(No Model.) 6 Sheets—Sheet 1.

L. C. CROWELL.

NEWSPAPER FOLDING AND WRAPPING MACHINE.

No. 549,112. Patented Nov. 5, 1895.

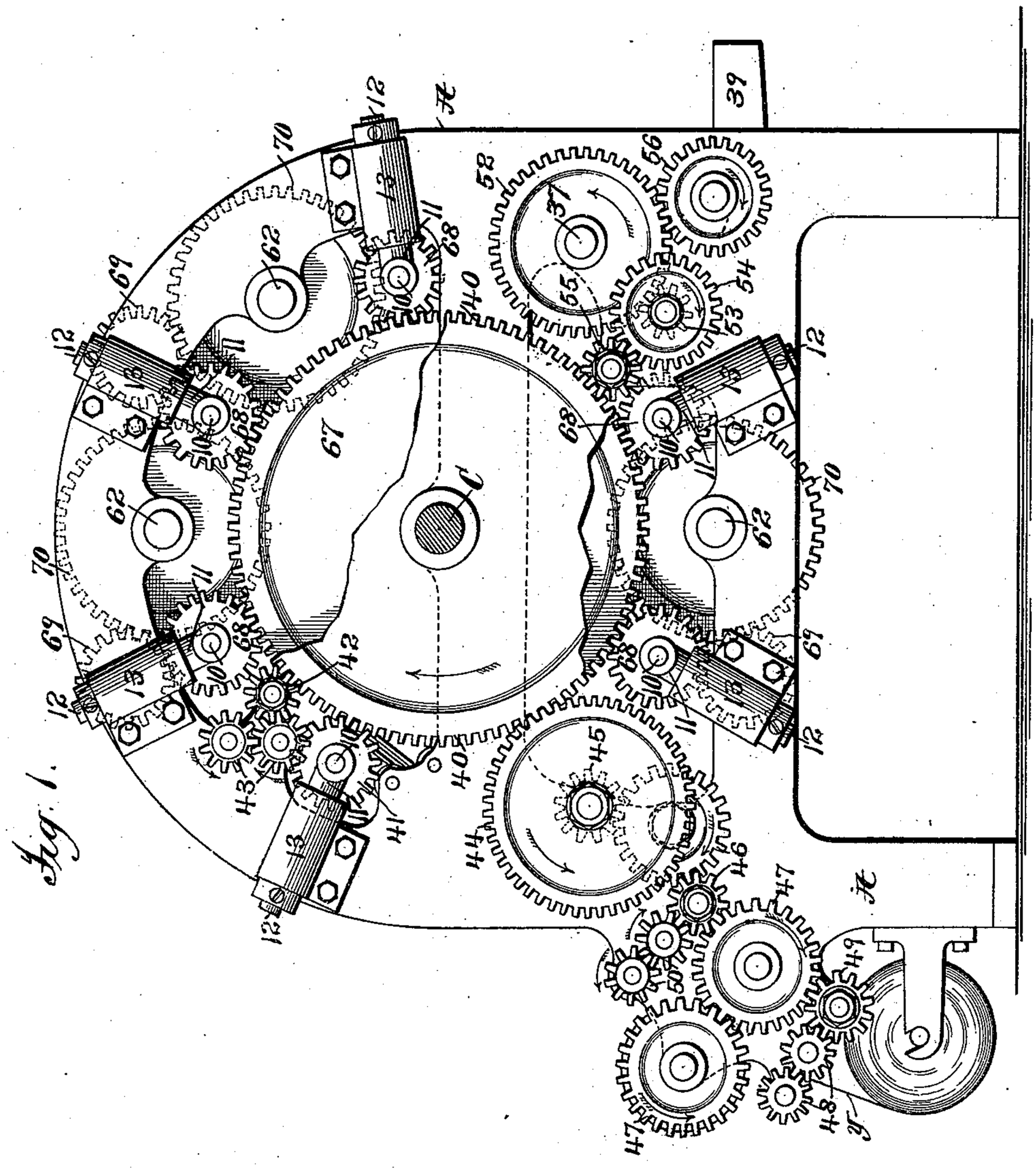

Fig. 1.

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(No Model.) 6 Sheets—Sheet 2.

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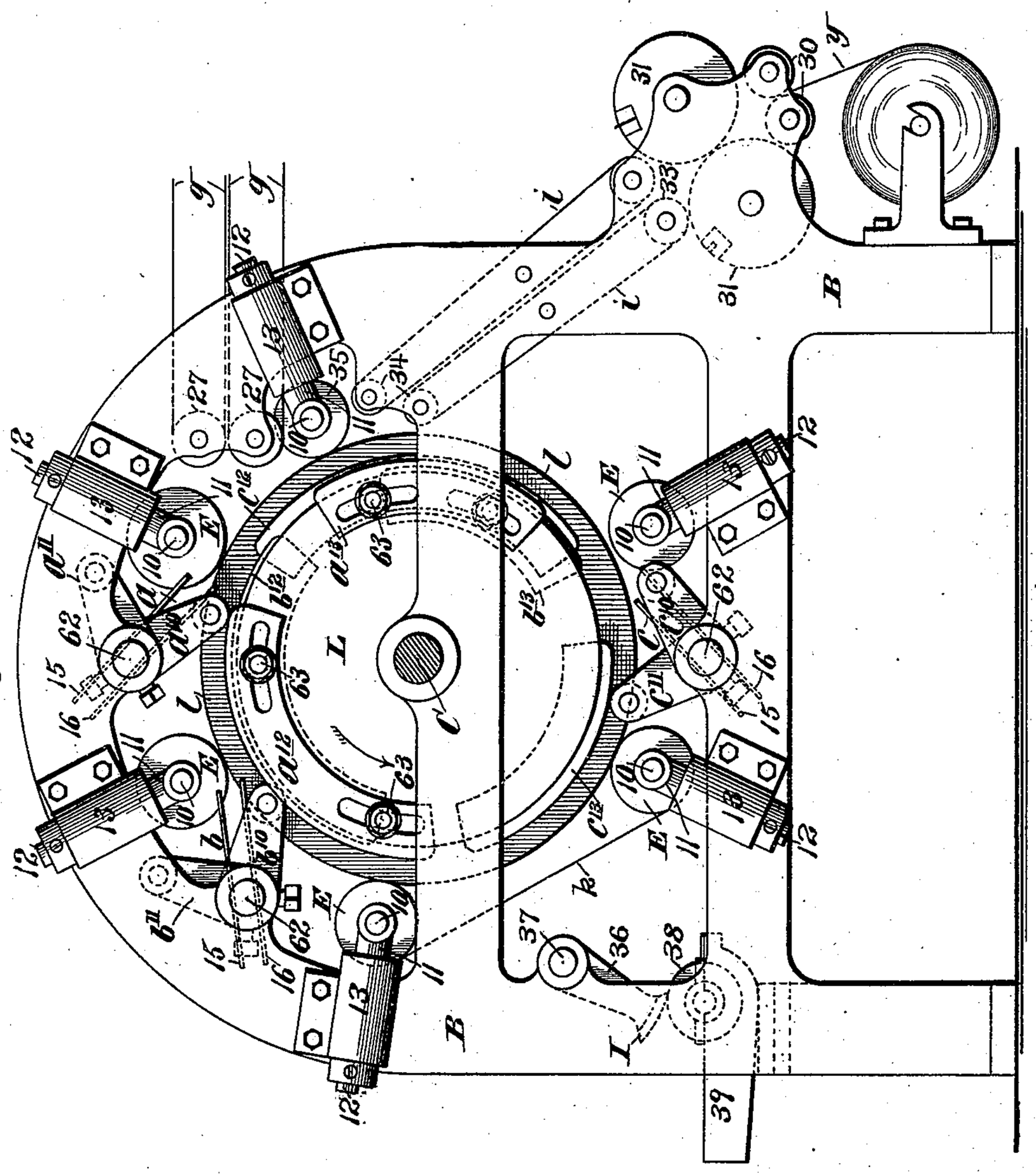
NEWSPAPER FOLDING AND WRAPPING MACHINE.

No. 549,112. Patented Nov. 5. 1895.

Fig. 2.



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(No Model.) 6 Sheets—Sheet 3.

L. C. CROWELL.

NEWSPAPER FOLDING AND WRAPPING MACHINE.

No. 549,112. Patented Nov. 5, 1895.

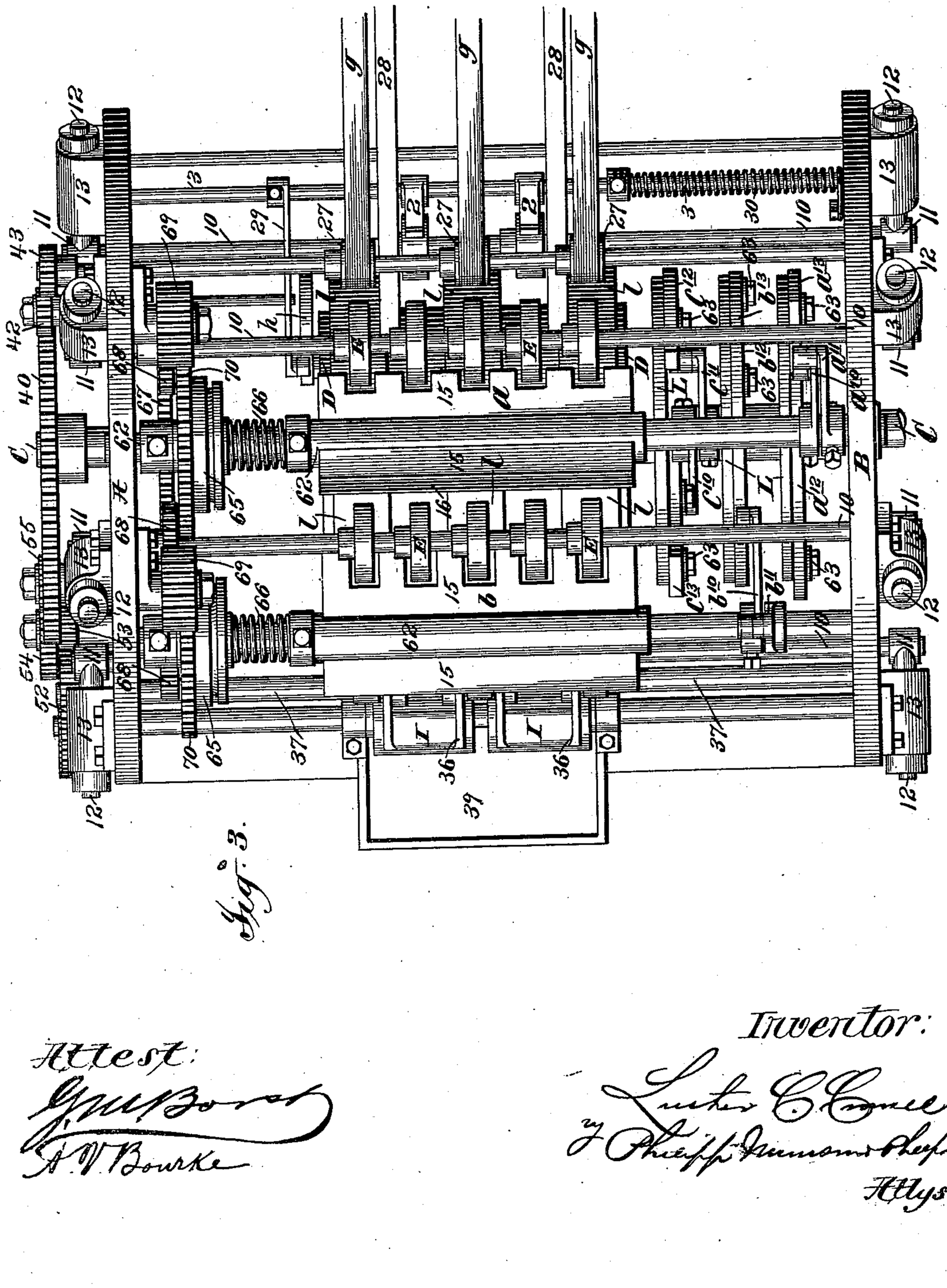

Fig. 3.

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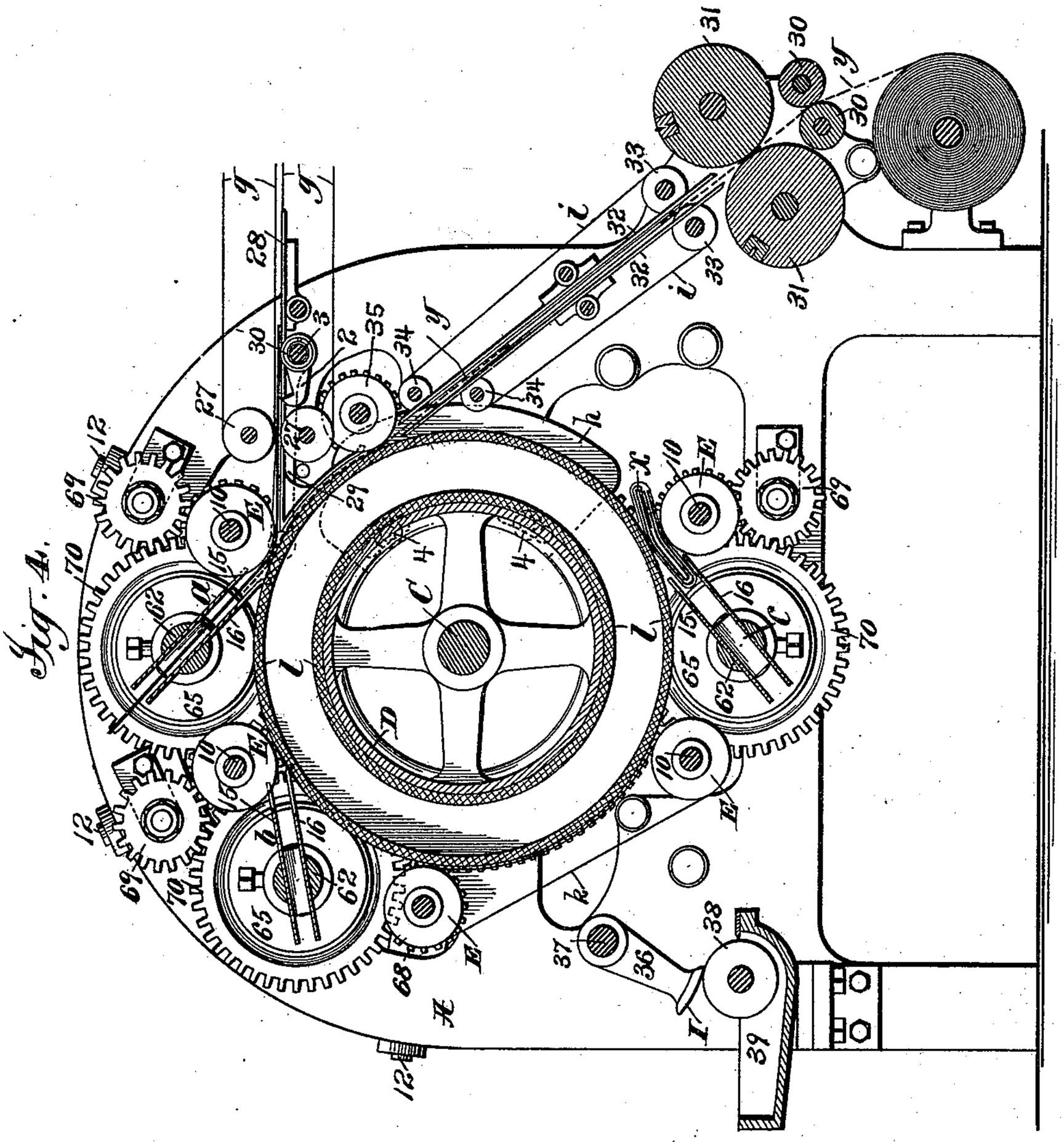
(No Model.) 6 Sheets—Sheet 4.

L. C. CROWELL.

NEWSPAPER FOLDING AND WRAPPING MACHINE.

No. 549,112. Patented Nov. 5, 1895.

Fig. 4.



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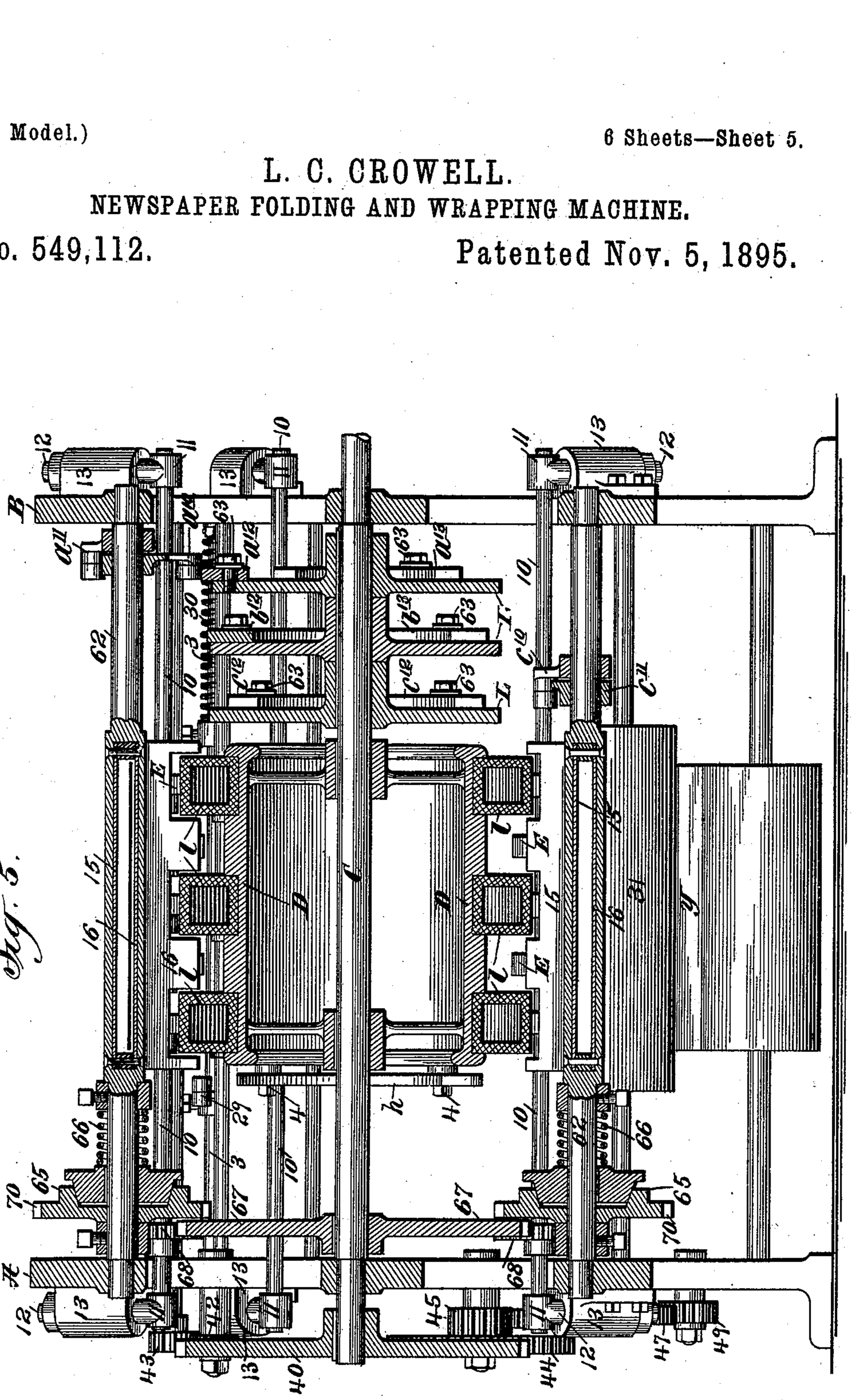
(No Model.) 6 Sheets—Sheet 5.

L. C. CROWELL.

NEWSPAPER FOLDING AND WRAPPING MACHINE.

No. 549,112. Patented Nov. 5, 1895.

Fig. 5.



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(No Model.) 6 Sheets—Sheet 6.

L. C. CROWELL.

NEWSPAPER FOLDING AND WRAPPING MACHINE.

No. 549,112. Patented Nov. 5, 1895.

Fig. 7.

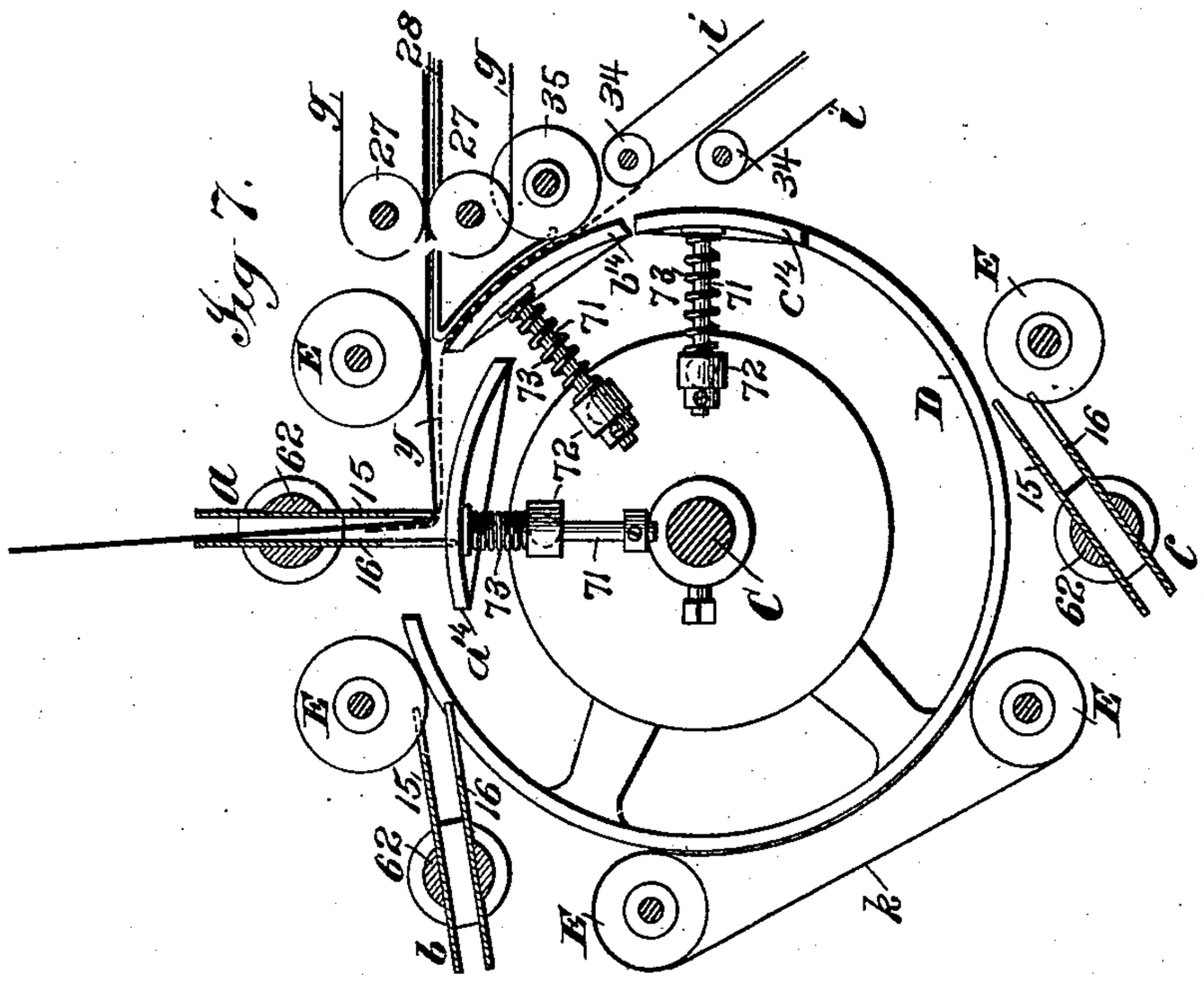
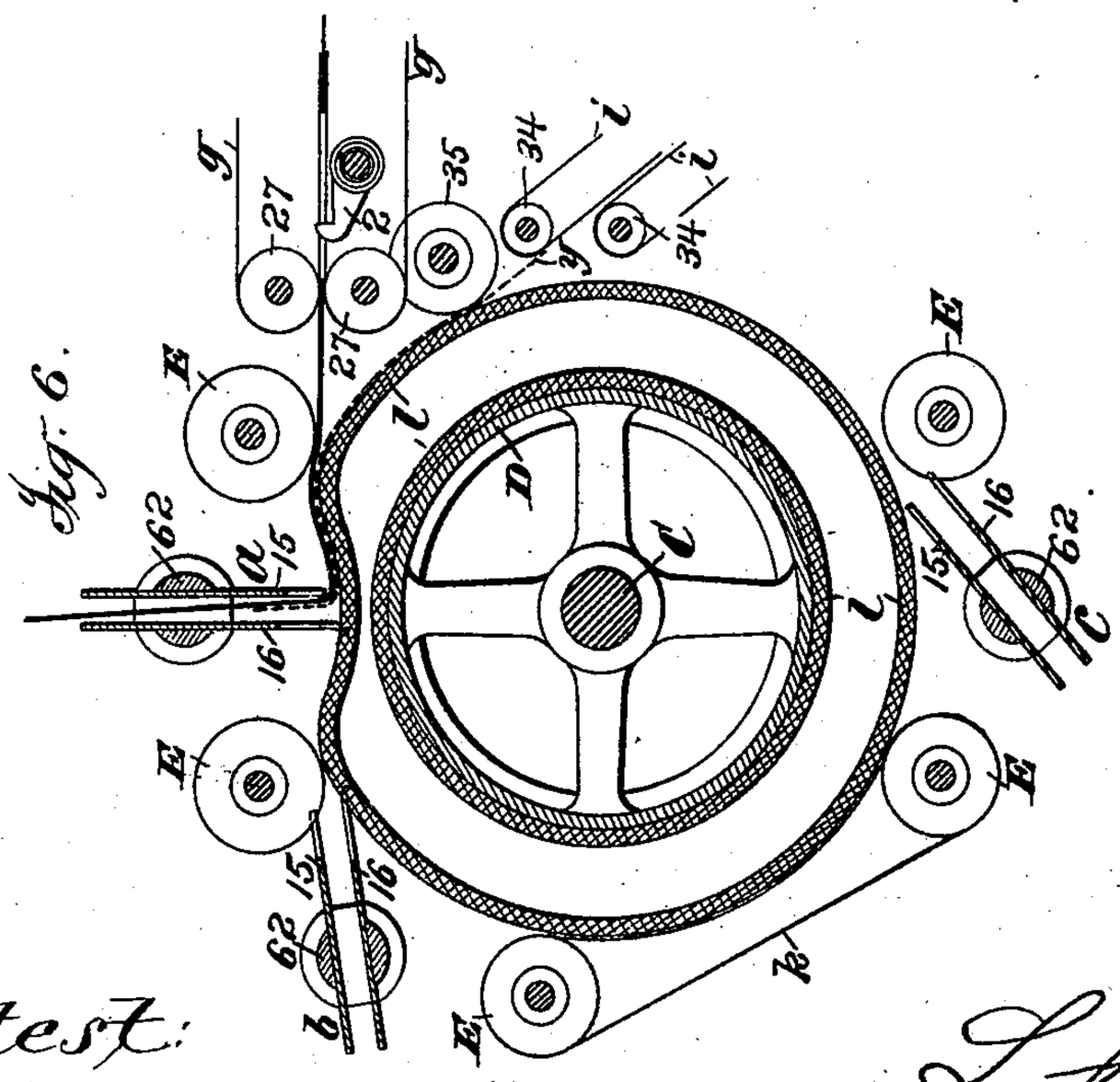


Fig. 6.



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UNITED STATES PATENT OFFICE.

LUTHER C. CROWELL, OF BROOKLYN, ASSIGNOR TO ROBERT HOE, THEODORE H. MEAD, AND CHARLES W. CARPENTER, OF NEW YORK, N. Y.

NEWSPAPER FOLDING AND WRAPPING MACHINE.

SPECIFICATION forming part of Letters Patent No. 549,112, dated November 5, 1895.

Application filed April 25, 1895. Serial No. 547,136. (No model.)

To all whom it may concern:

Be it known that I, LUTHER C. CROWELL, a citizen of the United States, residing at Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Wrapping and Folding Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of the present invention is to provide an improved folding-machine, and especially to provide an improved machine for folding and wrapping newspapers and other publications.

In a previous application, Serial No. 474,025, filed May 12, 1893, I have described and claimed broadly constructions employing a cylinder or other abutment with feeding devices and one or more carriers mounted between the successive feeding devices and coacting with the cylinder or other abutment to fold a sheet and transfer the fold-line from one feeding device to the next, and I have described as one of the forms of machines in which the invention may be embodied a construction employing a carrier, which returns to normal position to receive the next sheet after the operation of folding by completing a full rotation, and in which the cylinder or other abutment preferably has an elastic surface, so as to preserve the proper distance between the carrier and abutment, while permitting the axis of the former to be mounted in a fixed position relatively to the latter.

The present invention relates particularly to such constructions employing a rotating carrier or carriers and an elastic abutment; but the invention includes, also, these features independently of their combination, as either may be used without the other, although they are preferably combined and coact to form a very simple, compact, and efficient mechanism of high capacity.

It is evident that the construction of machines embodying the invention may be varied widely, that the feeding devices, carriers, and abutment may be of different form, and their arrangement and movement be varied within wide limits, and that the elastic surface of the abutment coacting with the carrier or carriers may be formed in any suitable manner. It will probably be found preferable, however, to form the elastic surface of the cylinder by one or more elastic tubes filled with air or other elastic fluid, a simple construction of cylinder being thus provided, and to use carriers which are constantly under tension tending to rotate them and held stationary against this tension, while receiving and delivering the sheets. This latter result may best be secured by employing friction-clutches of any suitable form for driving the carriers and holding the carriers stationary when desired by stops, which release the carriers and permit them to be rotated by the clutches at the proper times. Any other suitable device for securing the proper movement of the carriers may be used. The elastic surface of the cylinder, moreover, instead of being formed of elastic tubes, may be of any other suitable construction. Spring-pressed segments yielding to the carriers may be used, it being necessary only that a part or the whole of the surface of the cylinder should be of sufficient elasticity to yield against the pressure of the carriers and return to position as the pressure of the carriers is removed. This folding or folding and wrapping mechanism may be fed by hand, or any suitable feeding devices for automatically advancing papers, or papers and wrappers, to the wrapping mechanism in proper time, together or independently of each other, may be combined therewith. The wrappers may previously be cut to the desired size and fed to the folding and wrapping mechanism as sheets, or fed from the web and severed in the machine. This folding and wrapping mechanism may be combined with a printing-press, so that the papers may be printed, folded, and wrapped by a single machine, suitable wrapper feeding and pasting devices being added, the wrapper mechanism herein shown being of sufficient capacity to be applicable to rapid web-printing machines.

In the accompanying drawings, forming a part of this specification, there is shown for the purpose of illustration a complete folding and wrapping machine of the general construction above described, which will be found an efficient and convenient embodiment of the present invention, and a modifi-

cation thereof and a detailed description of the same will now be given, and the features forming the invention will then be specifically pointed out in the claims.

In the drawings, Figure 1 is a side elevation of the gear side of the machine. Fig. 2 is a side elevation of the opposite side of the machine. Fig. 3 is a plan view. Fig. 4 is a central vertical longitudinal section looking from the side shown in Fig. 2. Fig. 5 is a central vertical cross-section looking to the right in Figs. 2 and 4. Fig. 6 is a detail cross-section of the cylinder, carriers, and feeding-rolls, taken centrally through one of the cylinder-tubes. Fig. 7 is a similar section showing a modified construction.

Referring to said drawings, the frame of the machine may be of any suitable construction for supporting the operating parts. As shown, it consists simply of the vertical side frames A B. In these frames is mounted centrally of the machine the main shaft C, which carries a large cylinder D, the outer surface of this cylinder being preferably formed, as shown, of a series of tubes *l*, filled with air or other suitable elastic medium secured in the body of the cylinder, so as to form a surface which will yield against the pressure of the carriers. As shown, three tubes are used, these tubes being arranged side by side and extending circumferentially about the entire cylinder and being mounted at suitable distances apart to form grooves of the required width between the tubes for fingers on the carriers to enter between them, as fully described hereinafter.

About the cylinder D are arranged a plurality of feeding-rolls E, these rolls being arranged at considerable distances apart, according to the length of the sheet to be doubled or folded between them, and preferably being formed of disks set at suitable distances apart, as shown, or provided with grooves in some other manner, so as to receive the fingers on the carriers. The cylinder D may be of any suitable size, and any number of these feeding-rolls E be used in accordance with the number of folds of the sheet desired. There are shown, however, five of these rolls, making a construction by which a sheet may be thrice folded or twice folded and wrapped. These rolls E may be mounted rigidly if the the maching is to be used only with sheets of the same thickness; but it is preferable to make the rolls spring-pressed, in order to accommodate sheets of different thicknesses, and this construction is preferable even with sheets of the same thickness. Any suitable construction may be used for this purpose; but there is shown a common arrangement in which the shafts 10 of the rolls E are mounted in bearings 11, having stems 12, supported in hollow studs 13 on the frame, the bearings being spring-pressed to force the rolls toward the cylinder by coiled springs within said studs.

Between the rolls E are mounted carriers *a b c*, a carrier being mounted between each two feeding-rolls, except that space is left between two of the rolls previous to the last for applying paste to the wrapper. If the pasting mechanism be omitted or other pasting devices employed, it will be understood that one of the rollers E may be omitted. These carriers consist in the form shown of plates 15 16, preferably of thin sheet metal, carried by shafts 62, mounted in fixed positions in frames A B, and each of these shafts carries two arms, these arms being lettered, respectively, a^{10} a^{11} b^{10} b^{11} c^{10} c^{11}, corresponding to their respective carriers, each of these arms being provided at its end with a bowl, which bowls at the proper time engage stops rotating with the shaft C and cylinder, so as to hold the carriers in position during the feeding in and out of the sheets in their receipt and delivery by the carriers. These stops are carried by disks L, secured to the shaft C, and are attached thereon by means of set-nuts 63 and slots, so that they may be adjusted into position accurately for the proper operation of the carriers, and this operation varied in accordance with the length of the sheet to be folded, the arms on the shafts 62 preferably being made adjustable also by set-screws or otherwise. Two of these stops are provided for each carrier, one stop engaging each arm, and these stops are lettered, respectively, a^{12} a^{13} b^{12} b^{13} c^{12} c^{13}, corresponding by pairs to their respective carriers and arms.

The shaft 62, by which the carriers *a b c* are carried, are driven by cone friction-clutches 65, the driving members being loose and the driven members splined on shafts 62, and the two members being pressed together by means of adjustable springs 66 on the shafts 62, as usual in such constructions. The main shaft C carries inside the frame a large gear 67, which drives the rolls E through gears 68 on their shafts, and the driving members of the clutches 65 are driven from these gears 68 through intermediates 69 and gears 70 on the driving members of the clutches.

The carrier *a* is shown as extended above the shaft 62, by which it is carried, so as to support the leading edge of the sheet while it is fed into the carrier, and such support is desirable when the sheet consists of only one or two plies; but with sheets of considerable thickness and rigidity this may be found unnecessary, and this carrier, as well as carriers *b c*, may terminate at or just above the shaft 62. If the carriers are formed of continuous plates 15 16, as shown in the construction now being described, they are both cut away at their inner edges, so as to enter the grooves in rolls E in receiving and delivering the sheet, and the plate 16 is preferably cut away, so as to form fingers entering between the tubes *l* of the cylinder D in receiving a sheet, thus securing greater certainty of operation and rendering a high speed possible.

The plate 15, which forms the folding-plate coacting with the cylinder to fold the sheet,

should be of considerable extent, so as to secure proper folding by engaging the fold-line through a considerable portion of the width of the sheet, and this plate, of course, should not project within the surface of cylinder D. The plate 16, however, which forms the guide for the sheet may be formed of a series of narrow fingers, but little strength being required, and, as stated above, they preferably project slightly inside the surface of the cylinder in receiving the sheet. It may be found preferable to make guide 16 of such a series of fingers, as this leaves no edge outside the cylinder to be engaged by the sheet as it is fed forward into the carrier.

The construction thus far described may be used as a folding-machine, or papers and wrappers may be fed thereto by hand and the machine used as a hand-fed folding and wrapping machine, the paste being applied by hand or by any suitable devices. The machine shown, however, is adapted for use as a high-speed automatic folding and wrapping machine, the sheets or papers being represented as taken from a pair of feed-belts, which may be the delivery of a printing-press or to which the papers may be fed from a pile. It will be understood, however, that the invention does not depend upon any special form of paper or wrapper feeding devices, but that these may be varied as desired. Any suitable form of pasting devices may be used, and the paste applied at any desired point, and either to the loose flap of the wrapper or to the layer of wrapper upon the paper. It is desirable, however, that the paste should be applied as late as possible, and there are shown devices for applying the paste to the wrapper just prior to the operation of the last carrier, by which the flap of the wrapper is turned over for pasting.

In the construction shown the sheets or papers *x* are fed in over guides 28 by the belts *g*, extending around belt-pulleys 27, placed adjacent to the first feeding-roll E. To secure the proper timing of the feed of the sheet relatively to the operation of the carrier *a*, any suitable means may be provided; but there are shown stops 2, carried by a rock-shaft 3, mounted below said belts and actuated by a crank-arm 29, carrying a bowl, which runs upon cam-plate *h*, carried by the cylinder D at one end, so as to throw the stops 2 upward into the path of the sheet as it is advanced by the belts *g* and hold it until the proper time, when the cam *h* passes the bowl on arm 29 and releases the rock-shaft, which is then rocked by spring 30 on the shaft to carry the stops below the belts and release the sheet, a single sheet being fed at each revolution of the shaft C and cylinder D. It will be understood that the cam *h* is so timed relatively to the carrier *a* that the sheet is released by the stops 2 just at the proper time to reach the carrier *a* when it is in the position shown in Figs. 2 and 4. This cam *h* is preferably made adjustable by means of slots and set-nuts 4, so as to secure the accurate timing of the sheets, and by this adjustment, also, the machine may be capacitated to act on sheets of different length and to fold on different lines without adjustment of the stops for controlling the carriers, as it is apparent that the fold-line of the sheet will depend upon the distance to which it is fed within the carrier *a*, and this depends upon the time at which the stops 2 are lowered to release the sheet by the cam *h*.

The wrapper *y* is shown as fed from a wrapper-roll by a pair of feed-rolls 30 and received from said rolls by a pair of perforating-rolls 31, by which the web is perforated on the line at which the wrapper is to be severed, the perforated wrapper then being advanced to the cylinder between guides 32 by feed-belts *i*, carried by pulleys 33 34. The leading end of the wrapper-web is thus advanced between the cylinder D and a roll 35, preferably spring-pressed, and shown as mounted for this purpose in the same manner as the rolls E, previously described. This roll rotates and the cylinder advances the wrapper at a speed accelerated over that of the tapes *i*, and the wrapper is thus snapped off on the line of perforation and advanced forward about the cylinder D to the first roll E and the carrier *a*, where it is associated with the sheet *x*.

The pasting devices are shown as placed at the opposite side of the cylinder D from the point at which the wrapper and paper are fed in and just behind the last carrier *c*, two of the rolls E being separated a sufficient distance to accommodate the pasting devices and the sheet, which at this time has been folded down to the size of the final product, is advanced between these separated rolls E by tapes *k*, extending between said rolls and coacting with the cylinder D. The paste is applied by means of a rotating paster I, constructed to apply paste at the desired point, and carried by arms 36 on a shaft 37, mounted in the frame of the machine, the paster being shown as cut away, so as to accommodate the tapes *k*. The paste is supplied to the paster I by a fountain-roll 38, rotating in the usual fountain 39.

The operating parts of the machine, with the exception of the carriers *a b c* and feeding-rolls E, the driving of which has already been described, are actuated from the main shaft C as follows: The shaft C carries outside the frame A a large gear 40, which drives the roll 35 through a gear 41 on the shaft of the roll, and the tapes *g* are driven from the gear 40 by an intermediate 42, meshing with one of the gears 43, by which the shafts of said rolls are geared together. The wrapper-feeding mechanism is driven from the gear 40 at a lower rate of speed than the cylinder and rolls by a large intermediate 44, meshing with the gear 40, and small gear 45 on the same shaft, and intermediates 46, connecting this small gear 45 with the gear 47, by which the perforating-rolls 31 are geared together.

The feeding-rolls 30 are geared together by gear 48 and driven from one of the gears 47 by intermediate 49, and the tape-rolls 33 are likewise geared together by gears 50 and driven from one of the intermediates 46. The shaft 37, carrying paster I, is driven directly from the gear 40 at a reduced rate of speed by gear 52 on the shaft of the paster meshing with a small gear 53, the shaft of which carries a larger gear 54, which is driven from the gear 40 through intermediate 55, and the gear 52 meshes with a gear 56 on the shaft of the fountain-roll 38. While this system of gearing forms a very simple and efficient construction, it will be understood that any other suitable means for driving the parts of the machine may be used.

The operation of the construction will be understood from the following brief description, in connection with the drawings, referring especially to Figs. 2, 4, and 6. In the position shown in Figs. 2 and 4 a sheet x has been advanced by the tapes g, the stops 2 having been lowered by the spring 30 on the release of the arm 29 by the cam h on the cylinder D, and the sheet has been fed into the carrier a, which is just about to be actuated to double the sheet with the cylinder D and transfer the fold-line of the double sheet to the next roll E, the machine being illustrated as operating to fold the sheet twice on the middle line—that is, to form four plies of the original sheet and apply a wrapper thereto. The wrapper y has been broken from the perforated wrapper-web by the cylinder D and roll 35 and advanced thereby to the roll E and within the carrier a on the under side of the sheet sufficiently to insure the wrapper being folded with and outside the latter. In this position the stop a^{12} is just about to pass arm a^{10}, so as to release the latter and allow the friction-clutch 65 to rotate the shaft 62 and swing the carrier a forward with the cylinder D, and as the cylinder continues its rotation the carrier is thus moved with the shaft 62 and the sheet and wrapper folded and transferred to carrier b, the surface of the cylinder yielding as the carrier swings toward and past its central position, and returned to position by its elasticity as the carrier moves forward from the central position, and thus away from the cylinder, the surface of the cylinder thus following the carrier during the latter part of this movement, and the fold-line of the doubled sheet thus being advanced positively into the grip of the cylinder D and next roll E. Just as the carrier a reaches the proper position to transfer the sheet to carrier b, which is then in the position shown in Figs. 2, 4, and 6, with the fingers of plate 16 entering between the tubes l, the arm a^{11} on the shaft of carrier a engages the stop a^{13}, and the carrier a is thus held stationary and accurately in position until the paper has been fed out from carrier a and into carrier b by the cylinder D and feeding-roll E, when the stop a^{13} passes the arm a^{11} and the friction-clutch 65 again rotates the shaft 62 of carrier a until the carrier is brought into the position shown in Figs. 2 and 4, when the arm a^{10} again engages the stop a^{12} and holds the carrier in position until the sheet and wrapper are fed in, when the operation is repeated. The operation of carriers b c is the same, the arms b^{10} b^{11} and c^{10} c^{11} being engaged by their respective stops b^{12} b^{13} and c^{12} c^{13}, so as to hold the carriers b c stationary against the tension of the clutches 65 during the operations of receiving and delivering sheets and being released by the stops in proper time to permit the actuation of the carriers by the clutches 65, so as to fold and transfer the sheets and return to normal position, as described in connection with carrier a.

In the position shown in Figs. 2 and 4, in which carrier a has just received a sheet and wrapper, as described above, carrier b is in normal position ready to receive the sheet from the carrier a, having been returned to position after folding and transferring the preceding sheet and wrapper, and this preceding sheet with the wrapper has passed the paster 36, where a line of paste has been applied to the wrapper, and the carrier c has received the sheet twice folded with the wrapper and transferred it to the next roll E, simultaneously folding down the flap of the wrapper, so that the twice folded and wrapped sheet is just being delivered from the carrier c by the cylinder D and roll E, the flap of the wrapper being pressed down by the roll and tubes l of the cylinder. In the position shown in Fig. 6, in which the carrier a is just being swung over to fold the sheet, the preceding wrapped sheet has been fully delivered and the carrier c is ready to be returned to normal position to receive the next sheet and wrapper.

While the machine has been illustrated and described as folding a sheet midway of its length, it will be apparent from an inspection of the drawings that the sheet may readily be folded upon any other line, it being necessary only to time the carriers and sheet-feeding devices so that the carriers are actuated at the proper time to fold the sheets on the desired lines. In folding and wrapping comparatively thick newspapers and pamphlets it is frequently desirable to fold at one-third of the length, so as to form a product consisting of three plies of the original sheet. It is difficult to form the second fold in such case with the common folding-blade and roll constructions of folding mechanisms or with others acting in the same way, as there is nothing to hold the free edge of the first fold as the second fold is made; but it will be seen that the machine embodying the present invention is excellently adapted for this method of folding, as the two plies of the sheet formed by the first fold are positively held within the carrier. In fact, this method of folding may be found preferable with the machine shown,

as it is necessary then to double or fold only a single ply of the original sheet at each folding operation. It will be seen, also, that the machine is very simple, and it will be found efficient, durable, and of very high capacity, so that the machine is of great utility not only as a folding-and-wrapping or wrapping machine, but also as a folding-machine only, this utility being increased largely by the ease with which the machine may be adjusted so as to fold sheets of different lengths or to fold sheets upon different lines. It will be seen, also, that this machine may readily be arranged so as to fold and wrap or to fold to different sizes, as desired. For instance, in the construction shown the machine may readily be used as a folding-machine, folding three times, solely by throwing out the paster and timing the carrier *c*, so as to form a third fold, or the carrier *c* may be thrown out of operation and the twice-folded sheet delivered finally by the tapes *k*, or the carrier *b* may be thrown out of operation and the once-folded sheet delivered by any suitable means.

It is obvious that many other arrangements of devices for securing the proper movements of the carriers may readily be devised and that other means may be provided for securing the desired relative positions of the carriers and surface of the cylinders as the former is swung over and with the latter to fold the sheet.

In Fig. 7 I have shown a construction in which rotating carriers, which may be constructed and actuated in the same manner as previously described, are used with a cylinder employing spring-pressed segments to form the yielding surface coacting with the carriers instead of the elastic tubes *l* of the construction previously described. In this modified construction the carriers *a b c* coact, respectively, with segments a^{14} b^{14} c^{14}, arranged circumferentially of the cylinder in proper positions to coact with their respective carriers, these segments being grooved or arranged in series extending longitudinally of the cylinder, so as to permit the fingers on the plates 16 of the carriers to enter the cylinder. These segments may be supported in any suitable manner, so as to yield for coaction with the carriers, and are shown as carried by bars 71, sliding radially in bearings 72 in the cylinder and spring-pressed outward by springs 73 on the rods. The operation of this modified construction will be clear from the preceding description, in connection with Fig. 7, being identical with that of the construction shown in Figs. 1 to 6.

It will be understood by those skilled in the art that many other modifications may be made in the general features of the construction shown without departing from the invention, and that the invention is not to be limited to the specific construction of the different parts, as these may be varied widely. While one feature of the invention consists in the combination of a plurality of carriers for folding a number of times, or folding and wrapping, the invention includes, also, constructions employing a single carrier, as claimed hereinafter. It will be understood, also, that the term "sheet" is used in the specification and claims as a broad term to cover the article to be folded or wrapped, whether consisting of one or more plies.

What is claimed is—

1. The combination with two feeding devices, of an elastic abutment between the feeding devices, and a carrier coacting with the abutment to fold a sheet and transfer it from one feeding device to the other, and means for actuating said carrier, substantially as described.

2. The combination with two feeding devices, of an elastic abutment between the feeding devices, and a pivoted carrier coacting with the abutment to fold a sheet and transfer it from one feeding device to the other, and means for actuating said carrier, substantially as described.

3. The combination with two feeding devices, of an elastic abutment between the feeding devices, and a rotating carrier coacting with the abutment to fold a sheet and transfer it from one feeding device to the other, and means for actuating said carrier, substantially as described.

4. The combination with two feeding devices, of an elastic abutment between the feeding devices, a rotating carrier coacting with the abutment to fold a sheet and transfer it from one feeding device to the other, a clutch driving said carrier, and devices for controlling said clutch to actuate said carrier with pauses to receive and deliver the sheet.

5. The combination with two feeding devices, of an elastic abutment between the feeding devices, a rotating carrier coacting with the abutment to fold a sheet and transfer it from one feeding device to the other, a friction clutch driving said carrier, and devices for stopping said carrier against the tension of the clutch to receive and deliver the sheet and releasing the carrier for the folding movement, substantially as described.

6. The combination with two feeding devices, of an elastic abutment between the feeding devices, a rotating carrier coacting with the abutment to fold a sheet and transfer it from one feeding device to the other, a friction clutch driving said carrier, an arm on the axis of said carrier, and a moving stop controlling said carrier through said arm, substantially as described.

7. The combination with two feeding devices, of an elastic abutment between the feeding devices, a rotating carrier coacting with the abutment to fold a sheet and transfer it from one feeding device to the other, a friction clutch driving said carrier, arms on the axis of said carrier for stopping it in position to receive and deliver the sheet, and moving stops controlling said carrier through said arms, substantially as described.

8. The combination with two feeding devices, of an elastic cylinder between the feeding devices, a pivoted carrier coacting with the cylinder to fold a sheet and transfer it from one feeding device to the other, and means for actuating said carrier, substantially as described.

9. The combination with two feeding devices, of an elastic cylinder between the feeding devices, a rotating carrier coacting with the cylinder to fold a sheet and transfer it from one feeding device to the other, and means for actuating said carrier, substantially as described.

10. The combination with two feeding devices, of an elastic abutment between the feeding devices, a carrier coacting with the abutment to fold a sheet and transfer it from one feeding device to the other, and means for actuating said carrier with pauses in position to receive and deliver the sheet, substantially as described.

11. The combination with two feeding devices, of an elastic abutment between the feeding devices, a rotating carrier coacting with the abutment to fold a sheet and transfer it from one feeding device to the other, and means for actuating said carrier with pauses in position to receive and deliver the sheet, substantially as described.

12. The combination with two feeding devices, of an elastic cylinder between the feeding devices, a rotating carrier coacting with the cylinder to fold a sheet and transfer it from one feeding device to the other, and means for actuating said carrier with pauses in position to receive and deliver the sheet, substantially as described.

13. The combination with an abutment having an elastic surface, of a plurality of feeding devices, a plurality of carriers mounted respectively between the successive feeding devices and arranged to receive sheets therefrom and coacting with the abutment to fold the sheets and transfer them to the next feeding device, and means for actuating said carriers, substantially as described.

14. The combination with a rotating cylinder having an elastic surface, of a plurality of feeding devices arranged about and coacting with the cylinder, a plurality of carriers mounted respectively between the successive feeding devices and arranged to receive sheets therefrom and coacting with the cylinder to fold the sheets and transfer them to the next feeding device, and means for actuating said carriers, substantially as described.

15. The combination with an abutment having an elastic surface, of a plurality of feeding devices, a plurality of rotating carriers mounted respectively between the successive feeding devices and arranged to receive sheets therefrom, and coacting with the abutment to fold the sheets and transfer them to the next feeding device, and means for actuating said carriers with pauses in position to receive a sheet from one feeding device and deliver it to the next feeding device, substantially as described.

16. The combination with a rotating cylinder having an elastic surface, of a plurality of feeding devices arranged about and coacting with the cylinder, a plurality of rotating carriers mounted respectively between the successive feeding devices and arranged to receive sheets therefrom, and coacting with the cylinder to fold the sheets and transfer them to the next feeding device, and means for actuating said carriers with pauses in position to receive a sheet from one feeding device and deliver it to the next feeding device, substantially as described.

17. The combination with a rotating cylinder having an elastic surface, of a plurality of feeding devices arranged about and coacting with the cylinder, a plurality of rotating carriers mounted respectively between the successive feeding devices and arranged to receive sheets therefrom, and coacting with the cylinder to fold the sheets and transfer them to the next feeding device, friction clutches for driving said carriers, and rotating stops for holding said carriers against the tension of the clutches to receive and deliver the sheets and releasing the carriers for their folding movement and return to normal position, substantially as described.

18. The combination with two feeding devices, of an abutment between the feeding devices, a rotating carrier coacting with the abutment to fold a sheet, and means independent of the sheet for actuating said carrier, substantially as described.

19. The combination with two feeding devices, of an abutment between the feeding devices, a rotating carrier coacting with the abutment to fold a sheet, a clutch driving said carrier, and devices for controlling said clutch to actuate said carrier with pauses to receive and deliver the sheet, substantially as described.

20. The combination with two feeding devices, of an abutment between the feeding devices, a rotating carrier coacting with the abutment to fold a sheet, a friction clutch driving said carrier, and devices for stopping said carrier against the tension of the clutch to receive and deliver the sheet, and releasing said carrier for the folding movement, substantially as described.

21. The combination with two feeding devices, of a rotating cylinder extending between the feeding devices, a rotating carrier coacting with said cylinder to fold a sheet and transfer it from one feeding device to the other, and means independent of the sheet for actuating said carrier, substantially as described.

22. The combination with two feeding devices, of a rotating cylinder extending between said feeding devices, a rotating carrier coacting with said cylinder to fold a sheet and transfer it from one feeding device to the other, and means independent of the sheet

for actuating said carrier with pauses to receive and deliver the sheet, substantially as described.

23. The combination with two feeding devices, of an abutment between the feeding devices, a rotating carrier coacting with the abutment to fold a sheet and transfer it from one feeding device to the other, and means for actuating said carrier with pauses in position to receive and deliver the sheet, substantially as described.

24. The combination with an abutment, of a plurality of feeding devices, a plurality of rotating carriers mounted respectively between the successive feeding devices and arranged to receive sheets therefrom, and coacting with the abutment to fold the sheets and transfer them to the next feeding device, and means for actuating said carriers with pauses in position to receive a sheet from one feeding device and deliver it to the next feeding device, substantially as described.

25. The combination with a rotating cylinder, of a plurality of feeding devices arranged about and coacting with the cylinder, a plurality of rotating carriers mounted respectively between the successive feeding devices and arranged to receive sheets therefrom, and coacting with the cylinder to fold the sheets and transfer them to the next feeding device, and means for actuating said carriers with pauses in position to receive a sheet from one feeding device and deliver it to the next feeding device, substantially as described.

26. The combination with paper and wrapper feeding devices and pasting devices for the wrapper, of a plurality of feeding devices, an abutment between the feeding devices, a plurality of rotating carriers mounted respectively between the successive feeding devices and coacting with the abutment to fold the papers and wrappers together, and means for actuating said carriers with pauses in position to receive a sheet from one feeding device and deliver it to the next feeding device, substantially as described.

27. The combination with paper and wrapper feeding devices and pasting devices for the wrapper, of a plurality of feeding devices, an elastic abutment between the feeding devices, a plurality of rotating carriers mounted respectively between the successive feeding devices and coacting with the abutment to fold the papers and wrappers together, and means for actuating said carriers with pauses in position to receive a sheet from one feeding device and deliver it to the next feeding device, substantially as described.

28. The combination with paper and wrapper feeding devices and pasting devices for the wrapper, of a rotating cylinder, a plurality of feeding devices arranged about and coacting with said cylinder, a plurality of rotating carriers mounted respectively between the successive feeding devices and coacting with the cylinder to fold the papers and wrappers together, and means for actuating said carriers with pauses in position to receive a sheet from one feeding device and deliver it to the next feeding device, substantially as described.

29. The combination with paper and wrapper feeding devices and pasting devices for the wrapper, of a rotating cylinder having an elastic surface, a plurality of feeding devices arranged about and coacting with said cylinder, a plurality of rotating carriers mounted respectively between the successive feeding devices and coacting with the cylinder to fold the papers and wrappers together, and means for actuating said carriers with pauses in position to receive a sheet from one feeding device and deliver it to the next feeding device, substantially as described.

30. The combination with paper and wrapper feeding devices and pasting devices for the wrapper, of a plurality of feeding devices, an elastic abutment between the feeding devices, a plurality of pivoted carriers mounted respectively between the successive feeding devices and arranged to receive sheets therefrom, and coacting with the abutment to fold the sheets, and means for actuating said carriers to fold the papers and wrappers together and transfer them to the successive feeding devices and for returning the carriers to normal position, substantially as described.

31. The combination with paper and wrapper feeding devices and pasting devices for the wrapper, of a rotating cylinder having an elastic surface, a plurality of feeding devices arranged about and coacting with said cylinder, a plurality of pivoted carriers mounted respectively between the successive feeding devices and coacting with the cylinder to fold the sheets, and means for actuating said carriers to fold the papers and wrappers together and transfer them to the successive feeding devices and for returning the carriers to normal position, substantially as described.

32. The combination with an abutment, of a pivoted carrier having its axis stationary relatively to the abutment, said abutment having an elastic surface coacting with the carrier to fold a sheet and arranged to yield to the pressure of the carrier, and means for actuating said carrier, substantially as described.

33. The combination with an abutment, of a rotating carrier having its axis stationary relatively to the abutment, said abutment having an elastic surface coacting with the carrier to fold a sheet and arranged to yield to the pressure of the carrier, and means for actuating said carrier, substantially as described.

34. The combination with a rotating cylinder having an elastic surface, of a pivoted carrier coacting with the cylinder to fold a sheet, said carrier and cylinder having their axes stationary relatively to each other, and means for actuating said carrier, substantially as described.

35. The combination with a rotating cylinder having an elastic surface, of a rotating carrier coacting with the cylinder to fold a sheet, said carrier and cylinder having their axes stationary relatively to each other, and means for actuating said carrier, substantially as described.

36. The combination of a moving abutment, a rotating carrier having its axis stationary relatively to the abutment and coacting with the abutment to fold a sheet, said carrier and abutment moving together during the folding operation and said abutment having an elastic surface arranged to yield to the pressure of the carrier, and means for actuating said carrier with pauses to receive and deliver the sheet, substantially as described.

37. The combination with a rotating cylinder, of a rotating carrier coacting with said cylinder to fold a sheet, said cylinder and carrier having their axes stationary relatively to each other, and means for actuating said carrier, substantially as described.

38. The combination with an abutment, of a rotating carrier having its axis stationary relatively to the abutment and coacting with the abutment to fold a sheet, said abutment having an elastic surface coacting with the carrier to fold a sheet and arranged to yield to the pressure of the carrier, a friction clutch driving said carrier, and devices for stopping said carrier against the tension of the clutch to receive and deliver the sheet and releasing said carrier for the folding movement, substantially as described.

39. The combination with an abutment, of a rotating carrier having its axis stationary relatively to the abutment, a friction clutch for driving said carrier, an arm on the axis of the carrier, and a stop controlling said carrier through said arm, substantially as described.

40. The combination with an elastic abutment, of a rotating carrier having its axis stationary relatively to the abutment, a friction clutch for driving said carrier, an arm on the axis of said carrier, and a stop controlling said carrier through said arm, substantially as described.

41. The combination with an elastic abutment, of a rotating carrier, a friction clutch for driving said carrier, arms on the axis of said carrier for stopping it in position to receive and deliver a sheet and moving stops controlling said carrier through said arms, substantially as described.

42. The combination with a cylinder, of feeding rolls E, rotating carrier a having arm a^{10}, a friction clutch for rotating said carrier, and rotating stop a^{12}, substantially as described.

43. The combination with a cylinder having an elastic surface, of feeding rolls E, rotating carrier a, having arm a^{10}, a friction clutch for actuating said carrier, and rotating stop a^{12}, substantially as described.

44. The combination with a cylinder, of feeding rolls E, rotating carrier a having arms a^{10}, a^{11}, a friction clutch for rotating said carrier, and rotating stops a^{12}, a^{13}, substantially as described.

45. The combination with a cylinder having an elastic surface, of feeding rolls E, rotating carrier a having arms a^{10}, a^{11}, a friction clutch for rotating said carrier, and rotating stops a^{12}, a^{13}, substantially as described.

46. The combination with cylinder D having a surface formed by one or more elastic tubes l, of feeding rolls E, rotating carrier a having arms a^{10}, a^{11}, a friction clutch for rotating said carrier, and rotating stops a^{12}, a^{13}, substantially as described.

47. The combination with a cylinder, of feeding rolls E, a plurality of rotating carriers, as a, b, c, between said rolls, having arms, as a^{10}, a^{11}; b^{10}, b^{11}; c^{10}, c^{11}, friction clutches for rotating said carriers, and rotating stops, as a^{12}, a^{13}; b^{12}, b^{13}; c^{12}, c^{13}, substantially as described.

48. The combination with a cylinder having an elastic surface, of feeding rolls E, a plurality of rotating carriers, as a, b, c, between said rolls, having arms, as a^{10}, a^{11}; b^{10}, b^{11}; c^{10}, c^{11}, friction clutches for rotating said carriers, and rotating stops, as a^{12}, a^{13}; b^{12}, b^{13}; c^{12}, c^{13}, substantially as described.

49. The combination with a cylinder, of feeding rolls E, a plurality of rotating carriers, as a, b, c, between said rolls, having arms, as a^{10}, a^{11}; b^{10}, b^{11}; c^{10}, c^{11}, friction clutches for rotating said carriers, and rotating stops, as a^{12}, a^{13}; b^{12}, b^{13}; c^{12}, c^{13}, adjustable to vary the time at which the carriers act relatively to the feed of the sheets, substantially as described.

50. The combination with a cylinder, of feeding rolls E, a plurality of rotating carriers, as a, b, c, and actuating devices for said carriers adjustable to vary the time at which the carriers act relatively to the feed of the sheet, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LUTHER C. CROWELL.

Witnesses:
C. J. SAWYER,
A. L. KENT.