

Jan. 7, 1930.

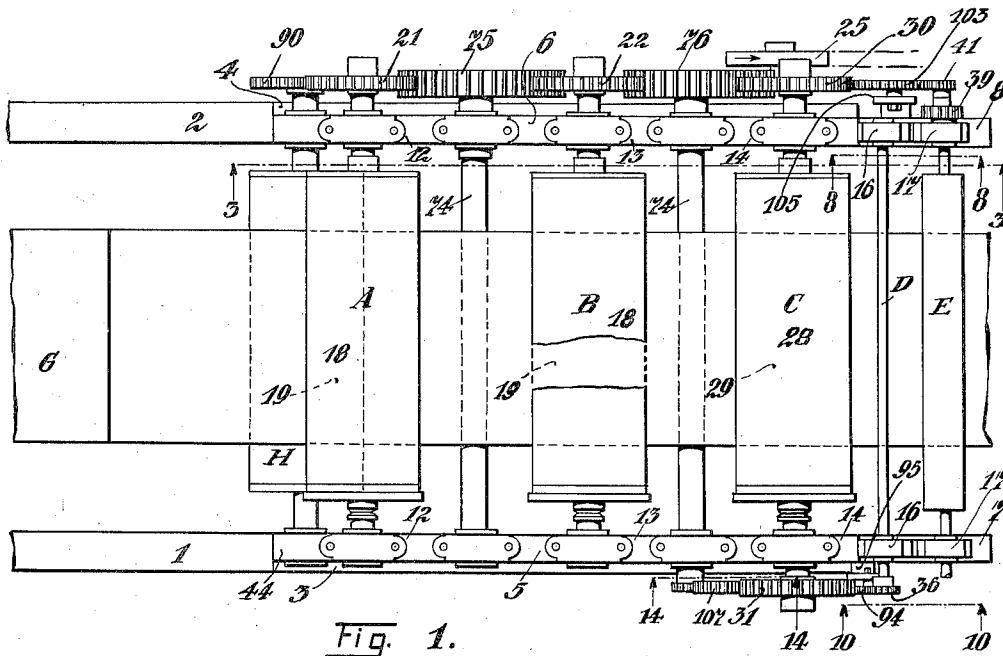
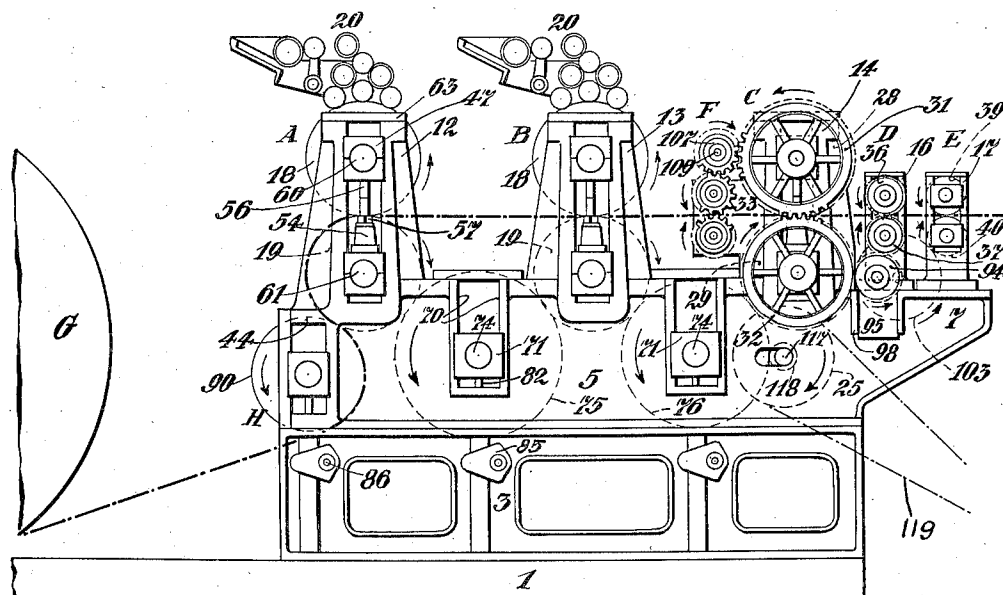
L. P. WILLSEA

1,742,335

PAPER PRODUCTS MACHINE

Filed Jan. 27, 1927

8 Sheets-Sheet 1



INVENTOR
Louis Putnam Willsea
BY
Albert M. Austin
ATTORNEY

Jan. 7, 1930.

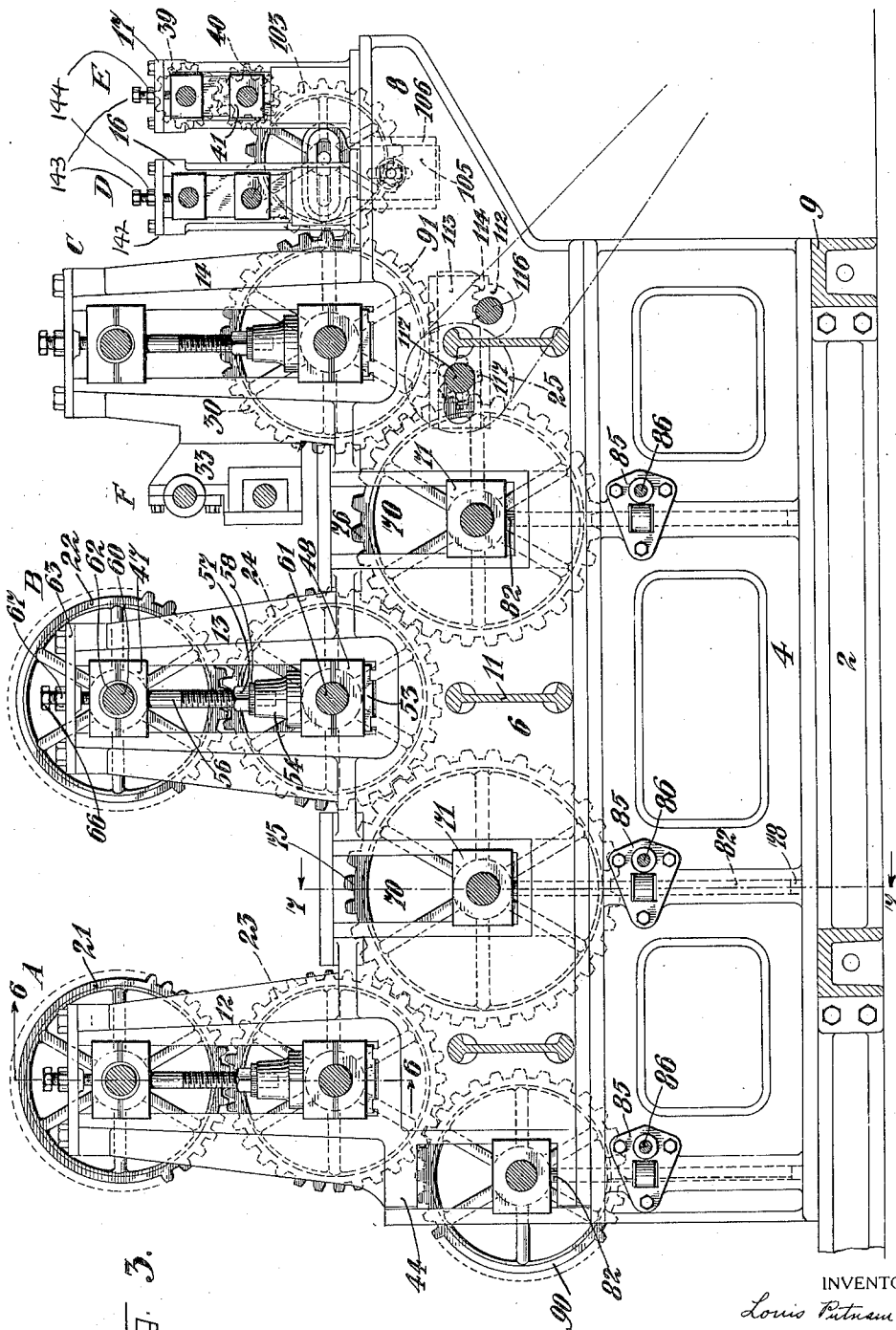
L. P. WILLSEA

1,742,335

PAPER PRODUCTS MACHINE

Filed Jan. 27, 1927

8 Sheets-Sheet 2



INVENTOR

INVENTOR
Louis Putnam Willcox

BY

Albert M. Austin

ATTORNEY

Jan. 7, 1930.

L. P. WILLSEA

1,742,335

PAPER PRODUCTS MACHINE

Filed Jan. 27, 1927

8 Sheets-Sheet 3

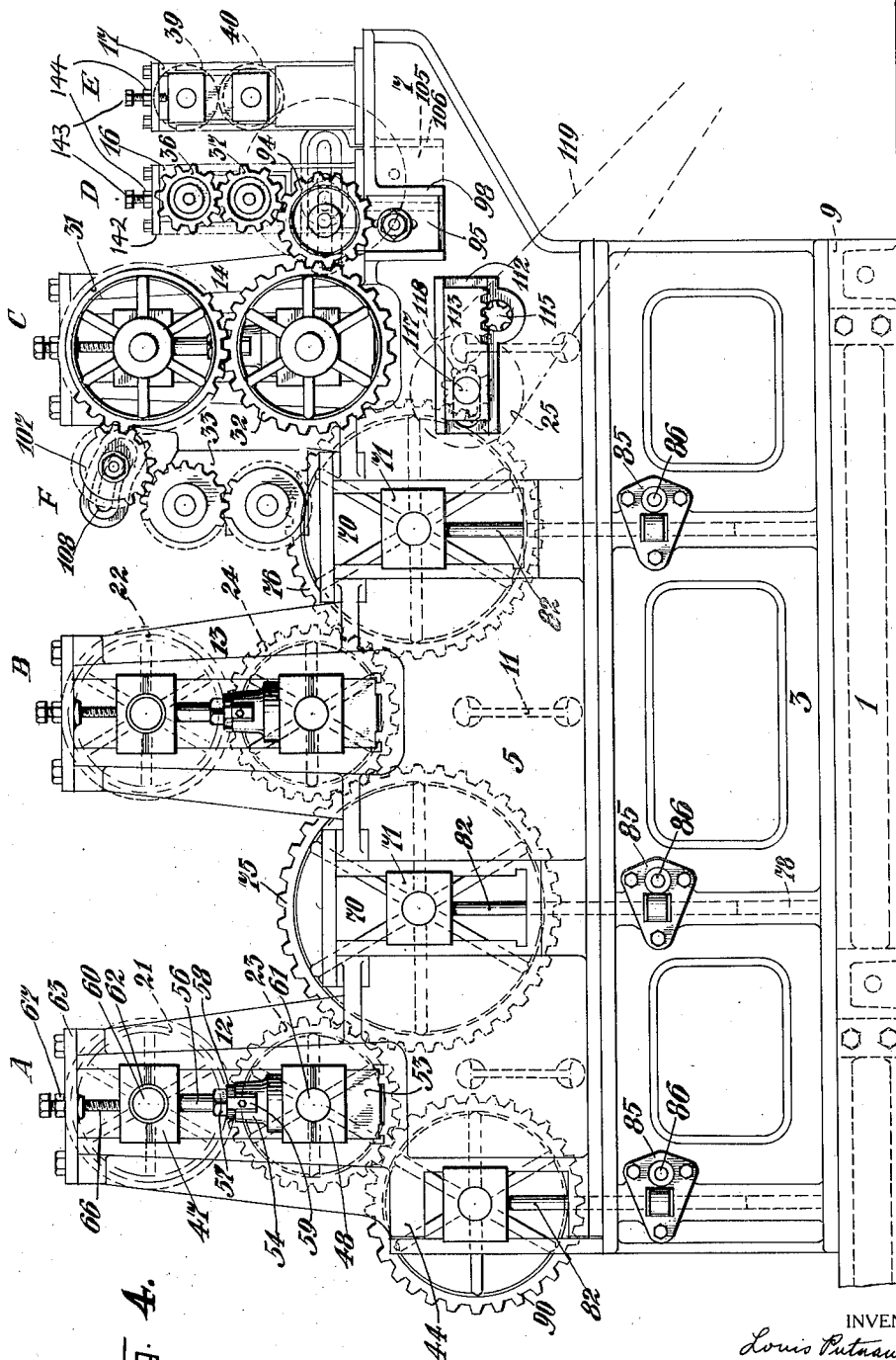


Fig. 4.

INVENTOR
Louis Putnam Willsea
BY *Albert M. Austin*
ATTORNEY

Jan. 7, 1930.

L. P. WILLSEA

1,742,335

PAPER PRODUCTS MACHINE

Filed Jan. 27, 1927

8 Sheets-Sheet 4

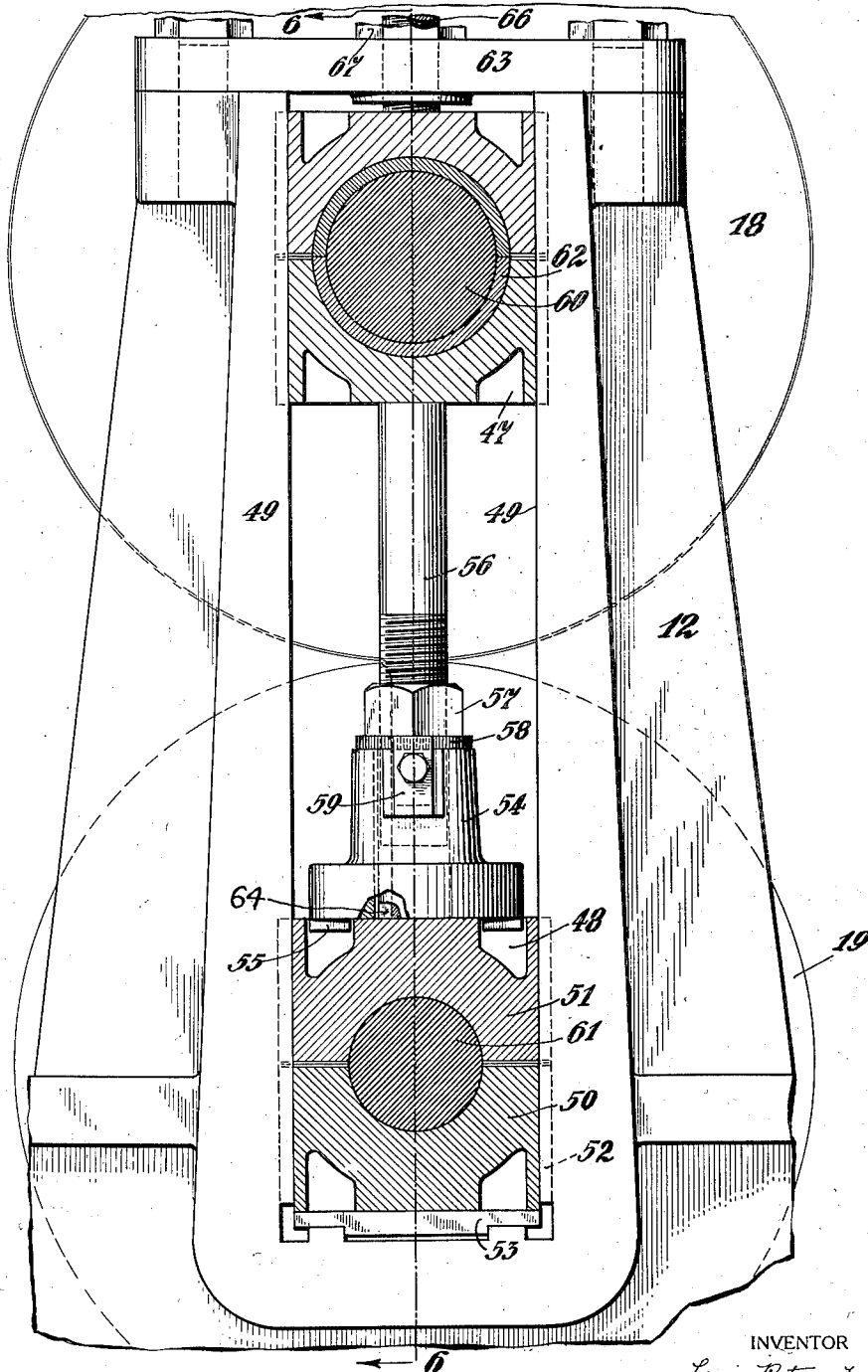


Fig. 5.

INVENTOR
Louis Putnam Willsea
BY Albert M. Austin
ATTORNEY

Jan. 7, 1930.

L. P. WILLSEA

1,742,335

PAPER PRODUCTS MACHINE

Filed Jan. 27, 1927

8 Sheets-Sheet 6

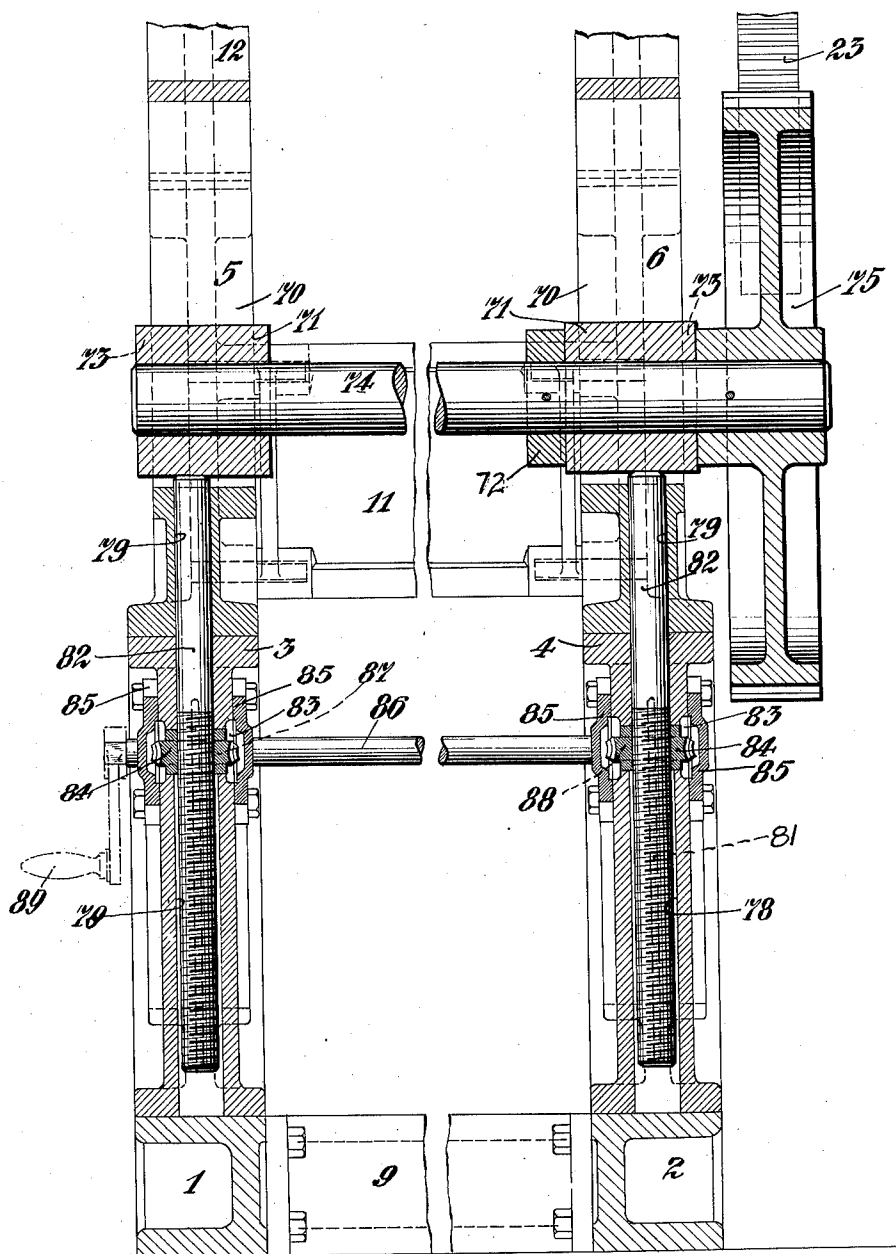


Fig. 7.

INVENTOR
Louis Putnam Willsea
BY Albert M. Austin
ATTORNEY

Jan. 7, 1930.

L. P. WILLSEA

1,742,335

PAPER PRODUCTS MACHINE

Filed Jan. 27, 1927

8 Sheets-Sheet 7

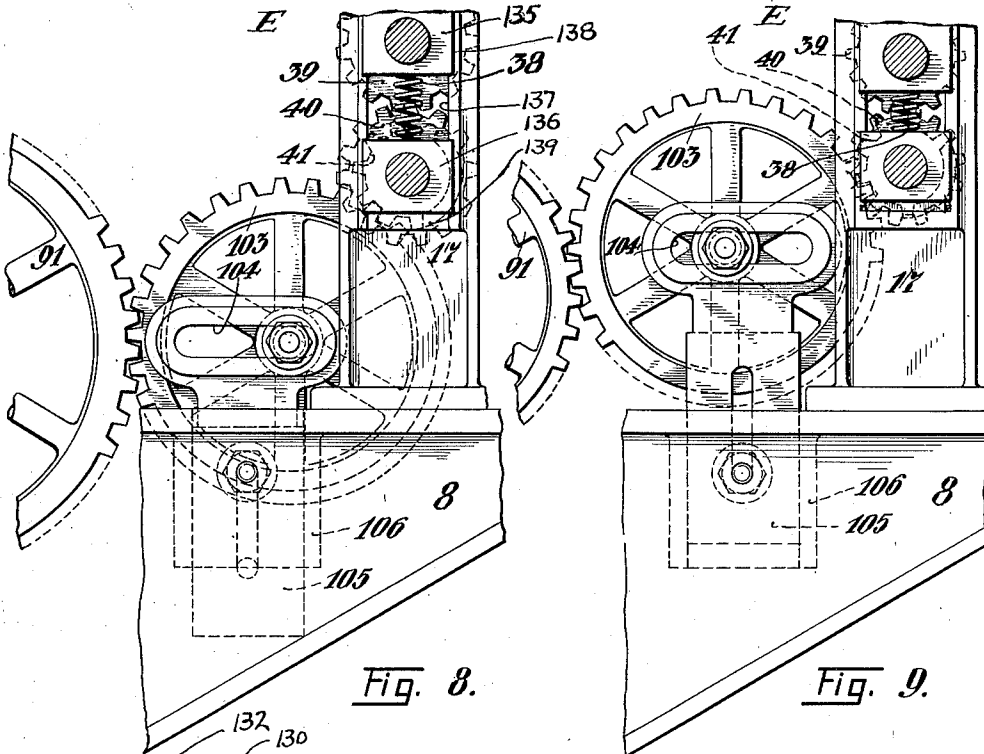


Fig. 8.

Fig. 9.

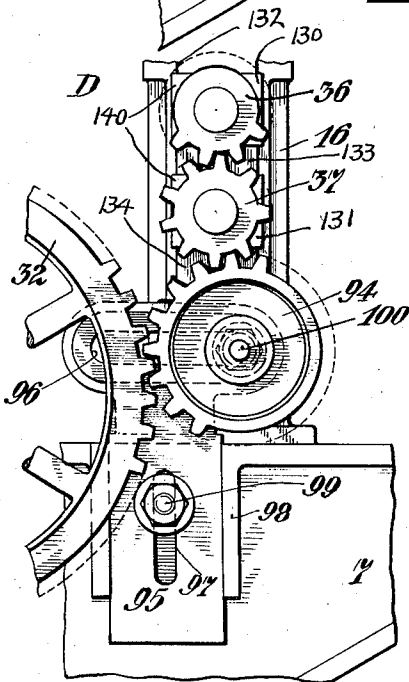


Fig. 10.

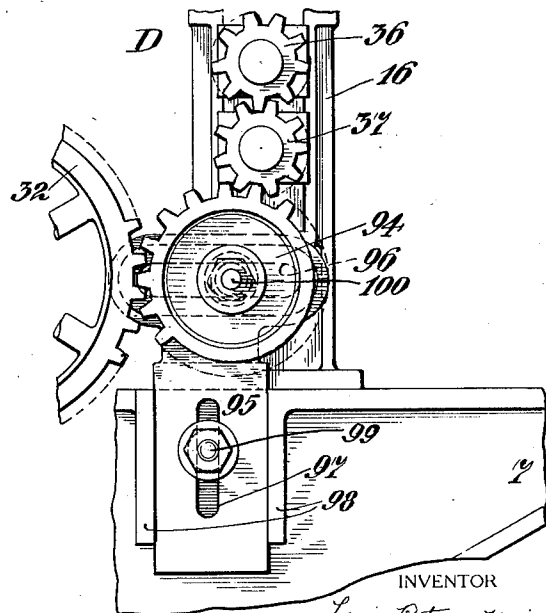


Fig. 11.

INVENTOR
Louis Putnam Willsea
BY
Albert M. Austin
ATTORNEY

Jan. 7, 1930.

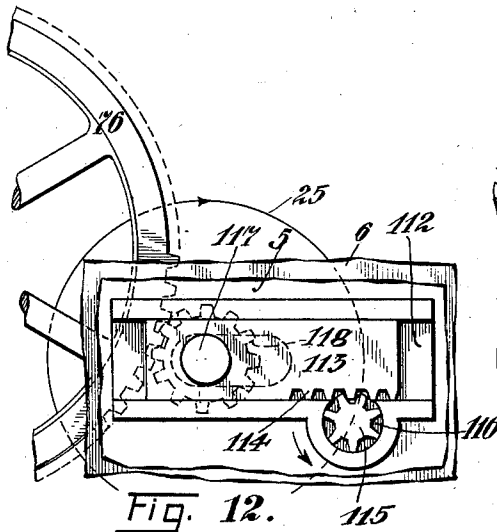
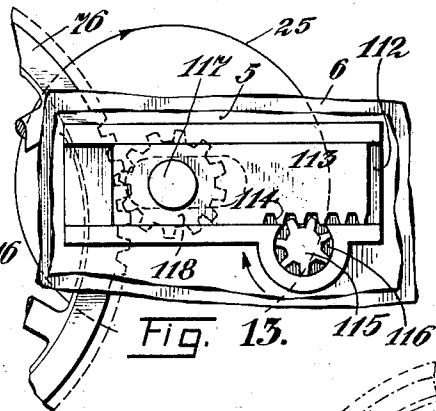
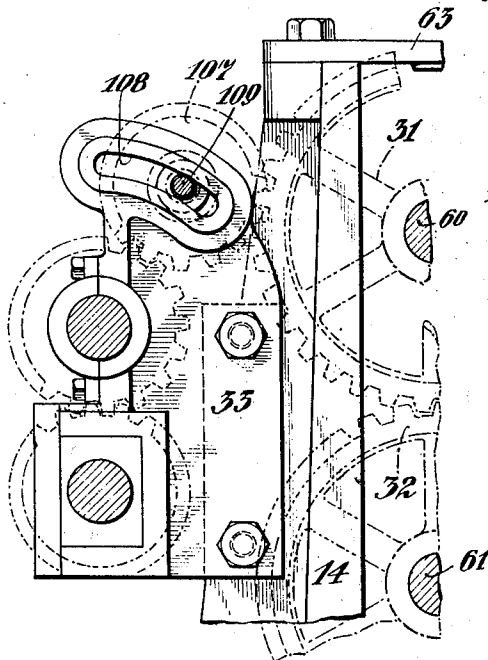
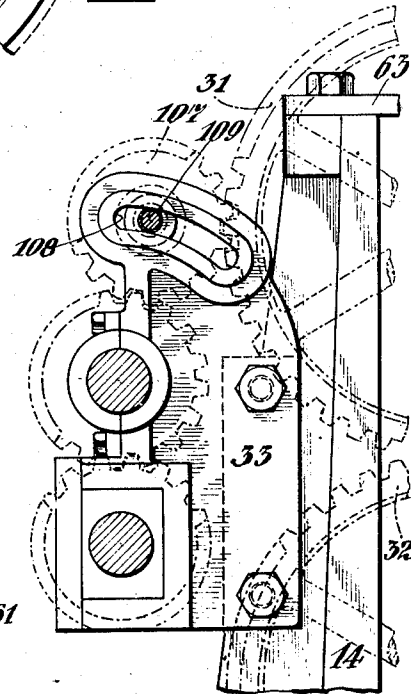
L. P. WILLSEA

1,742,335

PAPER PRODUCTS MACHINE

Filed Jan. 27, 1927

8 Sheets-Sheet 8



INVENTOR

Louis Putnam Willsea

BY Albert M. Austin

ATTORNEY

UNITED STATES PATENT OFFICE

LOUIS PUTNAM WILLSEA, OF ROCHESTER, NEW YORK, ASSIGNOR TO BOX BLANK CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

PAPER-PRODUCTS MACHINE

Application filed January 27, 1927. Serial No. 163,872.

The invention relates to improvements in paper products making machines, such as blanks for cartons, and, more particularly, to a paper products making machine which has all of its several individual operating mechanisms arranged in a straight line. A feature of the invention is the provision of a paper products making machine which may be of the straight line type and which can be set up for different jobs for making different size and shape paper products with minimum amount of expense and time. A further feature of the invention includes the provision of structure for allowing the easy mounting of different size rolls and gears for different jobs.

The arrangement in a straight line of the several individual mechanisms for performing the different functions in the making of a product from a web of paper board allows the different functions to be performed very rapidly and in close succession, so that a paper product is formed in a minimum length of time.

According to the invention a paper products making machine is provided which, in one continuous operation, may print the advancing web of paper board with one or more colors, score the web and cut it into products of the desired size and shape, pick the undesired particles of scrap out of the traveling web, separate the products one from the other and deliver them into counted piles without smudging the wet ink. For performing any one or more of the several operations, there may be provided pairs of rolls between which the web of paper board from which the products are to be made, may be passed.

In order to prevent waste of the paper board, the several impression rolls may be of such diameter as to provide impression surfaces for an integral number of products around the periphery. In order to maintain this condition for all jobs, different size rolls must be used. The different size rolls necessitate different size gears and a further feature of the invention is the provision of apparatus whereby the different size rolls and gears may be easily placed into position and adjusted for the different jobs. The rolls

whose size must be changed for the different jobs may be the printing rolls, die rolls and picker rolls. As the machine is preferably arranged so that the paper web always travels at the same linear velocity for all size jobs, the separator rolls may not have to be changed for the several jobs since the circumferential velocity of the separator rolls is arranged to be preferably a little greater than the velocity of the paper web.

According to the invention, the frame may be provided with adjustable bearings so that their position and the distance between them may be regulated for different size operating rolls. Further adjustable bearings may be provided for the transfer gears so that the transfer gears may be kept in mesh with the different size gears on the different size operating rolls.

Various other features and advantages of the invention will be obvious from the following particular description of one form of machine embodying the invention or from an inspection of the accompanying drawings; and the invention also consists in certain new and novel features of construction and combinations of parts hereinafter set forth and claimed.

In the drawings accompanying and forming part of this specification, a practical commercial embodiment of the invention is disclosed, but as such illustration is primarily for purposes of disclosure, it will be understood that the structure may be modified in various respects without departure from the broad spirit and scope of the invention as hereinafter defined and claimed.

Fig. 1 is a more or less diagrammatic plan view of the machine showing the arrangement of the several operating rolls;

Fig. 2 is a more or less diagrammatic side elevation of Fig. 1, the heavy dot-and-dash line illustrating the web of paper board;

Fig. 3 is an elevational view taken on the line 3—3 of Fig. 1 and showing the various gears on the drive motor side of the machine only, the parts being adjusted for large rolls;

Fig. 4 is a side elevation looking in the same direction as Fig. 3 but showing the several gears on the side of the machine op-

posite the drive motor, the parts being adjusted for small rolls;

Fig. 5 is an enlarged detail showing the mechanism for holding the bearings of a pair of printing and die rolls in adjusted position, the bearings being adjusted for large rolls. This figure is a section on the line 5-5 of Fig. 6;

Fig. 6 is a section taken on the line 6-6 of Figs. 3 and 5 the parts being adjusted for small rolls;

Fig. 7 is a section taken on the line 7-7 of Fig. 3 and shows the mechanism for adjusting the position of the main transfer gears and the reverse-bending roll, the position being one which will be occupied when large rolls are in use;

Figs. 8 and 9 are details showing the structure of the adjustable mounting for the transfer gear for driving the separator rolls, Fig. 8 illustrating the position of the parts when large rolls are used, while Fig. 9 illustrates the position of the parts when small rolls are used;

Figs. 10 and 11 are details showing the structure of the adjustable mounting for the transfer roll for driving the picker rolls, Fig. 10 showing the position of the parts when large die rolls are used, while Fig. 11 illustrates the position of the parts when small die rolls are used;

Figs. 12 and 13 illustrate the structure for adjustably mounting the driving gear and pulley, Fig. 12 illustrating the position of the parts when small impression rolls are used, while Fig. 13 illustrates the position of the parts when large impression rolls are used.

Figs. 14 and 15 are details showing the construction of the bracket for adjustably mounting the transfer roll for driving the advance rolls, Fig. 14 illustrating the position when small die rolls are used and Fig. 15 illustrating the position when large die rolls are used.

Referring to the drawings and more particularly to Figs. 1, 2, 3 and 4, the paper box making machine disclosed for purposes of illustration comprises a pair of spaced bed rails 1 and 2 at one end of which is placed a pair of lower frame members 3 and 4. Resting upon the lower frame members is a pair of upper frame members 5 and 6, the upper frame members having their forward ends formed into shelves 7 and 8 extending beyond the lower frame members and bed rails. It will be understood that the upper frame member, lower frame member and a bed rail on each side are suitably bolted together. In order to strengthen the frame, lower cross rails 9 are provided extending between the bed rails 1 and 2. Upper cross rails 11 are also provided extending between the upper frame members 5 and 6, these cross rails being bolted thereto.

Each upper frame member 5 and 6 is provided with three integrally connected standards 12, 13 and 14, each standard having a guideway, for supporting the printing rolls A and B and die rolls C. Supported upon the shelves 7 and 8, on each side, are two detachably connected standards 16 and 17 which have guides therein for supporting respectively the picker rolls D and separator rolls E.

The printing rolls A and B are each made up of an upper or impression roll 18 and a lower or pressure roll 19. The upper roll may have secured thereon an impression plate (not shown) for making the desired imprint. Devices denoted generally by 20 are provided for feeding ink to the upper roll. The upper printing rolls are provided with gears 21 and 22 and the lower printing rolls are provided with gears 23 and 24, the upper and lower gears of each set meshing each other. These gears are mounted outside the frame and on the same side of the machine as the drive pulley 25.

The die rolls C may comprise an upper or impression roll 28 having the male knives or cleats (not shown) for making all the impressions and scores not made by the auxiliary or advance rolls F. The lower roll 29 may have knives or cleats (not shown) thereon coacting with the knives or cleats on the upper roll. These knives or cleats may be of the type that are easily removable and are easily replaceable to any position on any size cylinder to meet the exigencies of the different jobs.

The lower die roll 29 is provided with a gear 30 on the drive pulley side and both the upper and lower die rolls are provided with gears 31 and 32 on the other side, the last gears meshing each other. All gears are mounted outside the frame.

Bolted to the standards 14 for supporting the die rolls, one on each side, are brackets 33 for supporting the advance or auxiliary rolls F (see Figs. 3, 14 and 15). These rolls F have cutting and scoring wheels (not shown) thereon for making cuts and creases which extend throughout the length of the blank, these wheels being adjustable axially to meet the exigencies of different jobs.

The picker rolls D are provided with devices (not shown) for picking out the small waste pieces which would otherwise clog up the machine. The picker rolls D will usually be arranged to make one revolution for each product around the periphery of the printing and die rolls and different size picker rolls D may be used with different size printing and die rolls. The picker rolls have meshing gears 36 and 37 outside the frame on the side opposite the drive pulley.

The upper picker roll is journaled in bearings 130 and the lower picker roll is journaled in bearing 131, the bearings being pro-

vided with ears 140 and slidable vertically in the guideways 132 in the standards 16 so as to be easily removable therefrom. Spacing members 133 of different size may be provided to be placed between the bearings 130 and 131 to adjust the distance between them to the proper amount and spacing members 134 of different size may be provided to be placed between the lower bearings 131 and the bottom of the guideways 132 to elevate the bearings to the proper height.

The separator rolls E may be rotated at a peripheral velocity which is slightly faster than the velocity of the web, the separator rolls being held normally in spaced relation by the springs 38 (Figs. 8 and 9) acting between the upper and lower bearings 135 and 136. At proper intervals devices (not shown) may be provided to press the separator rolls together to cause them to grip the paper web to separate a product from the preceding.

Both upper and lower separator rolls are provided with gears 39 and 40 on the drive pulley side meshing each other and outside the frame. The lower separator roll has also a smaller gear 41 mounted outside the gear 40 for a purpose hereinafter described.

The upper bearings 135 in which the upper separator roll is journaled and the lower bearing 136 in which the lower separator rolls is journaled are slidable vertically in the guideways 137 in the standards 17, the bearing blocks having ears 138 to allow the bearings to be vertically slidable in the guideways for easy adjustment and removal. Spacing blocks 139 of different sizes may be provided to be placed between the lower bearings 136 to elevate the bearings to their proper height. Since it is preferable to maintain the line of travel of the web of paper board at a fixed height, however, spacing blocks 139 of the same size may be used for all jobs. If desired, however, for any reason, the height of the contacting surfaces of the separator rolls may be changed by using different size spacing blocks 139.

The standards 16 and 17 may be provided with top plates 142 (Figures 3 and 4) in which are threaded set bolts 143 to engage the upper bearings 130 and 135 to limit the upward movement thereof. Lock nuts 144 may be provided for locking the set bolts 143.

The detailed construction of both the picker and separator rolls is disclosed in application, Serial No. 118,636, filed June 26, 1926 by the present inventor and it is not necessary to repeat the detailed disclosure here.

For the sake of efficiency and economy a plurality of products may be formed across the length of the rolls, each product being one of its particular line. Any number of lines of products may be formed, depending

on the size of the products and the width of the paper board.

Supported on the rear end of the bed rails 1 and 2 by suitable means (not shown) is the reel G of paper board from which the products are made. The frame members may have suitable devices including guide slots formed therein for the support of transfer gears, the structure and function of these devices being explained hereinafter more in detail.

As the paper web indicated by the heavy dot-and-dash line in Fig. 2 leaves the storage roll G, it engages a reverse-bending roll H mounted in the guides 44, this roll having for its purpose the bending of the paper board in a direction opposite to that in which it was bent while stored on the storage roll. From the reverse-bending roll it enters between the printing rolls A for printing the first color; thence between the second printing rolls B for printing a second color; thence between auxiliary or advance rolls F having annular knives (not shown) for making scores and cuts which extend throughout the entire length of the blank; thence between die rolls C on which are mounted the cleats or knives (not shown) for making all the remaining cuts or scores; thence between the picker rolls D where all the small waste particles are picked out and discarded, these particles otherwise interfering with the proper operation of the machine; thence to the separator rolls E where the products are separated one from the other, and thence to delivery mechanism (not shown).

To prevent waste of the paper board, the number of products impressed by a single complete revolution of the printing and die rolls must be an integral number. Therefore, for different size products different size printing and die rolls must be used. In order to take care of the different size rolls which are used for the different jobs, adjusting mechanism must be provided.

The mechanism for supporting and adjusting the printing and die rolls will first be described. These mechanisms are substantially identical, so the mechanism used with the pair of printing rolls A will be described in detail, this description applying to the other pair of printing rolls and to the die rolls.

Referring now to Figs. 5 and 6, a pair of upper bearings 47 for the upper roll 18 and a pair of lower bearings 48 for the lower roll 19 may be disposed in a pair of oppositely disposed guideways 49 in the standards 12. The lower bearing 48 which is made up of a lower bearing block 50 and an upper bearing block 51 having channeled sides to provide ears 52 is slidably mounted in the guideways. A spacing member 53 may be provided between the lower end of the guideway and the lower bearing block to elevate the lower roll 19 to

the desired position, it being understood that for different size rolls different size spacing blocks are provided. It will be noted that the upper bearing block is substantially identical in construction with the lower bearing block. Resting upon the upper bearing block 51 may be an adjusting block 54 having projections 55 fitting in the holes in the block. This adjusting block has an opening in which may be disposed a rod 56 suitably threaded. The rod 56 has a keyway 64 in which is disposed a key secured to the block 54, this construction allowing relative longitudinal movement but no relative rotary movement between the rod 56 and block 54. Threaded on the rod 56 may be a nut 57 having a notched collar 58. A clamping plate 59 may be bolted to the adjusting block 54, having projections engaging the notched collar 58 to hold the nut 57 in adjusted position. The upper bearing 47 is similar in construction with the lower bearing 48, the difference being in that the shaft 60 is larger than shaft 61 and the bearing has a lining 62 of bearing metal. Suitably bolted to the top of the standard 12 may be a top plate 63 in which may be disposed a set bolt 66 engaging the upper half of the top bearing 47 to rigidly hold the bearings in adjusted position. A lock nut 67 may be provided for locking the set bolt.

It will be understood that the distance between the upper and lower bearings may be adjusted to take care of different size rolls and gears by rotating the adjusting nut 57 and the elevation of the point of contact of the upper and lower rolls may be adjusted by means of the different size spacers 53.

Since the different jobs generally require different size rolls with different size gears, in order that the transfer gears may be made to mesh with the different size roll gears, they must be mounted so as to be adjusted.

Referring now to Figs. 3, 4 and 7, the upper frame members 5 and 6 are provided with vertically extending guideways 70. In each guideway a bearing 71 is mounted, each bearing having a channel in its side face to provide ears 73 so that the bearing may slide vertically in the guideway but is prevented from moving axially. Disposed in each pair of bearings is a shaft 74 extending the entire width of the machine, on which shaft is mounted a transfer gear 75 or 76. The transfer gears are located on the drive pulley side of the machine and overhang the frame. A collar 72 may be rigidly secured to the shaft 74 on the other side of the bearing from the gear to hold the shaft in fixed axial position.

In order to elevate the transfer gears 75 and 76 and bearings, under each bearing an elevating mechanism is provided. Since each elevating mechanism is identical with the others, it will be sufficient that one elevating mechanism only be described in detail.

Under each bearing 71 the lower frame member 3 or 4 and upper frame member 5 or 6 are provided with alining holes 78 and 79 in which is disposed a threaded rod member 82 whose upper end abuts the bearing 71. The rod member 82 has a keyway 81 in which is disposed a key secured to the frame, this construction allowing relative longitudinal movement but no relative rotary movement between the rod member 82 and the frame. In the lower frame member near the upper part thereof is a transverse hole 83 in which is disposed a worm wheel 84 having threaded engagement with the elevating rod 82. Disposed over the transverse hole 83 on each side of the lower frame member is a cover plate 85 suitably bolted to the frame member. Journalled in both the inner and outer cover plates is a control shaft 86 which extends the entire width of the machine and has a worm 87 thereon engaging with the worm wheel 84.

This shaft has a second worm 88 on the other side of the machine for engaging the worm wheel of the elevating mechanism for the other bearing of the pair. The end of this shaft may be provided with a suitably non-circular portion adapted to have fitted thereon a crank 89. It will be appreciated that on rotation of the control shaft 86 by the crank 89, the elevating rods 82 under a pair of bearings may be elevated or lowered together to cause the transfer gear 75 or 76 to have proper meshing relation with the gears on the impression rolls.

The reverse-bending roll H is adjustably mounted and is controlled by similar mechanism in exactly the same manner as the transfer gears 75 and 76, so the description of this mechanism is not necessary. The gear 90 on the reverse-bending roll and the transfer gears 75 and 76 are on the drive pulley side of the machine, transfer gear 76 meshing with die roll gear 30 and printing roll gear 24, transfer gear 75 meshing with printing roll gears 23 and 24, and reverse-bending roll gear 90 meshing with printing roll gear 23.

In order to take care of the different number of waste pieces per product in the different jobs and for the different number of products per roll and the different size rolls, it will be appreciated that different size picker rolls D may have to be used for the different jobs since the picker rolls must make one complete revolution for each waste piece picked per line of products. In order to provide a driving relation for different size gears on the lower die roll and on the lower picker roll, a transfer gear 94 is provided which is adjustably mounted with respect to the lower die roll gear 32 and the lower picker roll gear 37 on the side opposite the drive pulley.

Referring now to Figs. 10 and 11, the transfer gear 94 is mounted upon a bracket member 95 which in general is T-shaped, the upper horizontal portion having a slot 96 and the

lower vertical portion also having a slot 97. Guide ears 98 are provided upon the shelf 7 and a bolt 99 is fixed securely to the shelf to guide and to adjustably clamp the bracket member 95. Adjustably mounted in the horizontal slot 96 is a stud shaft 100 having a clamping nut on the end thereof, the stud shaft rotatably supporting transfer gear 94. It will be appreciated that from this construction the transfer gear may be adjusted to the position shown in Fig. 10, which position it will have when a large driving die gear is used, or the position in Fig. 11 when a small driving die gear is used.

Since it is preferably in a machine of this type that the paper board web always travels at the same linear velocity irrespective of the particular job and since the separator rolls E rotate always slightly faster than this velocity in order to cause separation of the products, it follows that the speed of the separator rolls must be maintained constant irrespective of the particular job. This condition is inherently obtained since the separator rolls are driven by a direct chain of gears from the drive pulley 25. However, in order to take care of the different size gears 30 used on the lower die roll on the drive pulley side for the different jobs, an adjustably mounted transfer gear 103 on the drive pulley side is used, the construction of the adjustable mounting being illustrated in detail in Figs. 8 and 9. This construction is very similar to the construction shown in Figs. 10 and 11 for adjustably mounting the transfer gear for driving the picker rolls. It is sufficient to say that the transfer gear 103 is adjustable horizontally in the slot 104 in the adjustable bracket 105 and the bracket is adjustable vertically in the guides 106 on the shelf 8. Transfer gear 76 meshes with lower die roll gear 30 and the lower outer separator roll gear 41.

Since the auxiliary rolls F are driven from the gear 31 on the upper die roll on the side opposite the drive pulley and since different size gears and die rolls may be used for different jobs, a construction (Figs. 14 and 15) must be provided whereby the transfer gear 107 is adapted to engage different size gears. In the brackets 33 which support the advance rolls F a slot 108 is provided in which is disposed a stud shaft 109 which may be clamped in any desired position. On the shaft 109 the transfer gear 107 is rotatably mounted. This slot 108 is concentric with the centre of the upper shaft of the advance rolls, allowing the transfer gear 107 to be moved about this centre into engagement with the upper gear 31 on the die rolls no matter what the size of the gear 31 may be.

The driving pulley 25 which drives the various operating mechanisms is mounted to drive the first transfer gear 76 directly, and since the transfer gear 76 is adjustable ver-

tically, mechanism must be provided whereby the driving pulley 25 is adjustable to take care of the different positions of the transfer gear for the different jobs. Referring now to Figs. 3, 4, 12 and 13, the frame may be provided with horizontally extending guide-ways 112 on each side in which may be mounted crossheads 113 having rack teeth 114. Engaging with the rack teeth may be driving pinions 115 mounted upon a control shaft 116 extending from one side to the other. By rotating this shaft by a suitable crank (not shown) the crossheads 113 may be moved horizontally to the desired position. Journaled in the crossheads 113 and extending across the machine is a drive shaft 117 on which is mounted a drive gear 118 engaging with the transfer gear 76 and having on the outside thereof the pulley 25 over which a belt 119 is mounted having driving connection with the driving motor (not shown).

Thus it will be seen that different size rolls and different size gears may be easily removed and installed as required by the different jobs. All the transfer gears are easily adjustable into meshing relation with the other gears so that the machine can be taken down or set up for a new job very easily. It is within the contemplation of the invention to have in stock a number of different size printing rolls, die rolls and picker rolls, the sizes varying by predetermined increments. Each roll will have a gear accompanying it, the gear being of the same size as the roll. When a given job is to be set up, the proper rolls will be selected to maintain the condition of an integral number of products around the periphery of the printing and die rolls.

To set the machine up for a new job, new rolls may be placed in position with the same bearing blocks being used for all the various size rolls, or different bearing blocks may be used for different rolls. It is preferable, however, to provide the different size rolls with the same size shafts so that the same bearing blocks may be used in all cases. The distance between the printing and die rolls will be adjusted by means of the adjusting mechanism to its proper value and the proper size spacing members will be selected to elevate the contacting surfaces of the rolls to the proper height. Similarly, if different size picker rolls are used the proper spacing member will be selected to separate the picker rolls the proper distance, and the proper size spacing member will be selected to elevate the contacting surfaces to the proper height. After the rolls are in position with the proper size gears on the shafts, the transfer gears may be moved into meshing relation and held in such position.

It will be understood that the proper impression surfaces or plates will be placed upon the printing rolls for the particular job before the rolls are put in position. Also the

proper arrangement of cutting and creasing cleats or knives will be placed upon the die rolls before the die rolls are put into position.

It will be seen that all the operations necessary to form the blank web of paper board into a finished product are performed in quick succession. Any number of lines of products may be formed simultaneously.

It would be understood that the gearing connecting the several rolls and other mechanisms will be so arranged and adjusting devices (not shown) will be provided so that the several operations will be properly synchronized and the impressions made by the printing mechanisms, the impressions made by the advance rolls, the die rolls and picker rolls will properly register with each other.

While I have shown and described and have pointed out in the annexed claims certain novel features of the invention, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In a straight line paper products making machine, a frame having a plurality of pairs of standards, each standard having a vertical guideway, a bearing for an upper roll and a bearing for a lower roll disposed in each guideway, devices for adjusting the distance between upper and lower bearings to take care of different size rolls and gears, said frame having second pairs of guideways, between said standards, a bearing in each second guideway, a shaft with a transfer gear in each pair of second bearings, said transfer gears being adapted to mesh with gears of different sizes on the rolls, and devices for adjusting said second bearings.

2. In a paper products making machine, a frame having a plurality of pairs of vertical guideways, a bearing for an upper roll and a bearing for a lower roll disposed in each guideway, devices for adjusting the distance between upper and lower bearings to take care of different size rolls and gears, said frame having second guideways between said first guideways, a bearing in each second guideway, a shaft with a transfer gear in each second bearing, said transfer gears being adapted to mesh with gears of different sizes on the rolls, and devices for adjusting said second bearings.

3. In a straight line paper products machine, a frame having a plurality of pairs of guideways, a bearing for an upper roll and a bearing for a lower roll in each guideway, devices for adjusting the positions of said bearings in said guideways to take care of different size rolls and gears, a second guideway between said first guideways, an adjustable bearing in said guideway and having a

shaft and transfer gear to mesh with said first gears, a third guideway extending toward said second guideway, a bearing adjustably mounted in said third guideway, said bearing having a shaft, a gear meshing with said transfer gear and a driving device on said shaft.

4. In a straight line paper products machine, a frame having a plurality of pairs of guideways, a bearing for an upper roll and a bearing for a lower roll in each guideway, devices for adjusting the positions of said bearings in said guideways to take care of different size rolls and gears, a second guideway between said first guideways, an adjustable bearing in said guideway and having a shaft and transfer gear to mesh with said first gears.

5. In a paper products making machine, a frame, a plurality of separate operating mechanisms having driven devices, a source of power having a driving device, a plurality of transfer devices between said driving and driven devices, means for adjusting and replacing said operating mechanisms and their driven devices for different jobs, and means for adjusting said driving device and transfer devices with respect to said driven devices for different jobs.

6. In a paper products making machine, a frame, a plurality of separate operating mechanisms having driven devices, a source of power having a driving device, a plurality of transfer devices between said driving and driven devices, means for adjusting and replacing said operating mechanisms and their driven devices with operating mechanisms and driven devices of different size for different jobs, and means for adjusting said driving device and transfer devices with respect to said driven devices for different jobs.

7. In a paper products making machine of the straight line type, a frame, a plurality of printing mechanisms having driven devices, a scoring and cutting mechanism having a driven device, a source of power having a driving device, a plurality of transfer devices between said driving and driven devices, means for adjusting and replacing said printing mechanisms and said scoring and cutting mechanism and their driven devices with printing mechanisms, cutting and scoring mechanisms and driven devices of different size for different jobs, and means for adjusting said transfer devices with respect to said driven and driving devices for different jobs, said mechanisms being arranged in a straight line.

8. In a paper products making machine, a frame, a plurality of printing mechanisms having driven devices, a scoring and cutting mechanism having a driven device, a source of power having a driving device, a plurality of transfer devices between said driving and driven devices, means for adjusting and re-

placing said printing mechanisms and said scoring and cutting mechanism and their driven devices for different jobs, and means for adjusting said transfer devices with respect to said driven and driving devices for different jobs.

9. In a paper products making machine of the straight line type, a frame, a plurality of printing mechanisms having driven devices, a scoring and cutting mechanism having a driven device, a source of power having a driving device, means for adjusting and replacing said printing mechanisms and said scoring and cutting mechanism and their driven devices for different jobs, and means for adjusting said driving device for different jobs.

10. In a paper products making machine, a frame including a side member, operating mechanisms including a driven gear whose pitch circle may change position for different jobs, said driven gear being disposed on the outer side of said side member, said side member having a guideway extending toward said gear, a crosshead in said guideway having rack teeth and a bearing, a drive shaft in said bearing having a driving gear for driving said driven gear, a control shaft journaled in said side member and having a pinion meshing said rack teeth.

11. In combination with a paper products making machine, a frame having spaced side members, operating mechanism including a driven gear whose pitch circle may change position for different jobs, said driven gear being disposed on the outer side of one of said side members, each side member having a guideway extending toward the axis of said gear, a crosshead in each guideway having rack teeth and a bearing, a drive shaft in said bearings having a driving gear for driving said driven gear, a control shaft journaled in said side members and having pinions, one meshing the rack teeth on each crosshead.

12. In a paper products making machine, a frame having spaced side members, operating mechanism including a driven gear whose pitch circle may change position for different jobs, a shaft for said driven gear having bearing in both side members, said driven gear being disposed on the outer side of one of said side members, each side member having a guideway extending toward the axis of said gear, a bearing in each guideway, a drive shaft in said bearings having a driving gear for driving said driven gear, and means for adjusting said bearings to meet the requirements of different jobs.

13. A paper products machine comprising a frame, an impression mechanism mounted on said frame and having a gear, separator mechanism mounted on said frame and having a gear, a transfer gear meshing said first gears, and means for adjustably mounting said transfer gear.

14. A paper products machine comprising a frame, an impression mechanism mounted on said frame and having a gear, picker mechanism mounted on said frame and having a gear, a transfer gear meshing said first gears, and means for adjustably mounting said transfer gear.

15. In a paper products making machine, a frame having spaced side members, die rolls journaled in said side members and having a driving gear, picker rolls journaled in said side member and having a driven gear, a vertical guideway on one of said frame members, a bracket member slideable in said guideway and having a slot, a clamping device on said frame member engaging in said slot, said bracket having an upper horizontal slot, a stud shaft having a clamping device for adjustable mounting in said horizontal slot, said shaft having a transfer gear for meshing said driving and driven gears.

16. In a paper products making machine, a frame, operating mechanism journaled in said frame and including spaced gears one or both of whose pitch circles may change for different jobs, a vertical guideway on said frame, a bracket member slideable in said guideway and having a slot, a clamping device on said frame member engaging in said slot, said bracket having an upper horizontal slot, a stud shaft having a clamping device for adjustable mounting in said horizontal slot, said shaft having a transfer gear for meshing said spaced gears.

17. A paper products making machine comprising spaced frame members, impression rolls mounted on said frame members, one of said rolls having a driving gear, separator rolls mounted on said frame members, one of said separator rolls having a driven gear, a transfer gear meshing said driving and driven gears, and means for adjustably mounting said transfer gear.

18. A paper products making machine comprising spaced frame members, impression rolls mounted on said frame members, one of said rolls having a driving gear, picker rolls mounted on said frame members, one of said picker rolls having a driven gear, a transfer gear meshing said driving and driven gears, and means for adjustably mounting said transfer gear.

19. In a paper products making machine, a frame, operating mechanisms having driving gears, said frame having a guideway, a transfer gear meshing said driving gears and having a bearing slideable on said guideway, means for adjusting the position of said transfer gear so as to mesh with different size driving gears used on different jobs, said means including a threaded rod engaging said bearing and a nut threaded on said rod.

20. In a paper products making machine, a frame, a pair of upper and lower cutting and creasing die rolls, means for adjustably and

replaceably mounting said die rolls in said frame, a pair of upper and lower cutting and creasing wheel rolls mounted on said frame, a transfer gear, and means for adjustably mounting said transfer gear so that it may mesh with different gears on said die rolls and wheel rolls.

21. In a paper products making machine, a frame having a pair of guideways, a pair of upper bearings and a pair of lower bearings in said guideways, devices for adjustably fixing the positions of said bearings in said guideways, upper and lower cutting and creasing die rolls having shafts in said bearings and a pair of meshing gears on said shafts on a given side, said frame having second upper and lower bearings, advance cutting and creasing rolls journaled in said last bearings and having meshing gears on said side, said frame having a guide slot, a transfer gear having a shaft adjustably mounted in said slot so that said transfer gear may mesh with any size gear on said upper die roll and with the upper advance roll gear.

22. In a paper products making machine, a frame having a pair of standards, each standard having a guideway therein, a pair of upper bearings and a pair of lower bearings in said guideways, devices for adjustably fixing the positions of said bearings in said guideways, upper and lower die rolls having shafts in said bearings and a pair of meshing gears on said shafts on a given side, a bracket on each standard having upper and lower bearings, advance rolls journaled in said last bearings and having meshing gears on said given side, one of said brackets having a guide slot concentric with the upper advance roll shaft, a transfer gear having a shaft adjustably mounted in said slot so that said transfer gear may mesh with any size gear on said upper die roll and with the upper advance roll gear.

23. In a paper products making machine, a frame having a pair of guideways, a pair of upper bearings and a pair of lower bearings in said guideways, devices for adjustably fixing the positions of said bearings in said guideways, die rolls having shafts in said bearing and a pair of gears on said shafts, a bracket on each standard having upper and lower bearings, advance rolls journaled in said last bearings and having gears meshing each other on one side, a gear on the upper advance roll on the other side, one of said brackets having a guide slot, a transfer gear having a shaft adjustably mounted in said slot, said transfer gear meshing with said upper gears.

24. In a paper products machine of the straight line type, a frame having spaced side members, said side members having a plurality of pairs of standards, each standard having a guideway, an upper bearing and a

lower bearing in each guideway, means for easily removing and for adjusting the position of said bearings, one or more pairs of said guideways being for printing rolls, a pair of said guideways for cutting and scoring rolls, a pair of said guideways for separating rolls and a pair of said guideways for picker rolls, said side members having second guideways between the printing and die rolls, a first transfer gear having means for adjustable mounting in each of said second guideways for meshing different size lower gears on different size printing and die rolls, a second transfer gear having adjustable mounting on one side member for meshing different size lower gears of the different size cutting and scoring rolls and a lower gear of the picker rolls, a third transfer gear having adjustable mounting on the other side member for meshing different size lower gears of the cutting and scoring rolls and a lower gear of the separator rolls, a driving gear having adjustable mounting for meshing relation with one of said first transfer gears.

25. In a paper products machine of the straight line type, a frame having spaced side members, said side members having a plurality of pairs of guideways, an upper bearing and a lower bearing in each guideway, means for easily removing and for adjusting the position of said bearings, one or more pairs of said guideways being for printing rolls, a pair of said guideways for cutting and scoring rolls, a pair of said guideways for separator rolls and a pair of said guideways for picker rolls, said side member having second guideways between the printing and die rolls, a first transfer gear having means for adjustable mounting in each of said second guideways for meshing different size gears on different size printing and die rolls, a second transfer gear having adjustable mounting on one side member for meshing different size gears of the different size cutting and scoring rolls and a gear of the picker rolls, a third transfer gear having adjustable mounting on the other side member for meshing different size gears of the cutting and scoring rolls and a gear of the separator rolls, a driving gear having adjustable mounting for driving relation with said gears.

26. In a paper products machine of the straight line type, a frame having spaced side members, said side members having a plurality of pairs of standards, each standard having a guideway, an upper bearing and a lower bearing in each guideway, means for easily removing and for adjusting the position of said bearings, a pair of said guideways being for cutting and scoring rolls, a pair of said guideways for separator rolls and a pair of said guideways for picker rolls, a transfer gear having adjustable mounting on one side member for meshing different size lower gears of the different

size cutting and scoring rolls and a lower gear of the picker rolls, a second transfer gear having adjustable mounting on the other side member for meshing different size lower gears of the cutting and scoring rolls and a lower gear of the separator rolls, a driving gear having adjustable mounting for driving relation with said gears.

27. In a paper products machine of the straight line type, a frame having spaced side members, said side members having a plurality of pairs of guideways, an upper bearing and a lower bearing in each guideway, means for easily removing and for adjusting the position of said bearings, a pair of said guideways being for cutting and scoring rolls, a pair of said guideways for separator rolls and a pair of said guideways for picker rolls, a transfer gear having adjustable mounting on one side member for meshing different size gears of the different size cutting and scoring rolls and a gear of the picker rolls, a third transfer gear having adjustable mounting on the other side member for meshing different size gears of the cutting and scoring rolls and a gear of the separator rolls, a driving gear having adjustable mounting for driving relation with said gears.

28. In a box blank machine, a frame, a printing mechanism having a driven device and a cutting and scoring mechanism having a driven device all mounted on said frame, means for replacing said mechanisms and driven devices with mechanisms and driven devices of different size for different jobs, a source of power having a driving device, and means for placing said driving device in driving relation with said different size of driven devices.

29. In a box blank machine of the straight line type, a frame, a pair of printing rolls having a pair of meshing gears, a pair of cutting and scoring die rolls having a pair of meshing gears, said pairs of rolls being arranged in a straight line, means for removably mounting said rolls and gears on said frame and for replacing said rolls and gears with rolls and gears of different size for different jobs, each gear being the same size as its roll, a web of material passing between the rolls of each pair, driving gears, means for adjustably mounting said driving gears to mesh said different size printing and die gears.

In testimony whereof I have hereunto set my hand.

LOUIS PUTNAM WILLSEA.