured in proper bearings so as to enable them to have a rocking motion and having at their lower ends lever arms Q^{10} Q^{10} supporting cam rollers Q^{11} Q^{11} which run in the inclosed cams Q^{12} Q^{12} secured to the shaft D^{24}. To the upper ends of the shafts Q^9 Q^9 are secured the folding fingers Q^{13} Q^{13} which under the influence of the cams Q^{12} are at proper intervals moved in from their normal outer position to a position over the clamping fingers Q^8, the throw of these fingers being indicated, for instance, in Figs. 55 and 56.

Q^{21} Q^{21} are guide ways arranged to direct the blanks as they pass from between the bite of the roll P and the disks P^9 P^9 over the shaft Q and the clamping plates Q^8; the blanks in the construction shown passing under the shaft Q^3.

The device as above described has to do with the folding inward of the rear flap of the diamond, the blank being fed over the clamping plates Q^8, the fingers Q^{13} Q^{13} are moved in over it until their inner edges coincide with the lines of fold of the rear flap which has already been creased and at this point the clamping plates Q^8 Q^8 are moved up clamping the blank against the fingers Q^{13} Q^{13} and holding this portion of the blank stationary while the rear portion continues to be fed forward. Up to this point the shaft Q has been revolving with its lesser speed until it reaches, for instance, the position shown in Fig. 60 or one slightly in advance thereof when it moves with its accelerated speed, the folder Q′ engaging the bottom of the blank and forcing the slack forward over the fingers Q^{13} Q^{13} carrying with it of course the rear flap of the diamond and pressing it down upon the central part of the diamond. The motion of the folder Q′ in accomplishing this is indicated, for instance, in Figs. 61 to 67 and at the point indicated in these figures the fingers Q^{13} are retracted permitting the blank as a whole to move forward into the bite of the feed rolls R R′ secured on the shafts D^{40} and D^{36}, the rear flap of the diamond being folded so far forward as to be engaged by the upper roll R and pressed down against the center of the diamond where it is held by the appropriate lines of paste previously applied. The roll R, it will be noticed, see Figs. 4 and 73 to 77, is slotted to give passage to the tucker blades R^4 R^4 the upwardly tilted front ends of which, indicated at R^6 extend to the front of the shaft D^{40} while the tucker angles proper indicated at R^5 R^5 are formed at the inner end of a segmental portion which in one position of the tuckers coincides, as shown in Figs. 76 and 77, with the periphery of the roll R′. These tuckers R^4 are secured to the rock shaft R^3, said shaft, see Fig. 4, having a lever arm R^9 at its end with a cam roller which engages the cam R^7 on the shaft D^{40} and gives to the shaft R^3 the properly timed rocking motion.

After passing between the rolls R and R′ the front ends of the blank are fed over the roll R^2 secured on the shaft D^{38} as shown in Fig. 74 and when the crease defining the front final fold comes beneath the tucker elbows R^5 R^5 etc., of the arms R^4 R^4 the shaft R^3, carrying these arms, is rocked from the position shown in Fig. 74 to that shown in Fig. 76 and 77, pushing down the crease into the bite of the rolls R′ and R^2 which thereupon engage it and feed it forward, pressing the front flap of the diamond down upon the center, as shown in Fig. 77, and completing the formation of the bag bottom, the shape of the tucker arm acting to hold the previously folded rear flap of the diamond in position until the front flap is folded down upon it.

As shown in my drawings the completed bags are fed from the rolls R′ and R^2 through a guide indicated at S to the feed rolls S′ and S^2 on the shafts D^{28} and D^{33} and thence over the roll S′ and held to it by a guide S^4 between the rolls S′ and S^3 the latter roll being secured on the shaft D^{31} and from this last pair the bags are delivered to whatever mechanism may be desired, my drawings showing them at the point of final delivery, though in my machine as constructed, mechanism for forming the bags into packages is arranged to receive and act upon the folded blanks.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is,

1. In a paper bag machine, the combination with feed rolls E^5 e^6 of two independent sets of mechanism for feeding forward and acting upon bag blanks, movable switching guides E^{12} e^{12} each operating in one position to engage the blank coming through the feed rolls and direct it into one of the separate sets of mechanism aforesaid, and means acting to shift the guides as described and so that they respectively engage successive blanks and direct them alternately into the separate feed mechanisms aforesaid.

2. In a paper bag machine, the combination with feed rolls E^5 e^6 of two independent sets of mechanism for feeding forward and acting upon bag blanks, movable switching guides E^{12} e^{12} each operating in one position to engage the blank coming through the feed rolls and direct it into one of the separate sets of mechanism aforesaid, cams E^8 e^8 secured on the shafts of the feed rolls E^6 e^6 and connections from said cams to the guides whereby they are operated to alternately engage successive blanks fed through the feed rolls and direct them into the separate sets of feeding and directing mechanism.

3. In a paper bag machine, the combination with two independent devices or sets of mechanism for forming folds on bag blanks, of feed mechanism acting to alternately deliver successive blanks to the separate folding mechanism, feed mechanism leading from each said folding mechanisms to a common feed mechanism, said feeds being arranged to deliver blanks alternately, a common feed mechanism arranged to successively receive the alternately delivered folded blanks and to feed them forward with accelerated speed and mechanism for performing further operations upon the folded blanks connected to receive said folded blanks from the common feed.

4. In a paper bag machine the combination with two independent devices or sets of mechanism for forming diamond folds on bag blanks, of feed mechanism acting to alternately deliver successive blanks to the separate folding mechanisms feed mechanisms leading from each said folding mechanisms to a common feed mechanism said feeds being arranged to deliver diamond folded blanks alternately, a common feed mechanism arranged to successively receive the alternately delivered folded blanks and to feed them forward with accelerated speed and mechanism for forming the final folds of the bags connected to receive said diamond folded blanks from the common feed.

5. In a paper bag machine, the combination with two independent devices or sets of mechanisms for forming folds on bag blanks, of feed mechanism acting to alternately deliver successive blanks to the separate folding

mechanism, feed mechanisms leading from each said folding mechanisms to a common feed mechanism, said feeds being arranged to deliver blanks alternately, a common feed mechanism arranged to successively receive the alternately delivered folded blanks and to feed them forward and mechanism for performing further operations upon the folded blanks connected to receive said folded blanks from the common feed.

6. In a paper bag machine the combination of two independent devices or sets of mechanism for forming diamond folds on paper bag blanks, of relatively high speed feed and switching mechanism arranged to deliver alternate blanks to the separate folding devices, mechanism for forming the final folds on the diamond folded blanks moving with relatively high speed to the diamond folding devices and arranged to receive the blanks alternatively from said diamond folding devices.

7. In a paper bag machine the device for opening the end of a tubular blank consisting of suction rolls through which the blanks are passed in combination with separate air valves acting to cut off the suction from the rolls at determined and different points in their revolutions.

8. In a paper bag machine the device for opening the ends of tubular blanks consisting of suction rolls, one or both having formed in it two or more air chambers, each communicating with the surface of the roll through perforations and means whereby the suction is successively cut off from said chambers as the rolls revolve.

9. In a paper bag machine the device for opening the ends of tubular blanks consisting of suction rolls, one or both having formed in it two or more air chambers, each communicating with the surface of the roll through perforations and means whereby the suction is successively cut off from said chambers as the rolls revolve and means whereby the suction is cut off from one roll in advance of the other.

10. In a paper bag machine, the device for opening the ends of tubular blanks consisting of suction rolls, one or both having formed in it or them a series of air chambers each communicating with the surface of the roll through perforations, in combination with a suction conduit, means whereby the air chambers are connected and disconnected with the suction conduit as the rolls revolve, an air inlet and means whereby the air chambers are successively connected with said inlet as they reach a determined point in the revolution of the roll.

11. In a paper bag machine, the combination of suction rolls for opening the ends of bellows folded tubular blanks having a series of air chambers formed in them communicating with their faces through perforations with means for cutting off the suction from said chambers at determined and different points in the revolution of the rolls, gripping fingers moving with the rolls and means for moving said fingers in to engage the corners of the blank and out to disengage said corners at definite points in the revolution.

12. In a paper bag machine, the combination with opening rolls adapted to act on the ends of blanks passing through them of gripping fingers J^5, stud shafts J^4 having bearings in the rolls and to which the fingers are attached, crank levers J^3 secured to the inner ends of said shafts, and situated in cavities G^6 of the rolls, longitudinally extending shafts J, having crank levers secured to them, bent pins J^2 connecting the crank levers on the stud shafts with those on the longitudinal shafts and means for oscillating the longitudinal shafts as the rolls revolve.

13. In a paper bag machine, the combination with rolls for distending the mouth ends of bellows folded tubular blanks as said blanks are fed between them, of fingers K K, not moving with the rolls but adapted to enter the bellows folds immediately above the point where the blanks are engaged by the rolls and means for advancing and retracting said fingers to and from operative position.

14. In a paper bag machine, the combination with distending rolls adapted to open the ends of bellows folded blanks fed between them, of a segmental feed roll acting intermittently in connection with one of the distending rolls to engage the distended end of the blank and feed said blank forward over said distending roll.

15. In a paper bag machine, the combination with distending rolls adapted to open the ends of bellows folded mechanism of a shaft Q rotating with varying speeds for spreading the distended end of the blank into a diamond fold and a segmental feed roll acting intermittently with one of the distending rolls to engage the distended end of the blank and feed said blank forward over said distending roll.

16. In a paper bag machine, the combination with distending rolls adapted to open the ends of bellows folded blanks fed between them, of an oscillating tucker operating to define the transverse fold of the diamond fold acting over one of said rolls and feed mechanism acting to draw the opened blanks away over the other of the distending rolls.

17. In a paper bag machine, the combination with distending rolls adapted to open the ends of bellows folded blanks fed between them of an oscillating tucker operating to define the transverse fold of the diamond fold acting over one of said rolls and a feed roller acting together with the other of the distending rolls to draw the opened blanks away from the tucker.

18. In a paper bag machine, the combination with distending rolls adapted to open the ends of bellows folded blanks fed between them of folding wings acting to press in and down the outer sides of the distended blanks as they emerge from the distending rolls and means for feeding the blanks forward under said wings and over one of said rolls.

19. In a paper bag machine, the combination with distending rolls adapted to open the ends of bellows folded blanks fed between them of an oscillating tucker operating to define the transverse fold of the diamond fold acting over one of said rolls, folding wings acting to press in and down the sides of the distended blanks as they emerge from the distending rolls said wings acting over the tucker and means for feeding the blanks forward under said wings and away from the tucker.

20. In a paper bag machine, the combination with distending rolls adapted to open the ends of bellows folded blanks fed between them of an oscillating tucker operating to define the transverse fold of the diamond fold acting over one of said rolls, folding wings acting to press in and down the sides of the distended blanks as they emerge from the distending rolls said wings acting over the tucker and a segmental feed roll acting with the distending roll over which the tucker does not move to engage the distended blanks at one side and feed them forward under the wing folders and away from the tucker.

21. In a paper bag machine, the combination with mechanism for spreading open the ends of bellows folded bag blanks in the formation of diamond folds thereon of wing folders acting on the sides of the distended ends to press them in and down and edge defining plates separate from the wing folders moving in against the edges of the diamond as the wing folders act upon its sides to regulate the alinement of the side folds.

22. In a paper bag machine, the combination with distending rolls acting to spread open the ends of bellows folded bag blanks fed between them of wing folders acting on the delivery side of the rolls to press in and down the sides of the distended blanks as they are led from between the distending rolls and edge defining plates separate from the wing folders operated to move in against the lateral edges of the distended blank as the wing folders move down to regulate the alinement of the side folds of the diamond fold formed on the blanks.

23. In a paper bag machine, the combination with means for spreading out the ends of bellows folded bag blanks in the formation of diamond folds thereon of wing folders pivoted at one edge and operative to press in and down the side folds of the diamond, pivoted levers L^4 L^4 actuated by cams and coupled to actuate the wing folders and edge defining plates I^7 secured to the levers L^4 and arranged to act against the lateral edges of the diamonds as the wing folders press in the sides.

24. In a paper bag machine, the combination with feed mechanism of retractable fingers movable from and to a position where they define the rear final fold of the bag, mechanism for operating said fingers, clamping devices whereby the bag is clamped against the fingers when they

are in operative position and for a determined period, a folder acting against the under side of the blank to fold its slack and the rear flap of the diamond over the fingers aforesaid and feed mechanism acting to receive the blank after it is released from the fingers.

25. In a paper bag machine, the combination with feed mechanism of retractable fingers movable from and to a position where they define the rear final fold of the bag, mechanism for operating said fingers, clamping devices whereby the bag is clamped against the fingers when they are in operative position and for a determined period, a rotary folder acting against the under side of the blank to fold its slack and the rear flap of the diamond over the fingers aforesaid and feed mechanism acting to receive the blank after it is released from the fingers.

26. In a paper bag machine, the combination with feed mechanism of retractable fingers movable from and to a position where they define the rear final fold of the bag, mechanism for operating said fingers, clamping devices whereby the bag is clamped against the fingers when they are in operative position and for a determined period, a rotary folder rotating with varying speeds and acting against the under side of the blank to fold its slack and the rear flap of the diamond over the fingers aforesaid and feed mechanism acting to receive the blank after it is released from the fingers.

27. In a paper bag machine, the combination with feed mechanism of a shaft Q over which the diamond folded blanks are fed, clamping fingers Q^8 Q^8 extending over said shaft and having intermittent movement towards and away from said shaft, retractable fold defining fingers moving from and to a position over the clamping fingers and against which said clamping fingers clamp the blanks for a determined period causing a slack in the rear portion of the advancing blank, and a folder Q' rotating with the shafts Q and timed to engage the slack and fold it with the rear flap of the diamond over the fold defining fingers.

28. In a paper bag machine, the combination with feed mechanism of a shaft Q rotating with varying speeds over which the diamond folded blanks are fed, clamping fingers Q^8 Q^8 extending over said shaft and having an intermittent movement towards and away from said shaft, retractable fold defining fingers moving from and to a position over the clamping fingers and against which said clamping fingers clamp the blanks for a determined period causing a slack in the rear portion of the advancing blank and a folder Q' rotating with the shaft Q and timed to engage the slack and fold it with the rear flap of the diamond over the fold defining fingers.

29. In a paper bag machine, the combination of pasting and creasing devices acting to apply paste to diamond folded bag blanks and to crease the same on the lines of the final folds, with clamping fingers over which the creased blanks are fed, retractable fold defining fingers acting to engage the blanks on the line of the rear final folds and to hold them for a determined period against the clamping fingers, and a folder moving over the fingers and acting to fold the slack of the blank and the rear flap of the diamond over the defining fingers.

30. In a paper bag machine, the combination with feed mechanism of clamping and retractable fold defining fingers arranged to engage and hold for a determined period the diamond folded blanks on the line of the final fold, a folder acting to fold the slack of the blank and the rear flap of the diamond over the defining fingers, feed and presser rolls arranged to receive the partly folded blank from the folder and compact the rear final fold, means for further feeding and pressing the blanks over which the front of the blanks are fed and a reciprocating tucker acting to press the blank into engagement with said devices.

CHAS. B. STILWELL.

Witnesses:
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