C. H. PETTIGREW.

FOLDER.

APPLICATION FILED APR. 28, 1909.

953,286. Patented Mar. 29, 1910.

4 SHEETS—SHEET 1

Fig. 1.

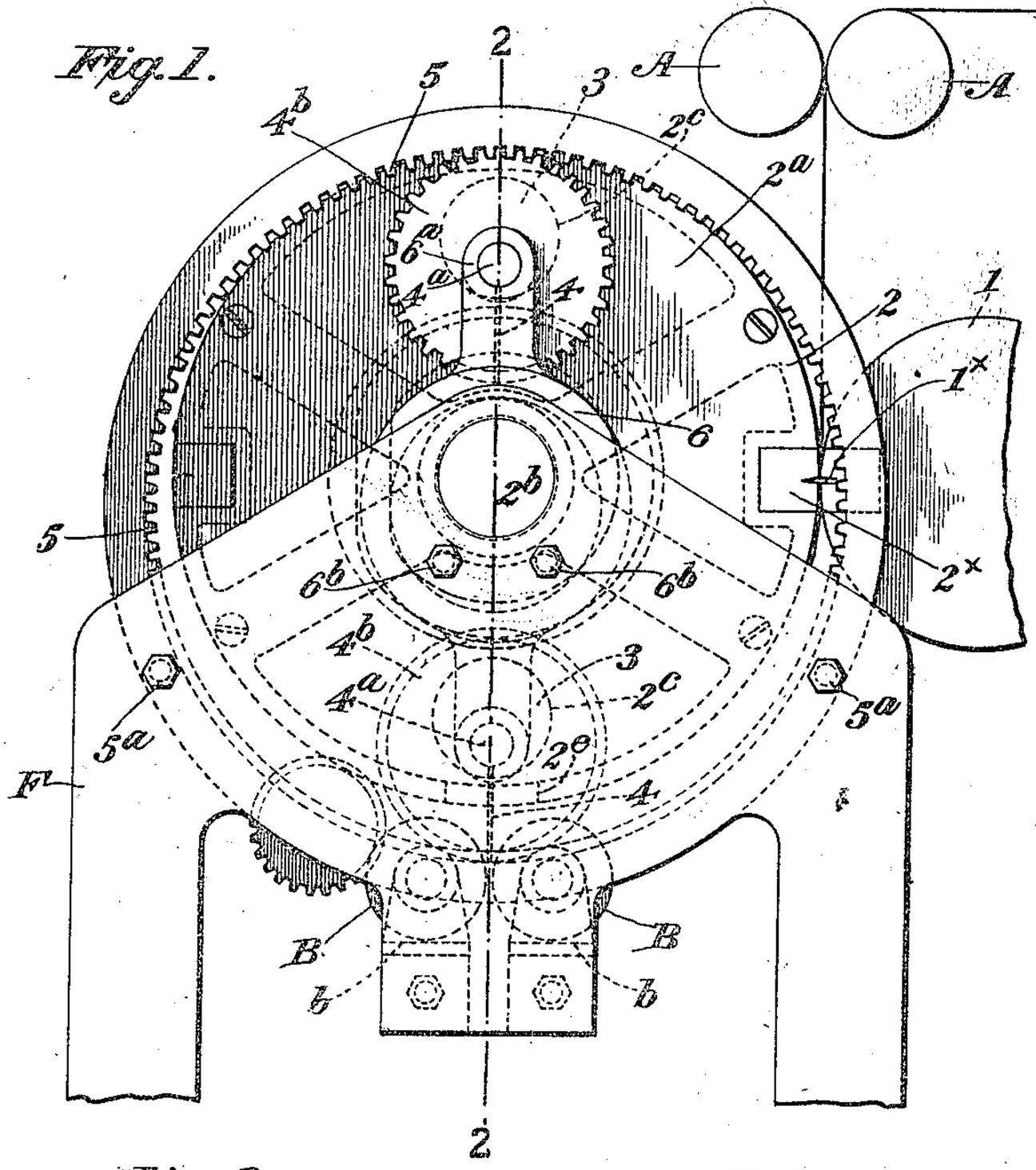


Fig. 3.

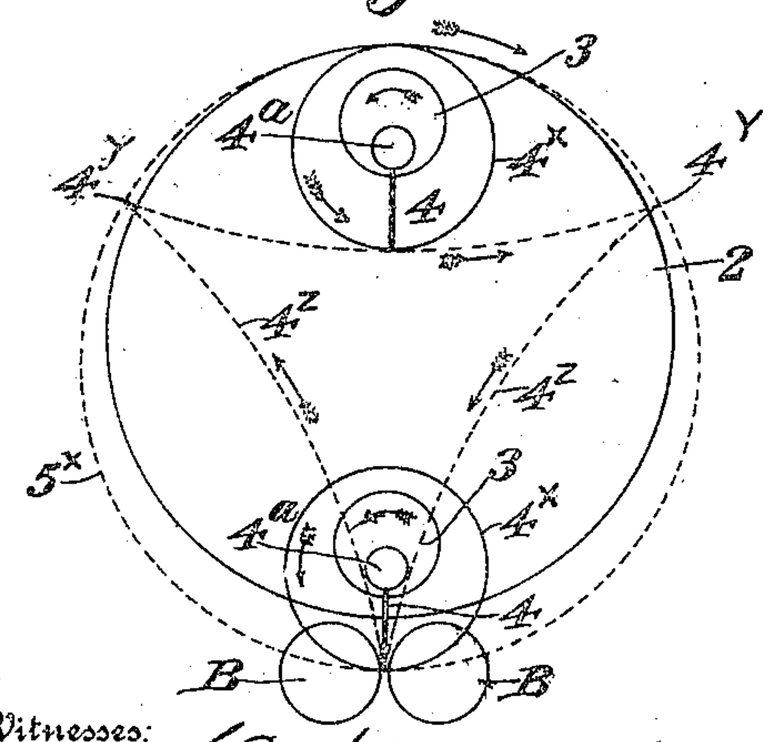
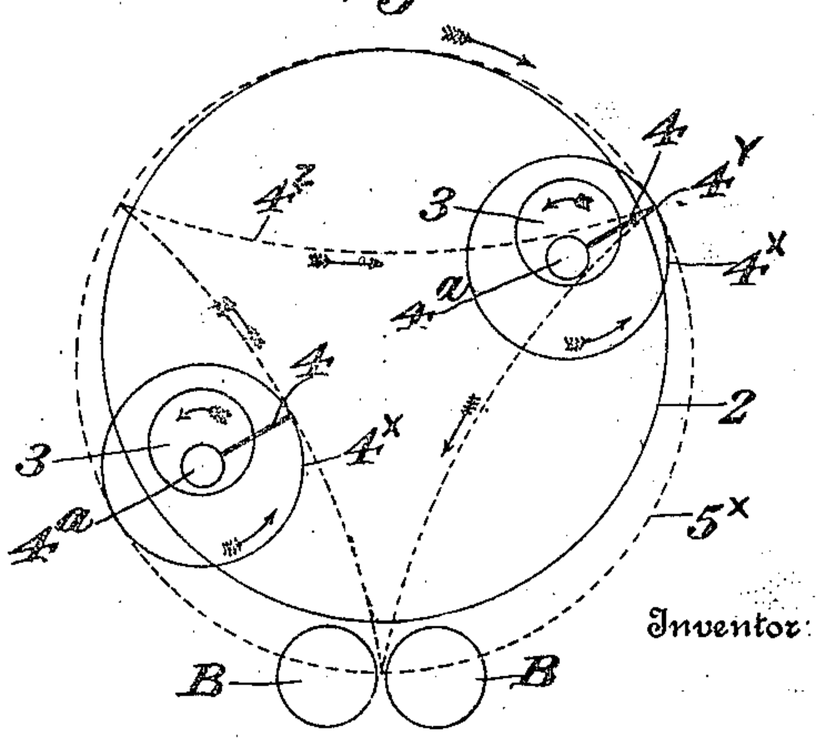


Fig. 4.



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4 SHEETS—SHEET 2.

Fig. 2.

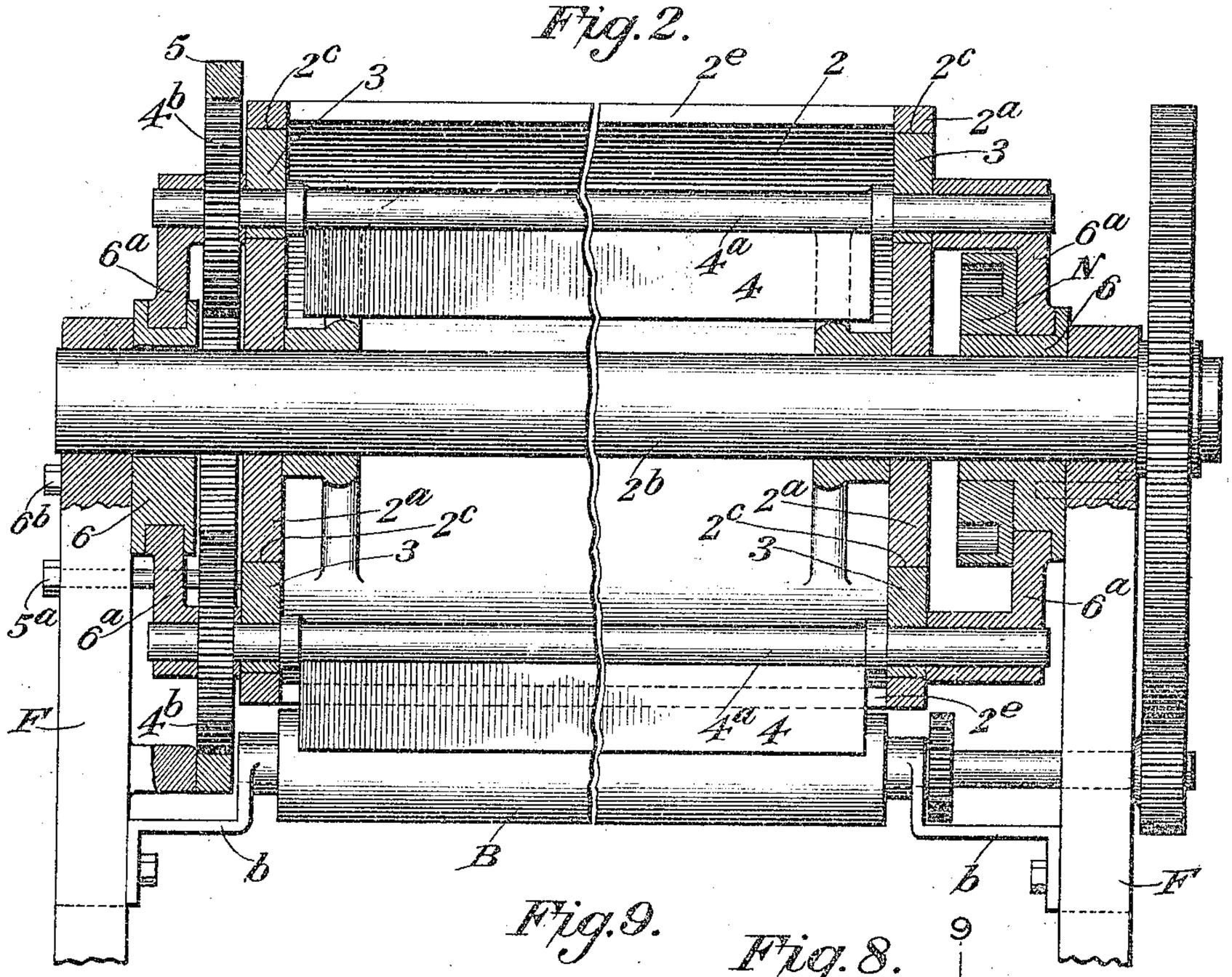


Fig. 9.

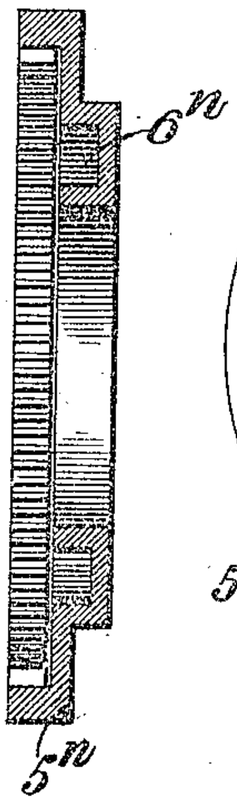


Fig. 8.

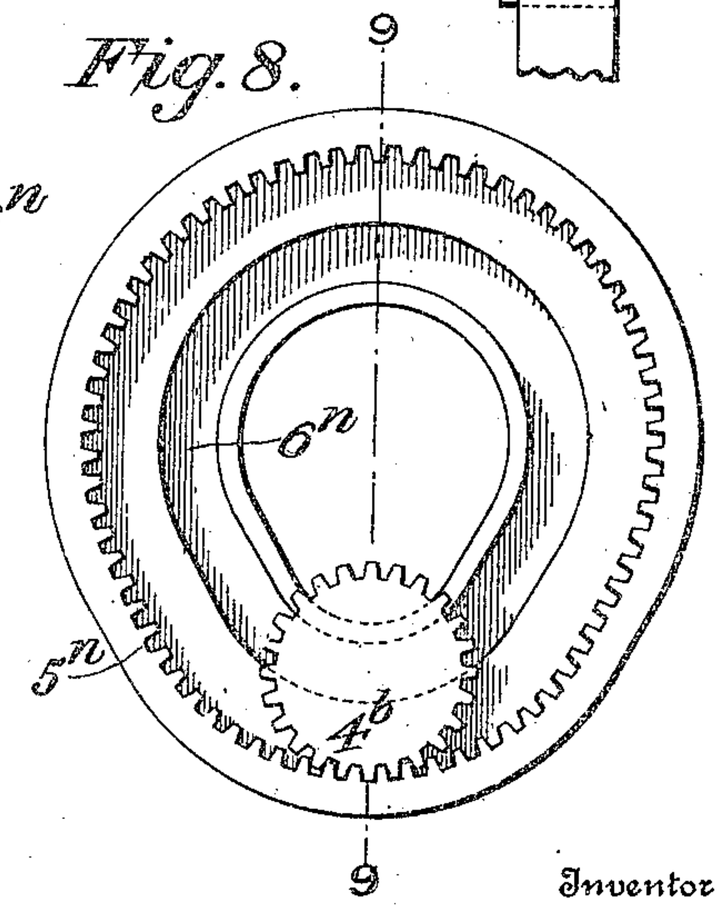
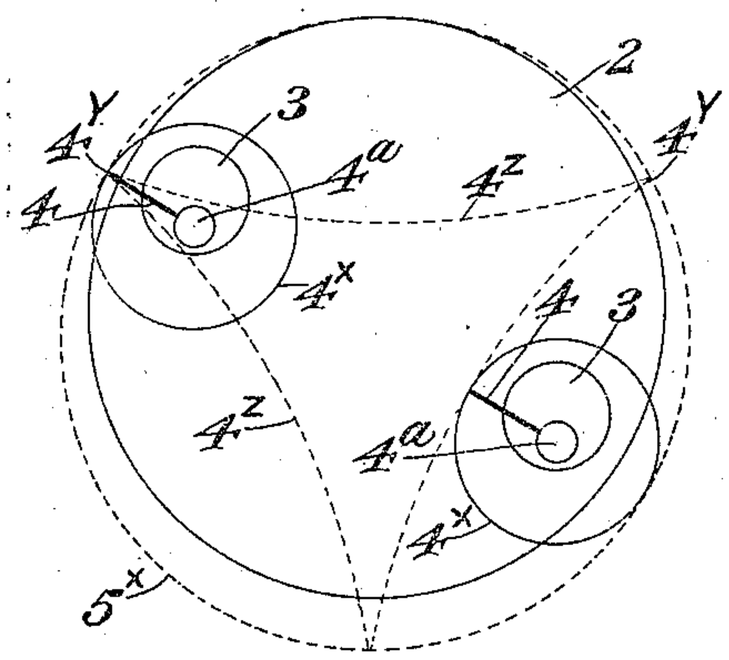


Fig. 5.



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4 SHEETS—SHEET 3.

Fig. 6

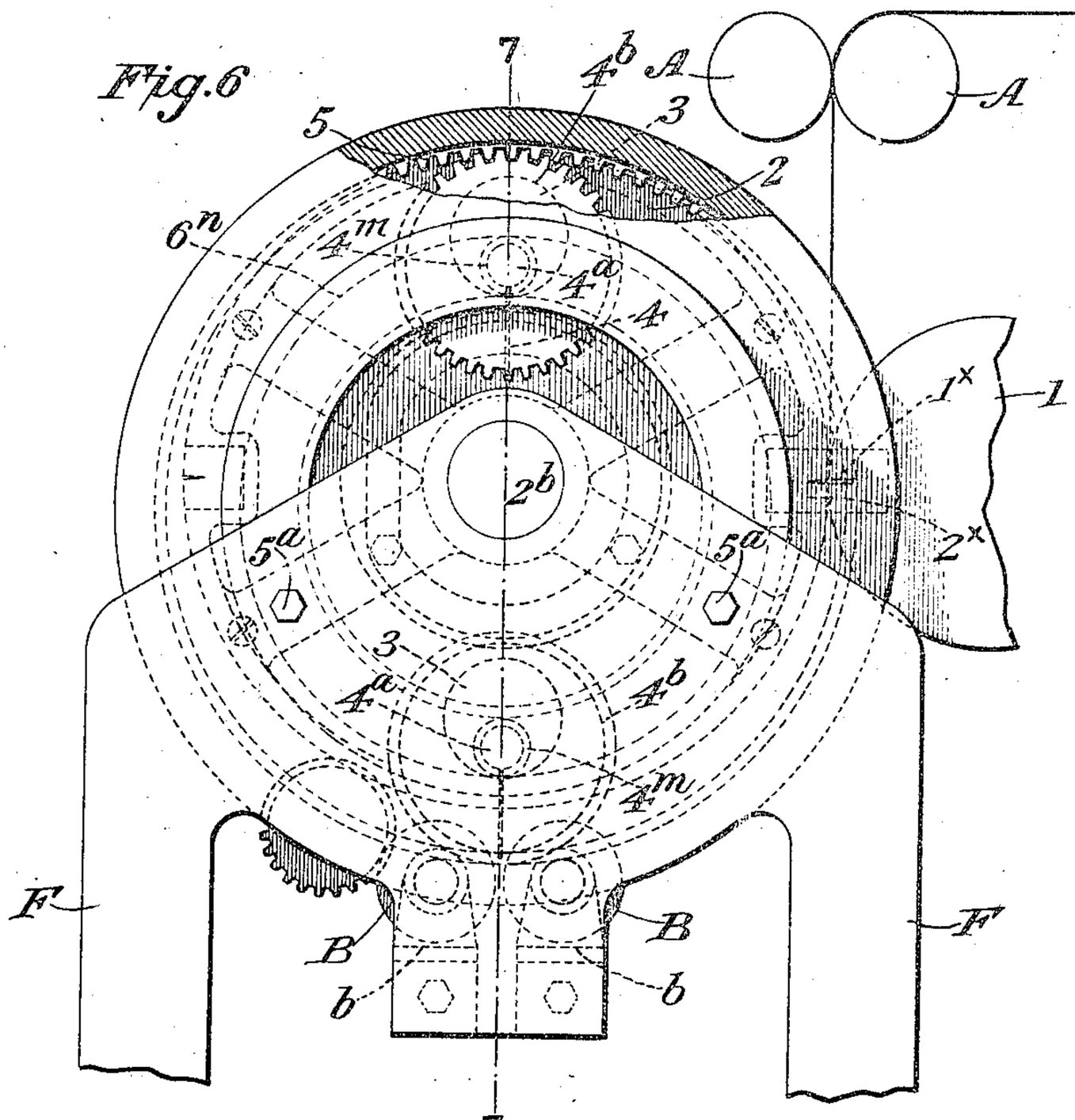


Fig. 10.

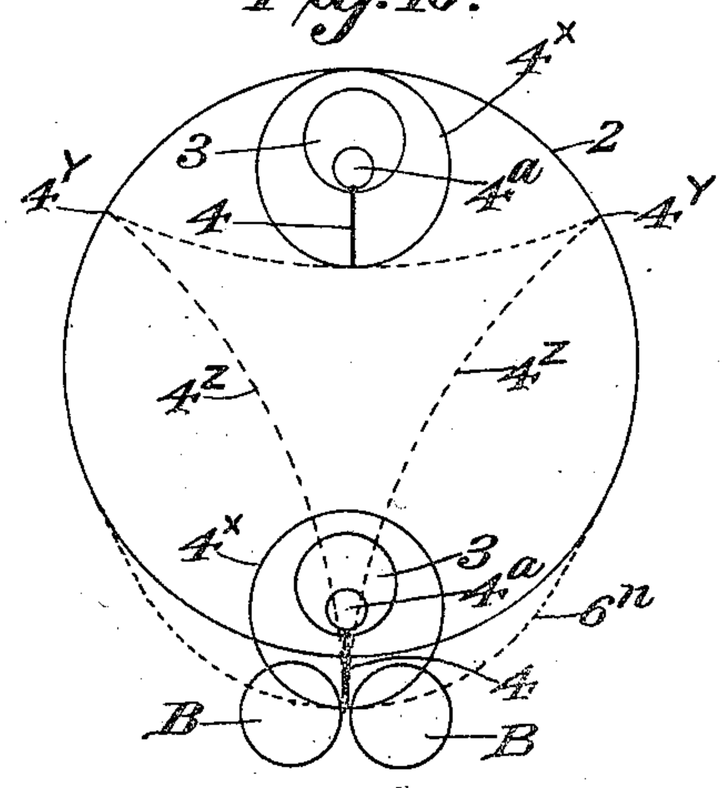
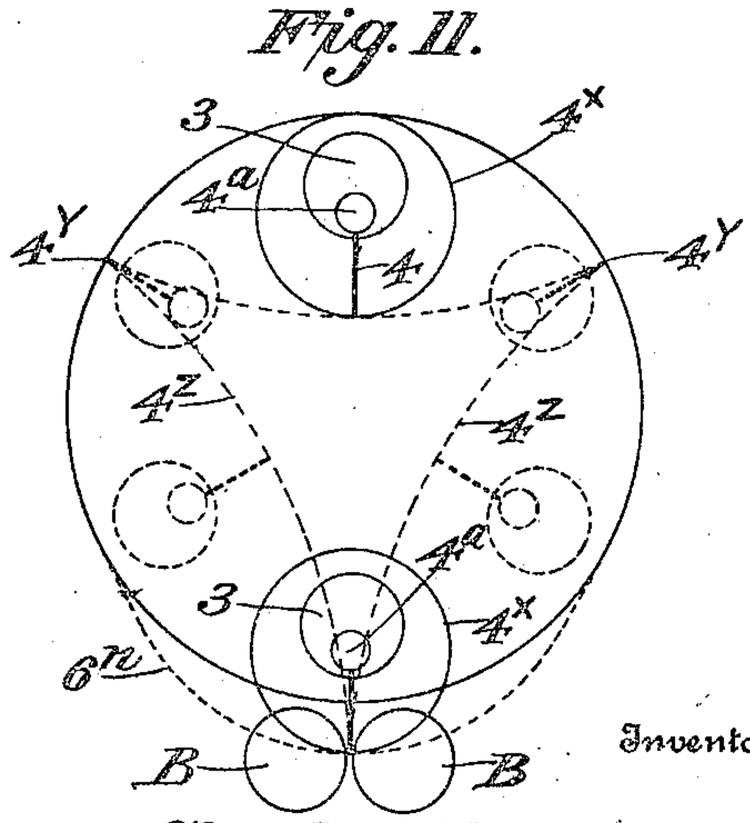


Fig. 11.



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4 SHEETS—SHEET 4.

Fig. 7.

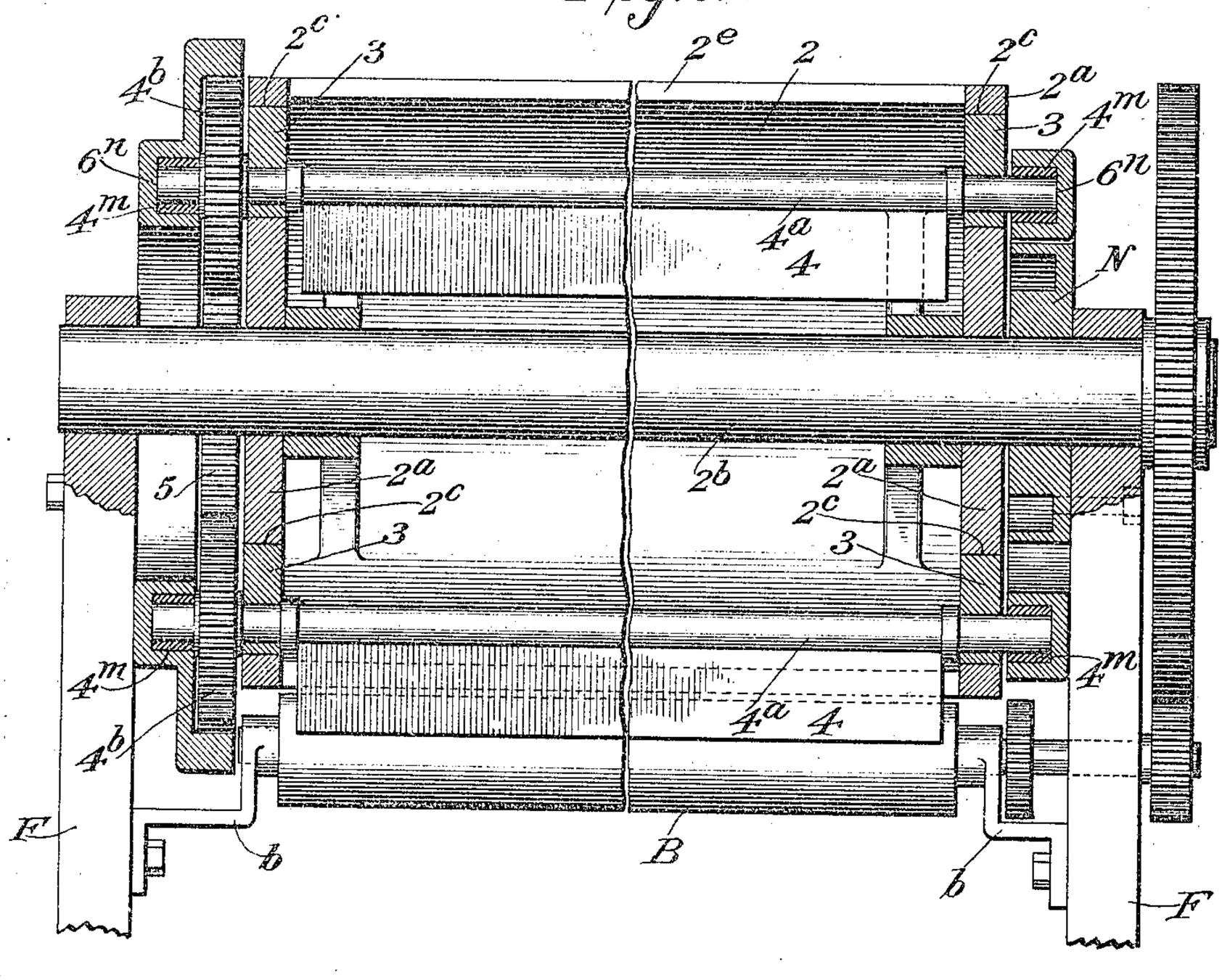


Fig. 12.

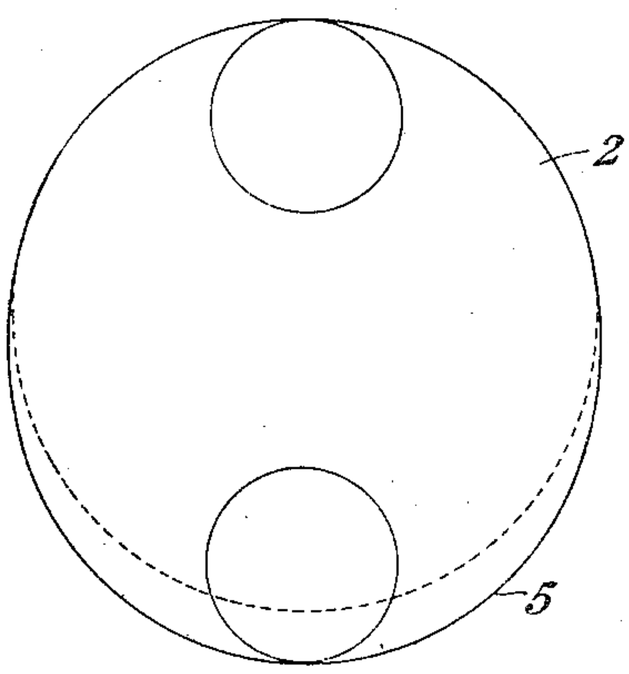
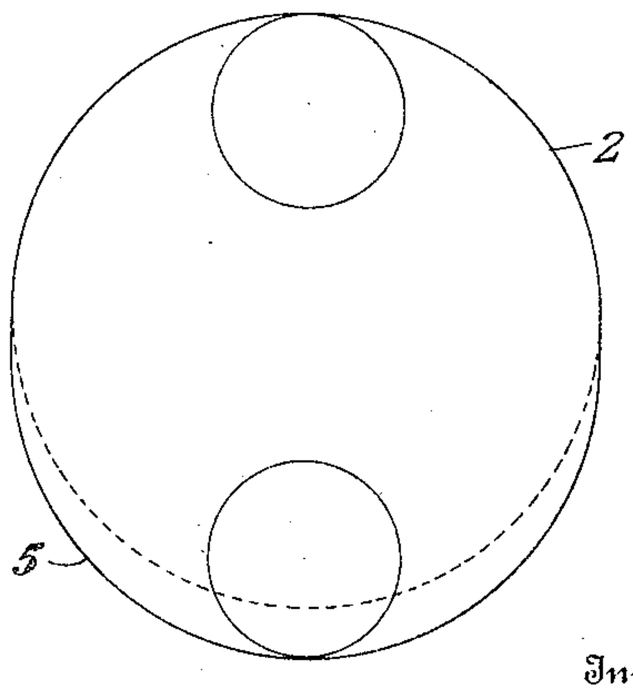


Fig. 13.



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953,286. Specification of Letters Patent. Patented Mar. 29, 1910.

Application filed April 28, 1909. Serial No. 492,688.

To all whom it may concern:

Be it known that I, CHARLES H. PETTIGREW, of Battle Creek, in the county of Calhoun and State of Michigan, have invented certain new and useful Improvements in Folders; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improvement in mechanism for folding newspapers, and is especially designed for use in connection with high speed rotary web-printing newspaper presses; and its object is to provide novel tucking devices for the rotary folding cylinders of such folding mechanisms so that they may be operated at a much higher speed than is considered practicable with the ordinary rotary-folding mechanism, in which the tucker-blades are operated by tumblers.

The present invention in brief consists in journaling the tucker-blade shafts in rotatable eccentric supports within the folding cylinder, and rotating the tucker-blades continuously on their axes, in a direction contrary to the direction of rotation of the cylinder, and also rotating the supports in such time relative to the rotation of the cylinder that as a resultant of the orbital movement of the tucker-blade shafts with the cylinder,—the axial rotation of these blades on their own shafts,—and the radial movement of the tucker-blade shafts caused by the rotation of their eccentric bearings—the edges of the tucker-blades will be moved to and from the first fold rolls and tuck the paper therebetween in a comparatively easy and gentle manner as compared with the action of tumbling tucker-blades, and without any sudden jar or reversal of movement of any part so that such improved folding apparatus is capable of operating at very high speed without injurious pounding.

In the accompanying drawings I have shown several practical embodiments of the invention, and will now describe the same and summarize in the claims following this description the essential features, combinations and constructions of parts for which protection is desired.

In said drawings—Figure 1 is an end view of a portion of a rotary folding mechanism, equipped with my invention. Fig. 2 is a longitudinal section thereof on line 2—2, Fig. 1. Figs. 3, 4 and 5 are diagrams illustrating the action of the tucker-blades in the construction illustrated in Figs. 1 and 2. Fig. 6 is an end view of a portion of the folding mechanism showing a modification of the construction indicated in Fig. 1. Fig. 7 is a longitudinal section on line 7—7, Fig. 6. Fig. 8 is a detail view of an eccentric race-way and gear which can be used in the folder shown in Figs. 6 and 7. Fig. 9 is a sectional view on line 9—9, Fig. 8. Figs. 10 and 11 are diagrams illustrating the action of the tucker-blade. Figs. 12 and 13 are diagrams illustrating contours for the eccentric-gear and race-ways.

In the drawings 1 designates the cutting cylinder and 2 the cutting-and-folding cylinder of a rotary folding machine, which cylinders may be journaled as usual in a frame of any suitable construction, parts of which are indicated at F in the drawings. This cylinder 1 is provided with the usual cutting knife 1^x and cylinder 2 with the cushion 2^x; cylinder 2 may also be provided with the usual collecting pins, which being well known need no description herein and have been omitted from the drawings for the purpose of clearness.

The paper coming from the press (not shown) is led from rolls A—A, to and between the cutting and folding cylinders 1 and 2, and is delivered from the cylinder 2 between the folding rolls B—B, which may be journaled in brackets *b* attached to the frames F.

The parts as thus far described are alike in the several figures, and may be of any desired construction, the present invention having particular reference to the means for operating the tucker-blades in the cylinder 2.

The cylinder 2 is provided with heads 2^a attached to a shaft 2^b and these heads are provided with circular openings 2^c in which are fitted rotatable disks 3 in which are journaled the shafts 4^a of the tucker-blades 4, two such blades being indicated in the drawings located at diametrically opposite points of the cylinder. The journals of shafts 4^a are eccentric to the centers of disks 3, which latter therefore form what I shall hereinafter term eccentric-bearings for the tucker-blade shafts.

In the form illustrated in Figs. 1 and 2 each shaft 4^a extends through its eccentric

bearings 3 and beyond the ends of the cylinder 2, and is provided on one end with a pinion 4^b which meshes with an internal gear 5, which is located eccentric to the cylinder shaft 2^b and is fastened to the frame F by bolts 5^a, or in other suitable manner, so as to be held rigidly in place. The shaft 4^a extends beyond the pinion 4^b and its extremity is rotatively engaged by the end of an eccentric-strap 6^a, which strap embraces an eccentric 6 which is perforated for the passage of shaft 2^b and is rigidly fastened to the frame F in any suitable manner, as by bolts 6^b, so that said eccentric 6 has no radial movement. I preferably use an eccentric 6 and eccentric straps 6^a at each end of the cylinder 2, so that the tucker-blade shafts 4^a will be kept in exact alinement with the shaft 2^b and will not be subjected to any torsional strain nor deflection.

The folding cylinder 2 has a longitudinal slot 2^e adjacent each shaft 4^a, through which slot the adjacent tucker-blade projects at the required time in order to tuck the papers between the rolls B—B.

The part N shown in Fig. 2 as fastened to the hub of the right-hand eccentric 6 is a pin-cam that is used to operate the impaling pins which lead the sheet around the cylinder, these impaling pins are well known and form no part of the present invention and therefore are not illustrated in the drawings.

It should be noted that the pinions 4^b are kept continually in mesh with the internal gear 5, and therefore as the cylinder 2 revolves the tucker-blades 4 are carried around in an orbital path at a speed equaling that of the rotation of the cylinder 2; at the same time each tucker blade is rotated on its own axis or shaft 4^a by the engagement of pinions 4^b with rack 5. Preferably the pinions 4^b have one-third as many teeth as the rack 5 so that each tucker-blade 4 is rotated three times on its own axis during each revolution of the cylinder 2.

The eccentric-straps 6^a are rotated around the eccentric 6 by reason of their connection with the shafts 4^a; and the eccentrics 6 are so located that the straps are given a reciprocating movement during each revolution of cylinder 2 and this movement of the straps causes them to impart a slow rotary movement to the eccentric bearings 3 of the tucker-blade shafts 4^a, the eccentric bearings 3 being caused to make one complete rotation during each rotation of the cylinder 2. As a resultant of this construction and arrangement of parts it follows that each tucker-blade 4 will have a slight radial movement in the cylinder 2 in addition to its rotary movement and each tucker-blade will be projected through the adjacent slot 2^e in the cylinder, as this slot passes the rolls B—B. and at this point the tucker-blades will operate to thrust the papers from the cylinder 2 to and between the folding rolls B—B. The withdrawal and projection of the tucker-blade has relation not only to the circumference of the cylinder but also to the large eccentric internal gear. Its line of retraction and thrust is therefore compelled to regard both of these elements and can be perfectly radial to neither but must follow a line determined by the two. This results in a motion of the tucker shaft which describes a complete small circle during every revolution of the cylinder. That is, the retraction and thrust of the shaft are along such lines that the curve thereof follows the track described by the bore of the eccentric bearing.

By reference to the diagrams Figs. 3, 4 and 5, the movement of the tucker-blades can be readily followed. In Fig. 3 the lower blade 4 is shown in fully projected position, and just ready to withdraw from between the rolls B—B; the dotted lines 5^x indicate the pitch of the teeth of internal gear 5; the dotted lines 4^x indicate the path circumscribed by the edge of each blade 4 rotating around its own axis 4^a. The dotted lines 4^z indicate the path traversed by the edge of each tucker-blade during its orbital movement with the cylinder. It will be seen from these diagrams that each blade is given a comparatively slow entrance, and slow withdrawal from, between the rolls B—B. In other words instead of depending upon the mere instant rotation of the blade upon its own axis to effect the tucking operation I give the blade a slower rotation and supplement its rotative movement by the action of the eccentrics 3, thereby obtaining a comparatively slower and longer stroke and more powerful and gentle action of the tucking-blades. As above explained, as the cylinder 2 revolves it will carry the tucker-blades in an orbital path, and at the same time the pinions 4^b on the tucker-blade shafts, being in mesh with the stationary rack 5, will cause the tucker-blades to rotate on their own axes; while the eccentrics 6 and straps 6^a engaging shafts 4^a will cause the eccentric bearings 3 to make one revolution in the cylinder 2 during one revolution of such cylinder. The object of these eccentric bearings 3 is to adjust the centers of the tucker-blade shafts 4^a and compensate for the varying positions of the centers of the cylinder and internal gear 5, which it will be noted is set eccentric to the axis of the cylinder, see particularly Figs. 3, 4 and 5. Such eccentric bearings 3 or their equivalents are important and essential to the successful operation of my folder.

The axis of the tucker-blade-shaft and its gear must, in order to retain proper mesh of the shaft gear and the large internal gear, maintain a constant fixed distance from the

pitch line of said internal gear. The circumference of the large cylinder does not coincide with the circumference of this large internal gear nor, consequently, with its pitch line, and any point traveling in a true circle with the revolving cylinder does not maintain a fixed distance from the pitch line of the eccentric pitch line of the internal gear. The center of the large gear is also not identical with the center of the cylinder. Therefore the gear on the tucker-shaft in order to mesh truly with the large gear must not only move in or out as the pitch line of the large gear approaches or recedes from the line of the cylinder's rotation, but must also be so moved circumferentially of the cylinder as to keep in a true radial position relative to the center and meshing point of the large internal gear. To secure the motion described and constantly be in true position the tucker blade shaft axis is compelled to describe a small circle, as indicated in Fig. 11 of the drawings (and also in other figures), the points of which coincide with points which the gear center (of the shaft gear) must occupy as the cylinder revolves. In regard to the positions shown in Fig. 11 it is obvious from the foregoing that the change of position of the eccentric bearing begins only when the eccentricity of the large gear begins and must be completed when the eccentricity is again lost. Therefore as indicated in Fig. 11 the total rotation of the bearing is accomplished while the cylinder is in the lower part of its revolution, and where the cylinder circumference and the gear are concentric the bearing will, of course, maintain a relatively stationary position. Figs. 3 and 4, which show a more extended eccentricity, also show a similarly extended period of rotation of the eccentric bearing. The means employed to force the eccentric bearing to turn in exact time with the eccentricity of the gear is in one case the eccentric straps, and in the other the eccentric raceway, gripping the end of the tucker-shaft. The straps, or raceways, are made to follow exactly the path which the center of the shaft and gear must be in. Therefore as the cylinder revolves in the general direction which the shaft and gear must follow, the straps or raceways are steadily exerting a presure on the shaft, which in turn forces the eccentric bearing, which is free to move, to turn and allow the shaft to follow the determined line of the strap or raceway. In other words, it is the combination of the revolving cylinder and the guiding strap or raceway which compels the eccentric bearing to turn.

The form described I consider the simplest; but in some cases, as a substitute for or equivalent of the eccentrics 6 and eccentric-straps 6^a, I may use eccentric-cams or raceways,—one such construction is illustrated in Figs. 6 and 7. As shown in said Figs. 6 and 7 in place of the eccentrics 6 and straps 6^a, I employ raceways 6^n which are fixedly attached to the frame F, eccentric to the shaft 2^b of the cylinder 2, and are engaged by rollers 4^m on the outer ends of the shafts 4^a of the tucker blades. These eccentric race-ways cause the eccentric bearings 3 to turn once for each revolution of the cylinder 2, substantially in the same manner and for the same purpose as the eccentrics 6 and straps 6^a of the construction above described. If these race-ways 6^n be made circular like the eccentric 6, the tucker-blades 4^a will have substantially the movements indicated in diagrams Figs. 3, 4 and 5.

It will be noted that when the tucker-blade is given as much projection between rolls B—B, as is indicated in Fig. 3 it will also be slightly projected beyond the periphery of the cylinder 2 at the points 4^y; but the slight projection of the blade at points 4^y will be of no practical disadvantage or moment in the ordinary use of the folders. By making the race-ways elliptical or orbital this incidental projection of the blades at the points 4^y or at any points, except at the rolls B—B, can be overcome. Thus if the race-ways 6^n, Figs. 6 and 7, be made of an oval form as shown in Figs. 8 and 9, the tucker-blades will only be projected through the cylinder slots 2^e when at the lowermost side of the cylinder and adjacent rolls B—B.

As indicated in Figs. 10 and 11 the upper half of the race-way 6^n is made concentric to the axis of the cylinder 2 and the lower half of the race-way irregular and eccentric to the cylinder; and the internal gear 5 instead of being circular is made to correspond in contour to the eccentric race-ways 6^n as indicated at 5^n, Figs. 8 and 9. By using such a gear and race-way the tucker-blades are kept within the cylinder except when they approach the rolls B—B, when they will be projected. The path of the tucker-blades in this construction is indicated in the diagrams Figs. 10 and 11, and in this case the points 4^y lie within the periphery of the cylinder 2; but the same amount of projection is given the tucker-blades at the rolls B—B.

Obviously by varying the contour of the eccentric race-ways and of the internal gears the time and instant of projection of the tucker-blades can be determined and varied with great nicety. Diagram Fig. 12 indicates how the internal gear and eccentric race-ways may be true ellipses; and Fig. 13 indicates an oval shape for such gear and race way.

In each case shown the number of teeth in pinion 4^b and gear 5 should be in the proportion of 1 to 3, or say 30 teeth in the

pinion 4^b to 90 teeth in the gear 5. In each case the main object of the invention—to wit the obtaining of a smooth and perfectly running rotary mechanism for operating the tucker-blades at a high rate of speed—is obtained.

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

1. In a folding apparatus, the combination of a folding cylinder, eccentric bearings therein, a tucker-blade journaled in said bearings, means for rotating the blade on its own axis during the rotation of the cylinder, and means for rotating the said bearings during the rotation of the cylinder.

2. In combination a folding cylinder, rotatable disks therein, a tucker-blade journaled eccentrically in said disks, means for rotating the blade on its own axis, and means for rotating the disks during the rotation of the cylinder.

3. In a folding mechanism the combination of a folding cylinder, eccentric bearings in the ends thereof, means for rotating these bearings once for each rotation of the cylinder, a tucker blade journaled in said bearings, and means for rotating the blade independently of said bearings during the rotation of the cylinder.

4. In a folding mechanism the combination of a folding cylinder, rotatable disks journaled in the ends thereof, means for rotating these disks once during each rotation of the cyinder, a tucker blade journaled eccentrically in said disks, and means for rotating the blade on its own axis independently of said disks during the rotation of the cylinder.

5. In a folding apparatus the combination of a folding cylinder, a tucker blade therein, means for rotating said blade on its own axis three times for each rotation of the cylinder, eccentric bearings for said tucker blade in said cylinder, and means for rotating the said eccentric bearings once for each rotation of the cylinder.

6. In a rotary folder the combination of a folding cylinder, eccentric bearings therein, a tucker-blade shaft mounted in said bearings, a gear adjacent said cylinder, a pinion on the tucker-blade shaft engaging said gear, and means for causing said eccentric bearings to turn during the rotation of the cylinder.

7. In a rotary folder the combination of a folding cylinder, eccentric bearings journaled therein, a tucker-blade shaft mounted in said bearings, a fixed internal gear adjacent said cylinder, a pinion on the tucker-blade shaft engaging said gear, and means for rotating the eccentric bearings once for each rotation of the cylinder.

8. The combination of a folding cylinder, a shaft carrying a tucker-blade therein, a gear adjacent the cylinder, a pinion on the tucker-blade shaft meshing with said gear, and eccentric devices for moving the said shaft laterally in a small orbit during the rotation of the cylinder.

9. The combination of a folding cylinder, a tucker-blade carrying shaft therein, rotatable bearings for said shaft in the cylinder, a gear adjacent the cylinder, a pinion on the tucker-blade shaft, meshing with said gear, means for moving the said shaft laterally in a small orbit during the rotation of the cylinder, and thereby causing said bearings to turn during the revolution of the cylinder.

10. In a folder the combination of a folding cylinder, a tucker-blade shaft therein, bearings for said shaft, a gear fixed adjacent one end of said cylinder, a pinion on the tucker-blade shaft engaging the said gear, and devices engaging the tucker-blade shaft whereby the latter is moved in a small orbit and said bearings are shifted during the rotation of the cylinder.

11. The combination of a slotted folding cylinder, a tucker-blade shaft therein, an internal gear fixed adjacent the cylinder, a pinion on the tucker-blade shaft meshing with said gear, and eccentric devices for moving said shaft in a small orbit and shifting the blade toward and from the slot in the cylinder during the rotation thereof.

12. The combination of a folding cylinder, a tucker-blade shaft therein, eccentric bearings for said shaft in the cyilnder, an internal gear adjacent the cylinder, a pinion on the tucker-blade shaft meshing with said gear, eccentric devices for moving said shaft laterally in a small orbit during the rotation of the cylinder, thereby causing said bearings to rotate during the revolution of the cylinder.

13. In a folder the combination of a folding cylinder, a tucker-blade shaft therein, eccentric bearings for said shaft, an internal gear fixed adjacent one end of said cylinder, a pinion on the tucker-blade shaft engaging the said gear, and eccentric devices engaging the outer ends of the tucker-blade shaft whereby the eccentric bearings are shifted during the rotation of the cylinder.

14. In combination a folding cylinder, disks journaled in said cylinder, a tucker-blade shaft journaled eccentrically in said disks, a gear adjacent one end of the cylinder, a pinion on the tucker-blade shaft engaging said gear, an eccentric device adjacent the gear, and means whereby the tucker-blade shaft is controlled by said eccentric and the disks thereby caused to turn during the rotation of the cylinder.

15. In combination a folding cylinder, disks journaled in said cylinder, a tucker-blade shaft journaled eccentrically in said disks, a gear adjacent one end of the cylinder, a pinion on the tucker-blade shaft en-

gaging said gear, eccentrics adjacent the ends of the cylinder, and means whereby the tucker-blade shaft is controlled by said eccentrics and the disks thereby caused to turn during the rotation of the cylinder, the tucker-blade being rotated thrice on its own axis during one rotation of the cylinder, and the disks being caused to rotate once for each rotation of the cylinder.

16. In a folder, the combination of a folding cylinder, disks journaled in said cylinder, a tucker-blade shaft journaled eccentrically in said disks, an internal gear adjacent the end of the cylinder, a pinion on the tucker-blade shaft engaging said gear, eccentrics fixed adjacent one end of the cylinder, and eccentric straps connecting the tucker-blade shaft with said eccentrics, whereby the disks are caused to turn during the rotation of the cylinder.

17. In a folder, the combination of a folding cylinder, disks journaled in said cylinder, a tucker-blade shaft journaled eccentrically in said disks, an internal gear adjacent the ends of the cylinder, a pinion on the tucker-blade shaft engaging said gear, eccentrics adjacent one end of the cylinder, and eccentric straps connecting the tucker-blade shaft with said eccentrics, the tucker-blade being rotated thrice on its own axis during one rotation of the cylinder and the disks being caused to rotate once for each rotation of the cylinder.

In testimony that I claim the foregoing as my own, I affix my signature in presence of two witnesses.

CHARLES H. PETTIGREW.

Witnesses:

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