C. F. JENKINS.

MACHINE FOR FORMING AND CUTTING OFF TUBES.

APPLICATION FILED JULY 10, 1908.

957,966.

Patented May 17, 1910.

4 SHEETS—SHEET 1.

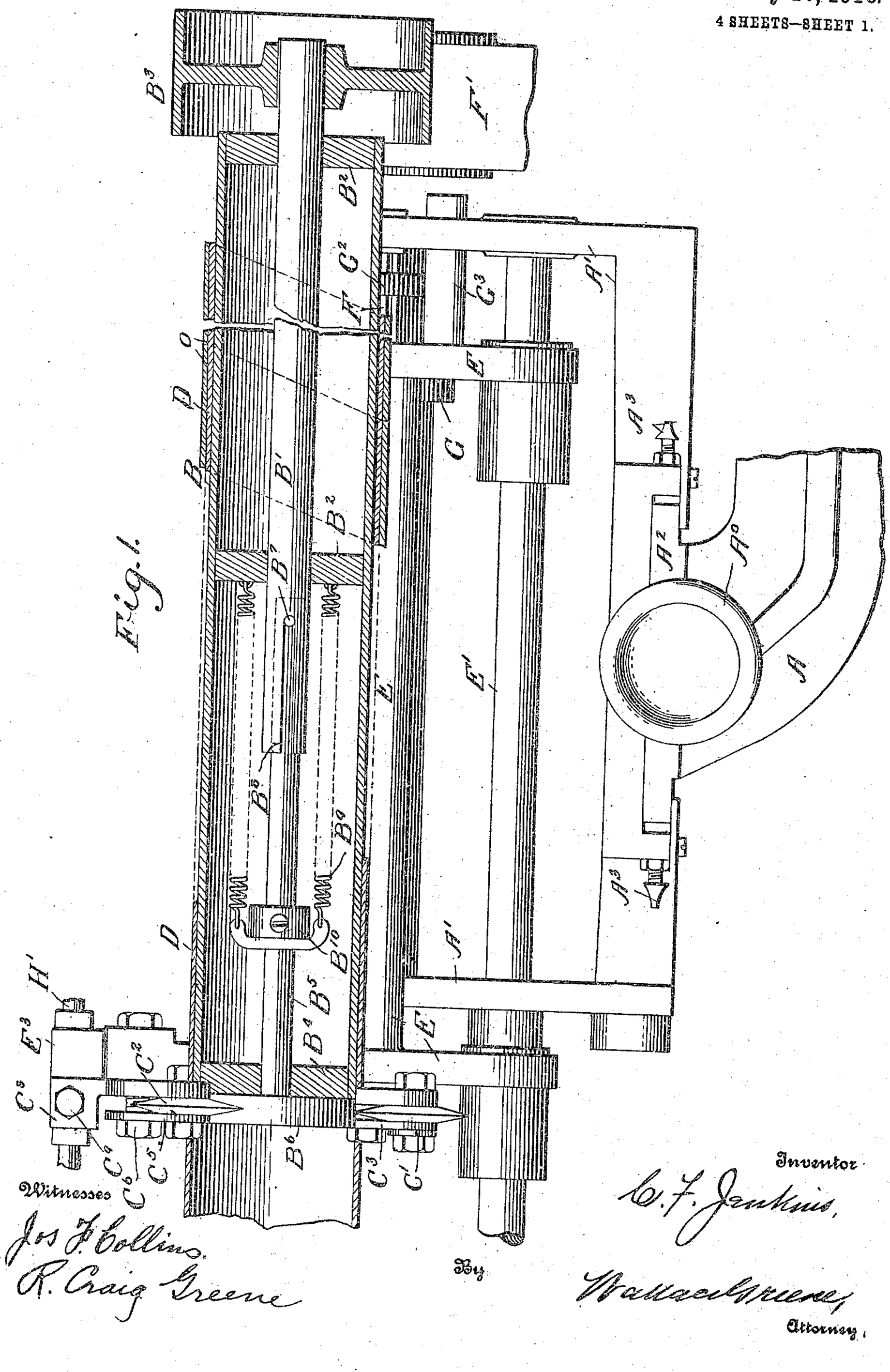


Fig. 1.

Witnesses

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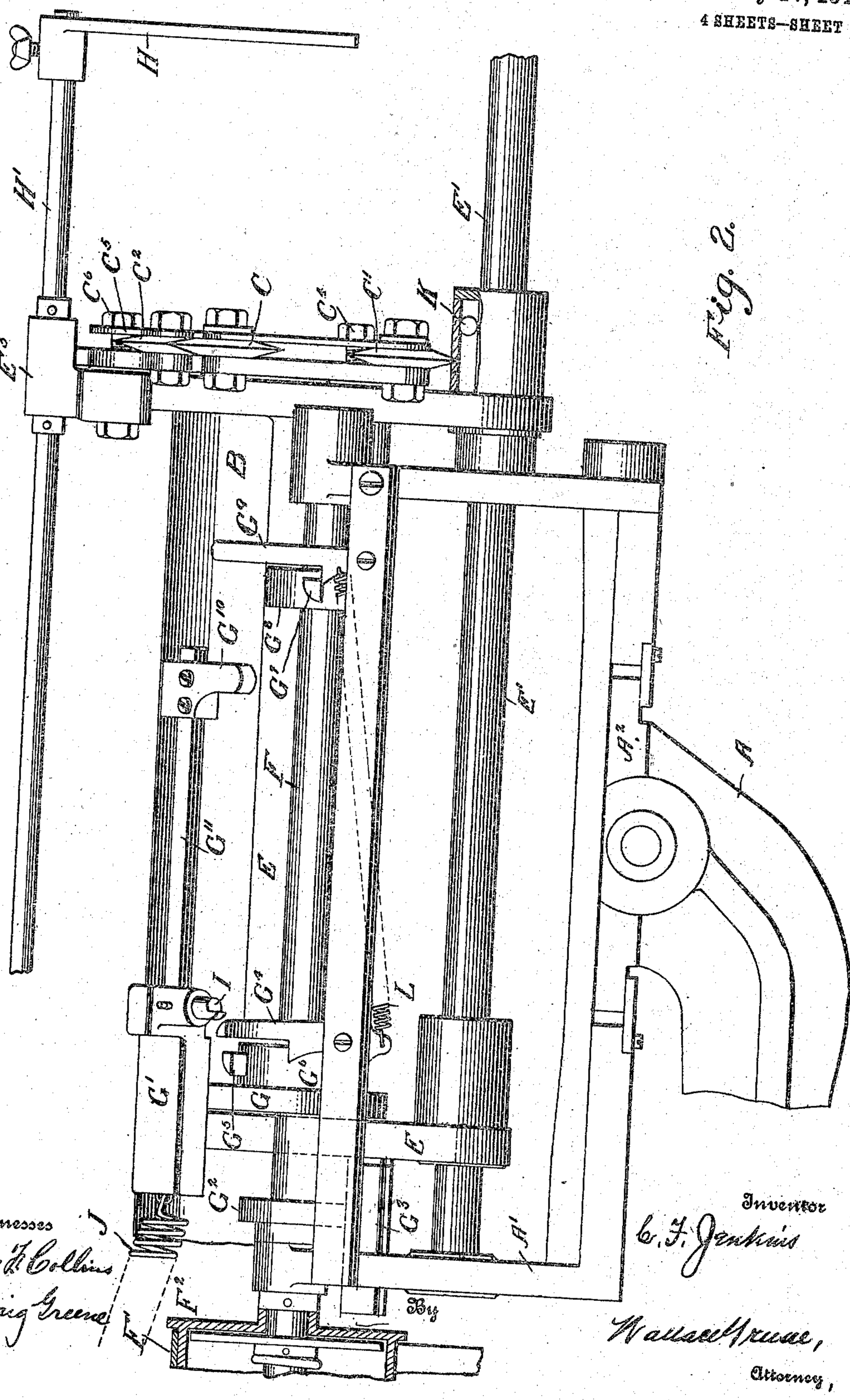


Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

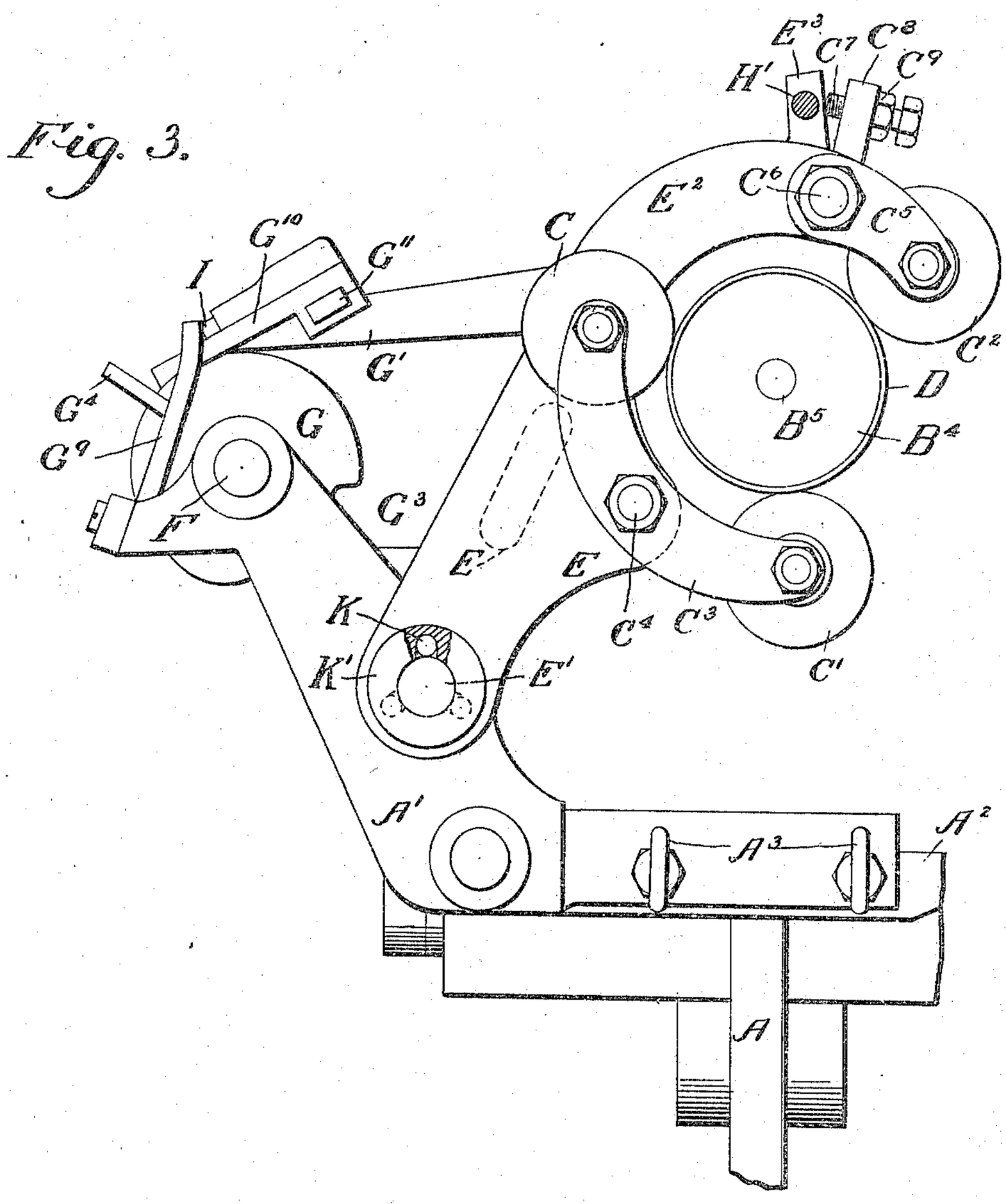


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Fig. 4.

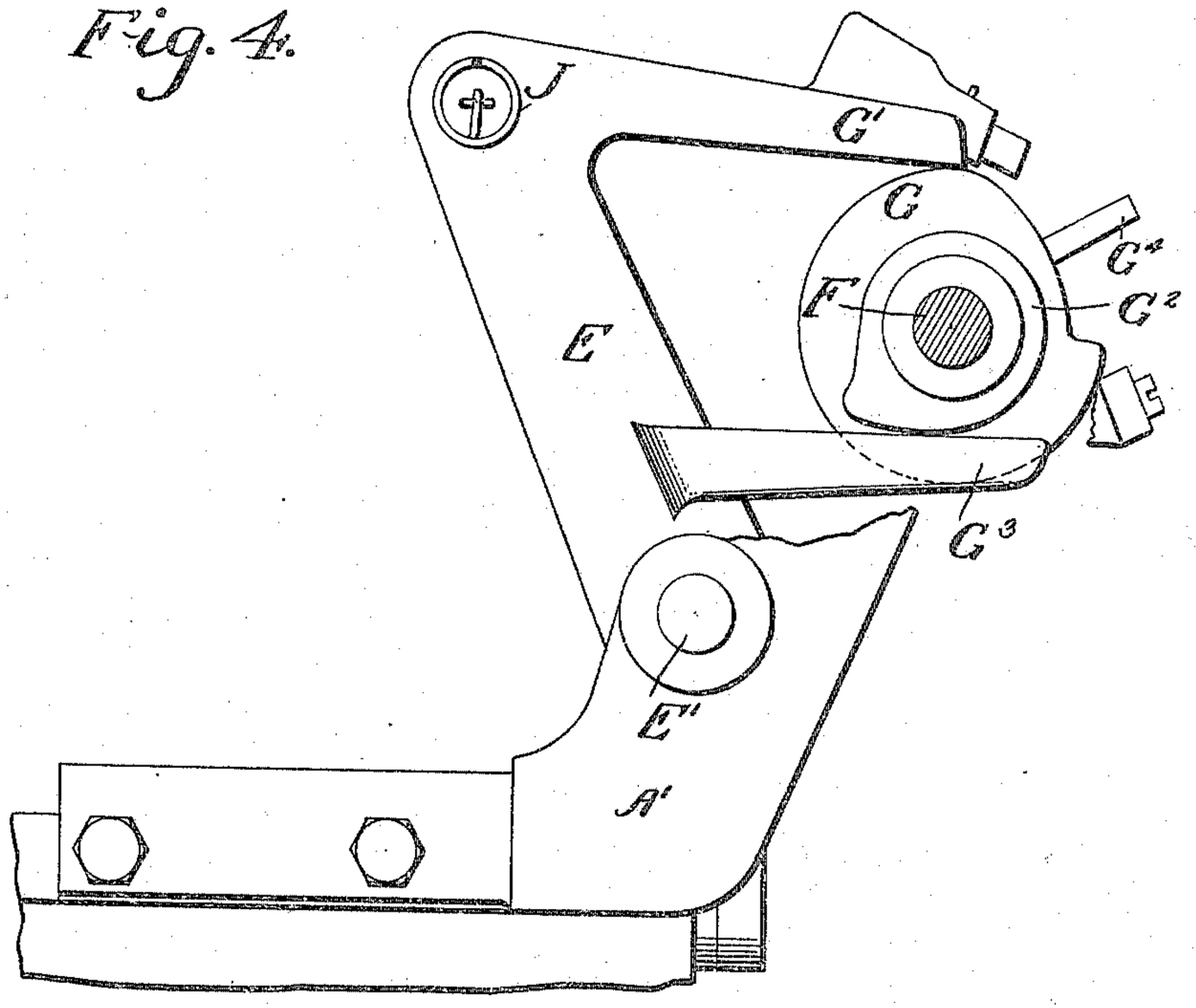
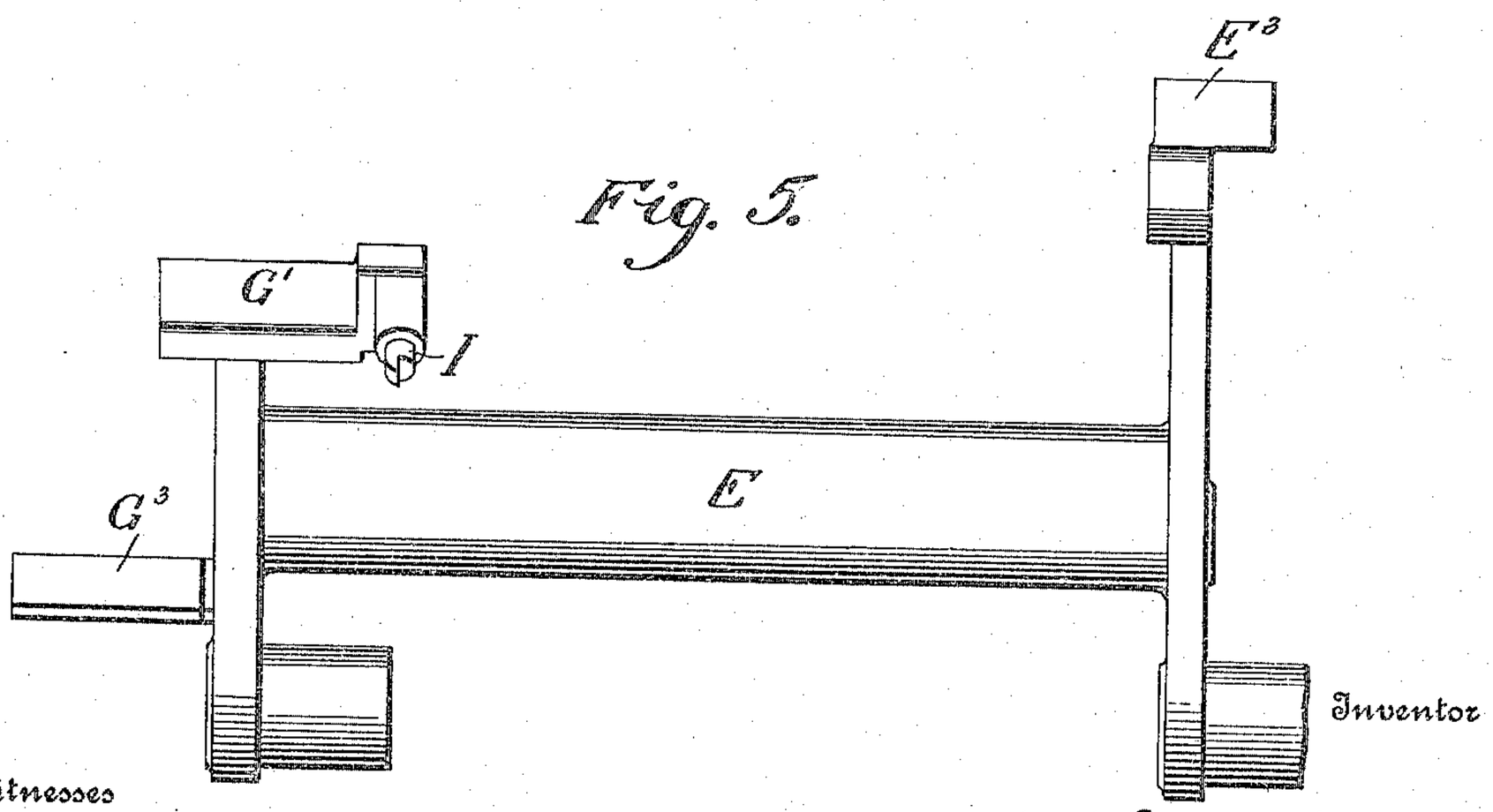



Fig. 5.

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# UNITED STATES PATENT OFFICE.

CHARLES FRANCIS JENKINS, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SINGLE SERVICE PACKAGE CORPORATION OF AMERICA, A CORPORATION OF NEW JERSEY.

## MACHINE FOR FORMING AND CUTTING OFF TUBES.

957,966. Specification of Letters Patent. Patented May 17, 1910.

Application filed July 10, 1908. Serial No. 442,846.

*To all whom it may concern:*

Be it known that I, CHARLES FRANCIS JENKINS, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Machines for Forming and Cutting Off Tubes, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to cutting into short segments continuously formed tubes and especially spirally wound paper tubes.

It is common to form continuous tubes by winding gummed and overlapping strips of paper spirally upon a fixed mandrel by suitable tube forming devices, for example, a belt, and heretofore such tubes have been sawed into fixed lengths, while they were advancing, by severing devices traveling bodily with the moving tube during the severing. Such apparatus, commonly has the disadvantage of leaving the ends of the tube segments rough, and of being incapable of cutting the tube into segments short enough for many uses, because the tube must make nearly a full turn to secure complete severing, and if the stock strips are as wide as it is desirable to have them, the severing device cannot do its work and return to initial position in time for a second operation, unless the segments have a length which is often undesirable.

The principal object of this invention is to avoid these difficulties, and this is accomplished by providing a series of knife-edged rotary cutters, in the same plane, arranged to be pressed against the rotating tube, to be severed, at equidistant points around its circumference, and to move onward with the longitudinal advance of the tube during the severing. At the completion of the severing, by the rotation of the tube through an angle approximately equal to 360° divided by the number of cutters, the latter automatically leave the tube and move, longitudinally with respect to the tube, back to initial position.

In the accompanying drawings, Figure 1 is a side elevation partly in section of my devices and so much of a tube winding machine as is necessary to an understanding of their operation. Fig. 2 is a similar view from the opposite side, certain parts being shown in axial section. Fig. 3 is an elevation, looking from the left, in Fig. 1. Fig. 4 is a section on the line 4—4, Fig. 2, looking to the right. Fig. 5 is a side elevation of a certain cutter-carrying frame.

In these figures, A represents portions of the frame of a machine, and B a fixed, hollow cylindrical mandrel borne by the frame and having one end free as in ordinary machines of this class. Upon this mandrel gummed and overlapping strips are continuously wound by well known devices, for example, a belt, O, shown only in section and in dotted lines, the formed tube, as usual, constantly advancing toward and beyond the free end of the mandrel. In the axis of the hollow mandrel is revolubly mounted a hollow shaft B′ rotated in bearings $B^2$ in the mandrel by a belt pulley $B^3$ driven from other parts of the machine. The inner end of this shaft and a disk $B^4$ fixed in the mandrel serve as sliding bearings for a smaller sliding shaft $B^5$ which bears at its projecting end a disk $B^6$. This shaft $B^5$ is compelled to rotate with the hollow shaft by means of lugs $B^7$ which lie in slots $B^8$ in the end portion of the latter shaft, and it is normally yieldingly held in the position shown in Fig. 2 by light springs $B^9$ connecting a collar $B^{10}$ fixed to the shaft, to one of the bearings $B^2$.

The cutting off is done by three circular rotary cutters C, C′, $C^2$ which meet the periphery of the tube D at points approximately 120° apart and cut through the same against the disk $B^6$ severing the tube while the latter is making about one-third of a revolution. The disk rotates at about the rotary speed of the tube and the pressure of the cutters against it and the tube grips the disk and causes it to advance longitudinally with the tube, the springs $B^9$ extending and by recoil when their disk is released, at the completion of the severing, restoring the disk to initial position. The cutters are supported from a frame E which is mounted to rock and to slide longitudinally upon a shaft or rod E′. The cutters C, C′ are revolubly mounted at the ends, respectively, of a bar $C^3$ centrally pivoted at $C^4$ to the frame E, and the cutter $C^2$ is revolubly mounted at the free end of a curved arm $C^5$ pivoted at $C^6$ to a curved arm $E^2$ projecting from the frame E, and this cutter is accurately adjusted to and from its work by

means of a screw $C^7$, working in a projection $C^8$ against a projection $E^3$ from the arm $E^2$, and locked by a lock-nut $C^9$.

Primarily, the frame and its cutters are swung away from the disk $B^6$ and the advancing tube D loosely inclosing the same, but at the proper time the frame is compelled to swing, toward the tube, upon the shaft E′. The cutter C′, if in nearly the position shown in Fig. 3, swings bodily about the pivot $C^4$ until its distance from the cutter $C^2$ equals the diameter of the tube and then the advance of the frame carries all the cutters forward until C′ also meets the tube. The forward pressure of the frame now compels the cutters to bite into the rotating tube, and the swinging of the bar $C^3$ and the lateral spring of the mandrel insures perfect equalization of the cutting by the three cutters.

When the frame is forced to swing from the line of the mandrel the bar $C^3$ rocks on its pivot, the cutter C′ at first moving downward and rearward with the frame, the cutter C remaining momentarily fixed and the cutting point of the cutter $C^2$ moving approximately in a line tangent to the disk $B^6$. A moment later the frame and its cutters swing together away from the disk. The movement just described occurs immediately after the tube has been severed or after each cutter, by one-third of a rotation of the tube, has cut the tube for 120°.

The shaft E′ upon which the frame E rocks and slides is rigidly fixed in a rectangular frame A, itself fixed to the main frame, but adjustable bodily toward and away from the vertical plane of the mandrel, the adjustment being conveniently made by a hand-wheel A° and screw without novelty, *per se*, moving the frame A′ along a guide $A^2$ upon the frame A whereon it is locked by set screws $A^3$.

In the upper part of the frame A′ is rotatably mounted a shaft F which is driven by a belt F′ acting upon a pulley $F^2$ made, in a well known way, of two parts, one fixed to the shaft and frictionally engaging the other part upon which the belt acts, whereby the belt may run continuously, but the shaft will be rotated thereby only when the resistance to rotation is insufficient to overcome the frictional power of the pulley, which, as usual in such pulleys, may be adjusted at will.

The shaft F swings the cutter bearing frame suddenly toward the mandrel, bringing the cutters into action, by means of a cam G fixed to the shaft and acting against a broad arm G′ projecting from the frame, and at the proper time just as the severing of the tube is completed swings it in the contrary direction by means of a second cam $G^2$ acting oppositely upon a similar arm $G^3$. Until the tube to be cut has advanced to a certain distance the shaft is locked against rotation by a detent $G^4$ engaging a stud $G^5$ projecting from a collar $G^6$ fixed to the shaft, but when the advancing tube end strikes a stop H projecting in its path from a rod H′ extending forward from the cutter frame, the whole frame is forced forward on its shaft E′ causing a finger I to strike the detent $G^4$ and release the shaft which is then rotated by the frictional pulley until a second stud $G^7$ upon a collar $G^8$ meets a second detent $G^9$, thereby again arresting the movement of the shaft just before an offset in the cam G reaches the end of the arm G′. The interval between the release of the first detent and the stoppage by the second is very short, and this movement is not dependent upon the rotation and longitudinal advance of the tube which goes on, whether or not the cam shaft is rotating, so long as the cam G holds the cutters in cutting position. The continued advance of the tube, longitudinally after the cutters bite into it, carries the cutters and their frame along the shaft E′ until the tube has rotated about one-third of a revolution when the three cutters have completed the severing. At this time the longitudinal advance of the frame causes an adjustable finger $G^{10}$ upon an arm $G^{11}$ of the frame to trip the detent $G^9$ and permit the cam shaft to resume rotation. The arm G′ is instantly released by the cam G and the cutter frame is quickly swung from the tube by the cam $G^2$ acting on the arm $G^3$ leaving the frame free to slide upon its shaft E′, when a spring J suddenly draws it back to initial position. As it nears such position the beveled side of the longitudinally yielding finger I strikes and passes the detent $G^4$, and the whole apparatus is ready to repeat the operations described.

It is to be noted that the width of the arms resting against the cams, respectively, is as great as the travel of the frame, and that as the frame advances they slide transversely upon and with respect to the cams. To lessen friction of the frame in sliding along its shaft I provide the bearings with a series of balls K each rolling along the shaft in a suitable race in the hubs K′. The two detents are centrally pivoted and are connected by a spring L which yieldingly holds each in stud-engaging position. It may be observed that by the use of a plurality of equidistant cutters the tube is severed so quickly that there is ample time, after the severing and before the tube has advanced to a distance equal to the length of any tube segment likely to be desired, for swinging the cutters outward, sliding the frame or carriage, and swinging them again to cutting position.

What I claim is:

1. In apparatus of the class described, the

combination with means for rotating a tube, of a series of cutters spaced about the tube in the same plane, and automatic means for at intervals forcing all the cutters inward through the walls of the rotating tube and again outward before the latter has completed a single revolution; whereby each cutter cuts through a part of the tube proportional to the number of cutters and the tube is divided while making a portion of one turn.

2. In tube severing devices, the combination with a centrally pivoted arm, and forwardly projecting cutters mounted in the same plane at the ends of said arm, respectively, automatic means for forcibly moving said arm and cutters at intervals toward a tube to be cut, and a third freely rotatable cutter in the same plane in position to support the tube, while cutting it, against the thrust of the cutters first mentioned.

3. In tube severing devices, the combination with means for rotating a tube and advancing it longitudinally, of a frame mounted to swing toward and from the tube and to travel parallel to the same, a series of cutters in the same plane spaced around the tube, means for forcing the frame to swing alternately toward and from the tube while permitting it to slide longitudinally, and a longitudinally movable disk adapted to lie within the tube to co-act with the cutters while advancing longitudinally therewith.

4. The combination with a hollow mandrel, of means for rotating and longitudinally advancing a paper tube thereon, a rotary extensible shaft mounted within the mandrel and projecting from the free end thereof, a disk of approximately the size of the mandrel secured to the projecting end of the extensible shaft, cutters arranged to travel with the tube and co-act with said disk to sever the same, and a spring for returning the disk to initial position when the severing is completed.

5. The combination with means for winding and rotating a tube, of a centrally pivoted bar at one side of the tube's path, carrying at each end a freely rotatable cutter, a third freely rotatable cutter in the same plane upon the opposite side of said path, means for adjusting the distance of the third cutter from the bar's pivot, and automatic means for causing the three cutters to grip the tube at intervals.

6. The combination with means for rotating and longitudinally advancing a tube to be severed, of a frame mounted to travel parallel to the tube and to rock toward and away from the same, a series of tube severing cutters carried by said frame in position to meet the tube at equidistant points when the frame moves toward the tube, and means whereby the tube itself carries the frame longitudinally after passing a predetermined point.

7. The combination with means for rotating and longitudinally advancing a tube to be severed, automatic severing devices arranged to advance with the longitudinal movement of the rotating tube and to sever it during a part of one of its revolutions, and automatic means for restoring said devices to initial position during the remainder of such revolution.

8. The combination with means for rotating and longitudinally advancing a tube to be severed, a frame mounted alongside the tube to move both parallel and transversely with respect to the same, a frictionally rotated shaft normally locked against rotation, cams borne by the shaft and arranged for rocking the frame toward and from the tube, tube severing cutters borne by the frame, means whereby the advancing tube advances the frame longitudinally, and means whereby such advance of the frame locks and unlocks said shaft at intervals.

9. The combination with means for longitudinally advancing a tube, of a sliding and rocking frame alongside the tube's path, tube severing cutters borne by the frame, a stop projecting from the frame into the path of the tube at some distance beyond the cutters, whereby the tube in reaching the stop begins to slide the frame, means for forcing the frame alternately toward and from the tube, and devices whereby the longitudinal advance of the frame controls the action of said means.

10. The combination with means for rotating and longitudinally advancing a tube, of a rocking and sliding frame alongside the tube's path, a spring yieldingly resisting the longitudinal advance of the frame, cutters borne by the frame, a stop borne by the frame in the path of the tube, and means for rocking the frame toward and from the tube's path at intervals.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES FRANCIS JENKINS.

Witnesses:
WALLACE GREENE,
CHAS. W. BLACKWOOD.