S. M. LANGSTON.

CUT-OFF MECHANISM AND CONTROLLER THEREFOR.

APPLICATION FILED JAN. 11, 1916.

1,176,680.

Patented Mar. 21, 1916.

3 SHEETS—SHEET 1.

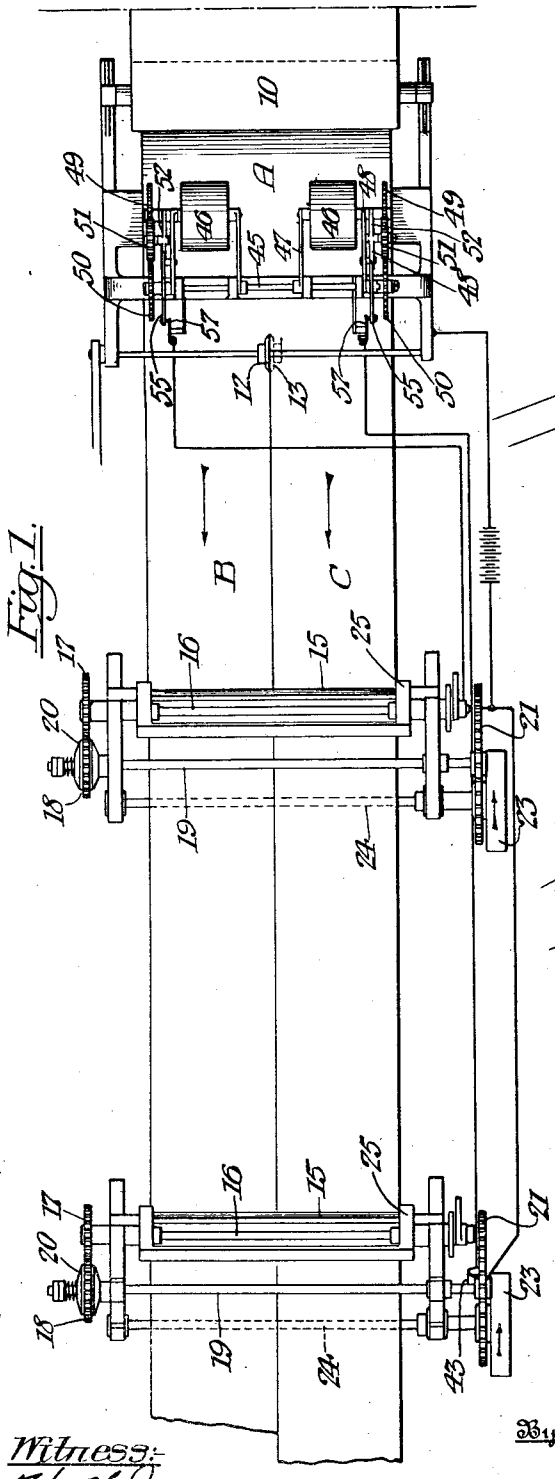


Fig. 1.

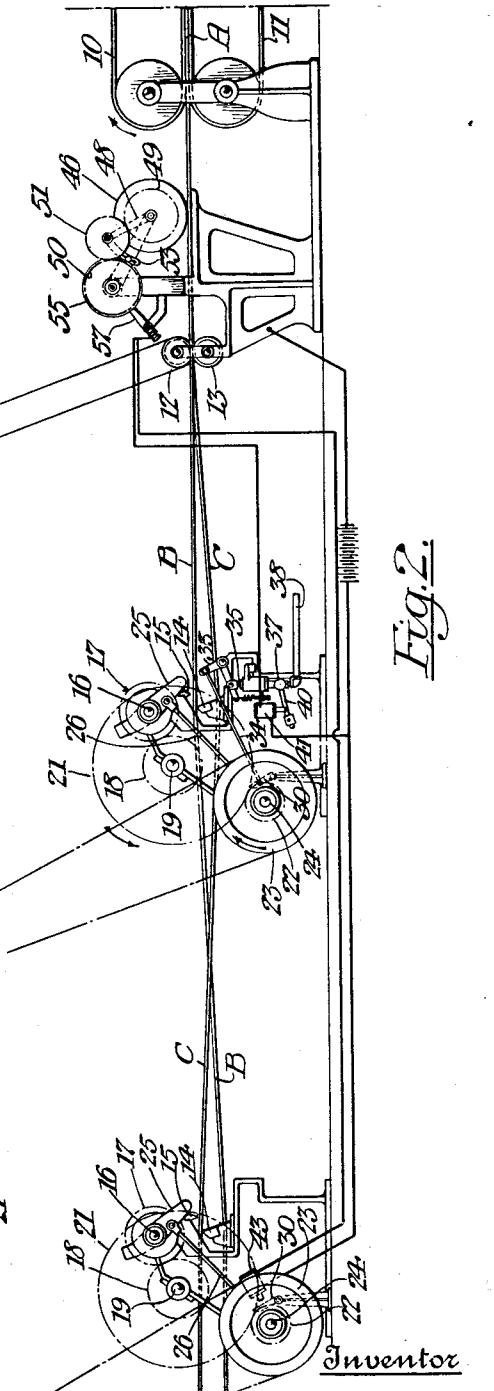


Fig. 2.

Witness:
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Samuel M. Langston.
By his Attorney.
C. W. Fairbank

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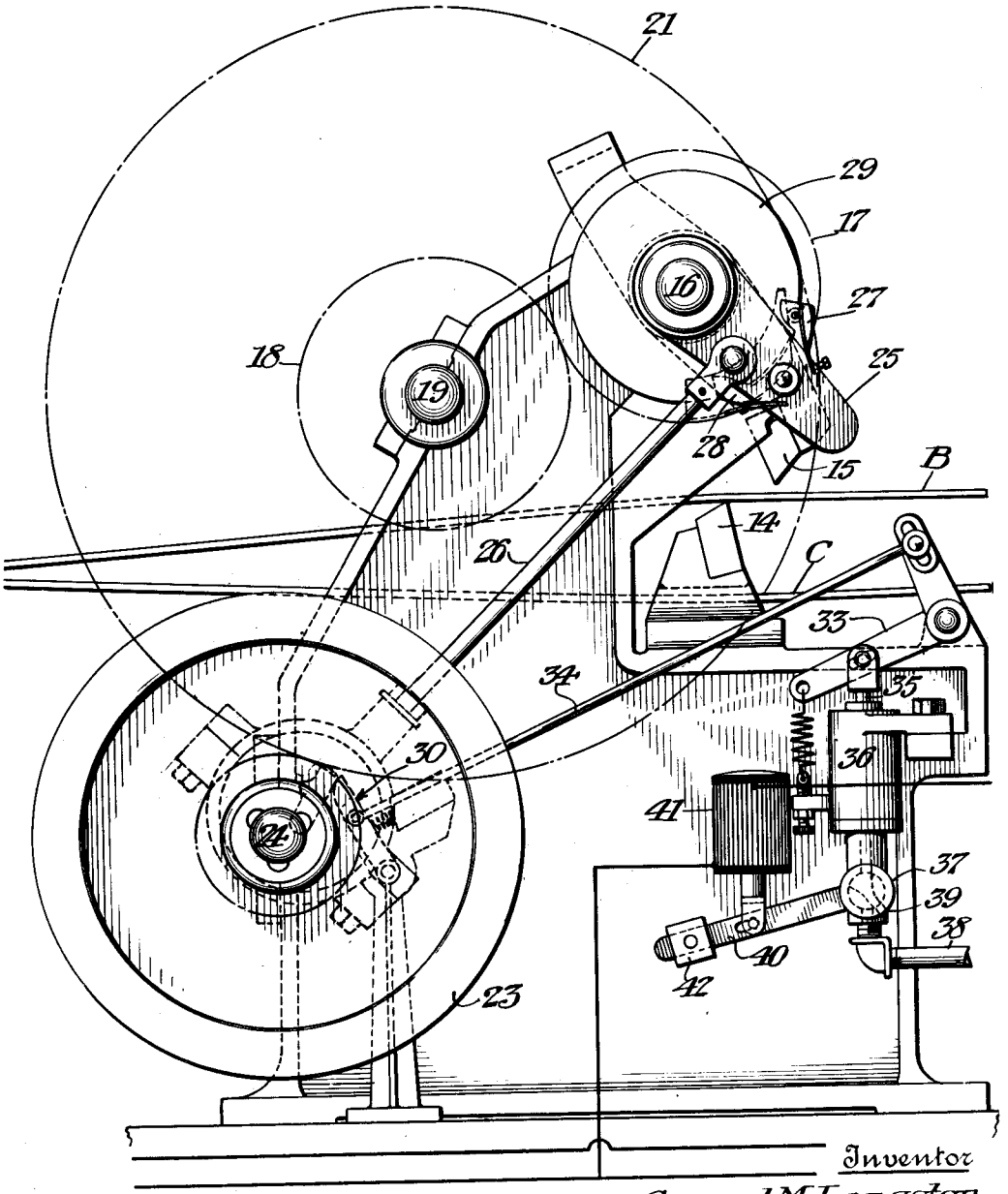
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3 SHEETS—SHEET 2.

Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 4.

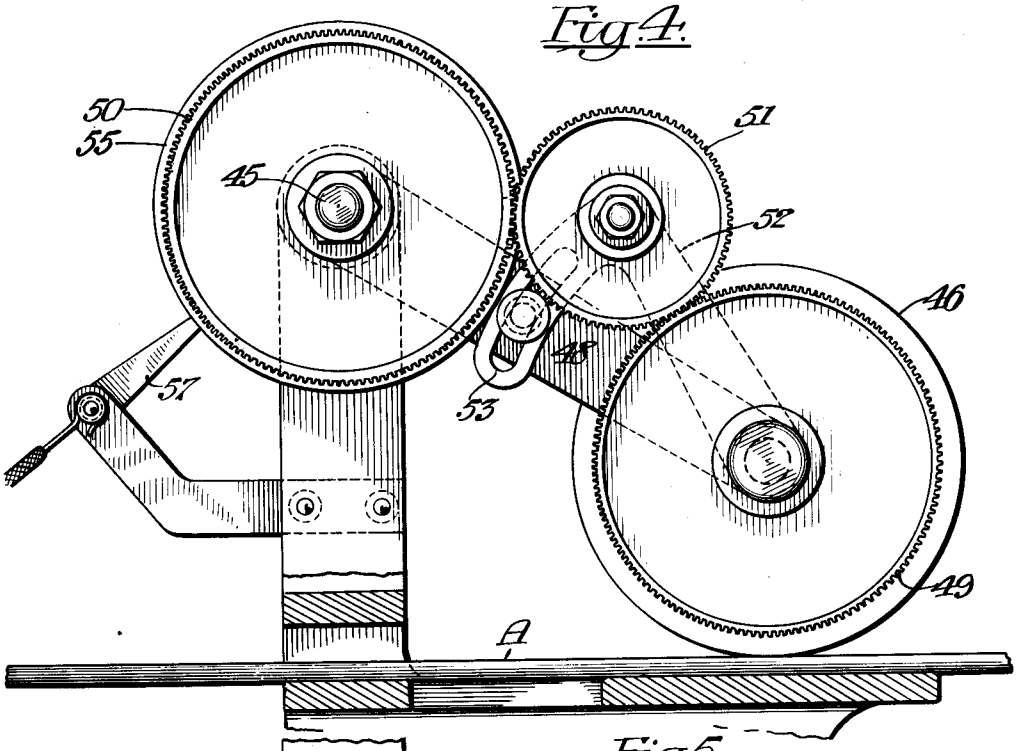


Fig. 5.

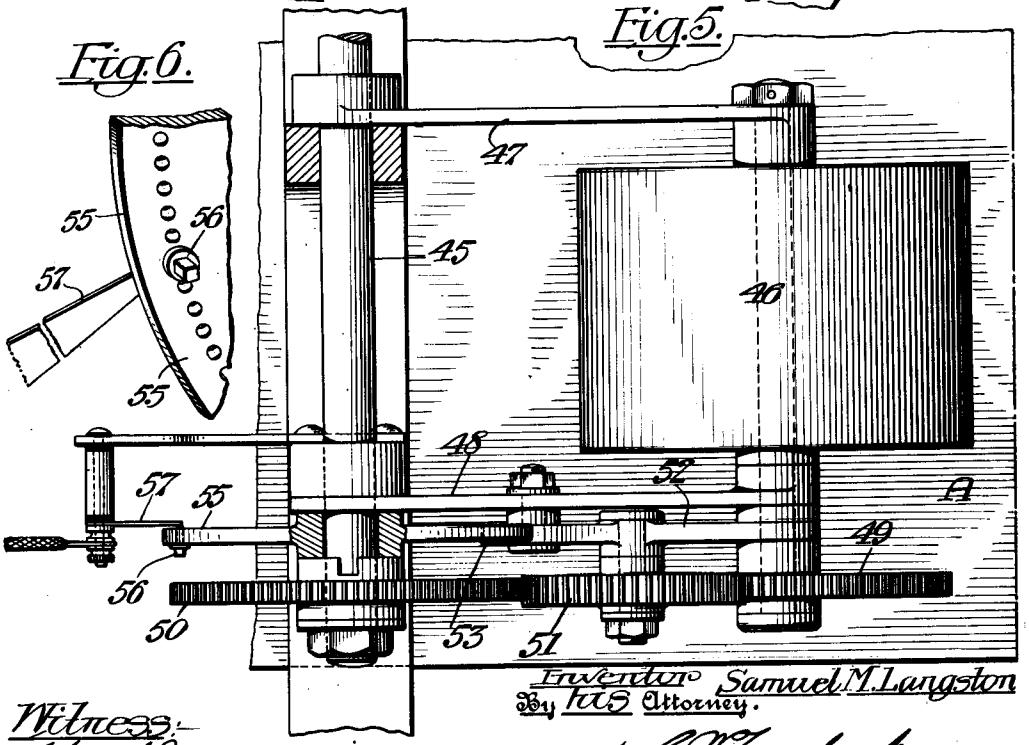


Fig. 6.

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UNITED STATES PATENT OFFICE.

SAMUEL M. LANGSTON, OF WENONAH, NEW JERSEY.

CUT-OFF MECHANISM AND CONTROLLER THEREFOR.

1,176,680. Specification of Letters Patent. Patented Mar. 21, 1916.

Application filed January 11, 1916. Serial No. 71,493.

To all whom it may concern:

Be it known that I, SAMUEL M. LANGSTON, a citizen of the United States, and a resident of Wenonah, in the county of Gloucester and State of New Jersey, have invented certain new and useful Improvements in Cut-Off Mechanisms and Controllers Therefor, of which the following is a specification.

My present invention relates to mechanism for cutting endwise delivered material into sections of predetermined length and the control of the cutting mechanism by the material.

Broadly considered, my invention may be embodied in machines for cutting pipes, tubes, rods, sheets, or the like, but in its preferred embodiment, it is particularly adapted for use in the transverse subdividing of comparatively stiff sheet material such, for instance, as double faced corrugated paper or multiple-ply paper board.

As an important feature of my invention, I provide mechanism adapted for direct engagement with the material and including a member rotated by the material itself as the latter advances and operating to control or set in operation the cut-off mechanism when said rotary member has rotated a predetermined angular distance which may include a part of a revolution or any predetermined number of revolutions.

I am aware that various trip mechanisms have been designed for controlling or setting in operation a cut-off mechanism when the advancing end of the material reaches the trip. In fact, I have shown such a trip mechanism in my prior and co-pending application, Serial No. 58,174, filed October 27th, 1915.

The controlling mechanism embodying my present invention has numerous advantages, among which are the fact that it can be installed at any point along the path of the material in advance of the cut-off mechanism; it is more accurate in that it is operated continuously and uniformly by the advancing of uncut material and the delivery of the cut-off sections is simplified in that there are no parts which have to be moved out of the path of the material or returned to a normal position after the operation of the cutter. The connection to the cutter may be mechanical, electrical, or fluid pressure.

In the accompanying drawings, to which reference is to be had and on which similar reference characters indicate corresponding parts in the several views, I have illustrated one embodiment of my invention and have illustrated it in connection with certain specific cut-off mechanism, but my invention is not limited to the specific details illustrated or to the particular combinations shown except as defined in the appended claims.

In these drawings: Figure 1 is a top plan view of a machine embodying my invention; Fig. 2 is a side elevation thereof; Fig. 3 is an end view of one of the cut-off mechanisms; Fig. 4 is a side elevation of a part of one of the controlling mechanisms; Fig. 5 is a top plan view of the construction illustrated in Fig. 4; and Fig. 6 is a perspective view of a detail.

In Figs. 1 and 2, I have illustrated a machine for slitting a continuously delivered sheet into separate strips and for cutting each of these strips into sections, the length of the sections of one strip being independent of those of the other. This machine embodies certain novel features of construction which I have illustrated and claimed in my prior and co-pending application Serial No. 50,336, filed September 13th, 1915, and is particularly adapted for use on such stiff material as double faced corrugated paper which cannot be folded or bent to any appreciable extent without weakening the structure and destroying the utility of the product. The sheet A is delivered by any suitable feeding mechanism and either continuously or intermittently as may be desired. It may come from the machine used for manufacturing the material or from any source of supply. Merely for purposes of illustration, I have shown the feed mechanism as including two belts 10 and 11 having superposed parallel runs for engaging with opposite surfaces of the material. These may involve a part of the machine for making the material or may serve merely as feeding means and may be replaced by any other feeding mechanism, such, for instance, as feed rollers. The sheet is delivered from the feeding mechanism to the slitting mechanism which operates to subdivide the sheet into a plurality of separate strips. Merely for purposes of illustration, I have shown this slitting mechanism as involving two overlapping rotary cutters 12 and 13 mounted on shafts on opposite sides of the plane of delivery of the material. There may be any desired number of these slitters, dependent upon the

number of strips into which it is desired to subdivide the sheet, or in accordance with the width of the desired strips. I have shown only a single pair of slitting cutters operating to subdivide the sheet into two strips B and C. These two strips pass to a first cut-off mechanism in which less than the whole number of strips are operated upon. This cut-off mechanism is illustrated as including a stationary knife 14 and a coöperating movable knife 15 and is so designed that one, or any desired number of strips, may pass between the cutters while the remaining strips may pass through the machine without being cut off. This may be accomplished by making the stationary knife 14 comparatively narrow and slotting its base to permit one or more of the strips to pass through the slot beneath the stationary knife as illustrated, or by moving the stationary knife endwise so that it lies beneath only one or more of the strips. Both of these arrangements are illustrated in my prior application Serial No. 50,336, above referred to. Other means might be devised to permit the cutter to operate on less than the double number of strips so that the remaining strips might pass through to a second and similar cut-off mechanism which may operate on all of the remaining strips or may be constructed the same as the first cut-off mechanism. I have illustrated the construction and arrangement of the knives the same in both cut-off mechanisms.

Each movable cutter 15 may be operated in any suitable manner and controlled independently of the other. It is so designed that the material may pass the cutter until the controlling mechanism operates, whereupon it makes a cutting stroke. As a preferred construction of cutter and operating mechanism therefor, I may employ and have illustrated substantially that shown and claimed in my prior application Serial No. 58,174 above referred to. I have not illustrated all of the mechanism in detail as it forms no portion of my present invention. Briefly, this mechanism involves means for quickly and positively moving the cutter 15 through the cutting stroke and then more slowly and frictionally carrying it through the remainder of its cycle to the initial position where it is positively stopped and held in spite of the continuing tendency of the friction drive to continue the movement.

The cutter 15 is carried by and rotates about a shaft 16 which latter has a gear 17 meshing with a gear 18 mounted on a shaft 19. Instead of keying the gear 18 to the shaft 19, it is secured merely by friction so that either the shaft or the gear may rotate in respect to the other, but when either is free to rotate it will turn with the other. The shaft 19 has a large gear 21 meshing with pinion 22 keyed to a drive pulley 23 and loose on a shaft 24. The shaft 19 is thus continuously rotated and there is a continuous application of friction tending to rotate the shaft 16 and the cutter. Mounted to swing about the shaft 16 as a center is an oscillating arm 25 connected by an eccentric rod 26 to an eccentric loose on the shaft 24. The arm 25 has two pawls 27 and 28 engaging with a disk 29 keyed to the shaft 16. A clutch serves to lock the eccentric to the shaft 24 and is normally held in disengaged position by a pawl or finger 30.

For a fuller and more complete description of the construction and operation of this particular mechanism, reference is to be had to my prior application Serial No. 58,174 above referred to, but briefly the operation is as follows: The driving pulley is continuously rotated and through the gearing and frictional connections continuously tends to rotate the shaft 16 and the movable cutter. The clutch connecting the eccentric to the shaft 24 is normally disengaged and the pawl 27 on the arm 25 locks the cutter 15 against rotation. When the clutch is thrown into operation by the outward movement of the member 30, the eccentric pulls the arm 25 toward the left from the position shown in Fig. 3 and the pawl 28 carries the cutter through its cutting stroke. In the meantime, the pawl 27 is disengaged so that during the second half of the revolution of the eccentric and the return movement of the arm 25, the cutter will not be returned and will be released so that it may be rotated through the remainder of its cycle by the friction drive. When the eccentric has completed one revolution, the clutch is disengaged and the arm 25 stopped in the position shown. When the movable cutter has been carried around to its normal position by the friction drive, it will be stopped and held by the pawl 27. Thus, the cutter 15 is normally held ready to make a cutting stroke, but makes it only when the pawl 30 is moved to cause the engagement of the clutch.

For positively pulling out the pawl 30 at the instant desired, various power mechanisms may be found satisfactory. In Fig. 3 I have illustrated the pawl 30 as connected to one arm of a bell-crank lever 33 by a rod 34. The other arm is connected by a piston rod 35 to the piston of a compressed air cylinder 36. At the lower end of the cylinder is a three-way air valve 37 connecting the cylinder to a compressed air supply conduit 38 and an exhaust port 39. The valve is normally in such position that the cylinder is open to the exhaust and the piston is retained at the lower end of its stroke. By lifting a valve lever 40, the cylinder may be connected to the supply and compressed air may raise the piston, swing the bell-crank lever, and pull the pawl out, whereupon the

clutch will instantly engage. For swinging the valve lever, I have shown a solenoid 41 which, when energized, will raise the valve lever. When the circuit is broken, any suitable means such, for instance, as a weight 42, may operate to close the valve. I have illustrated this form of operating mechanism in the first of the cut-off mechanisms shown in Fig. 2, but in the second cut-off mechanism shown in that figure, I have illustrated a solenoid or other form of electro-magnet 43 so positioned as to act directly upon the pawl 30. This avoids the necessity of using compressed air as a motive fluid but may require a somewhat stronger magnet. Either arrangement might be employed.

As an important feature of my invention, and particularly as an important part of the general combination and arrangement, I provide a roller mounted to rest upon and be rotated by the material and operating to effect the closing of an electric circuit including one or both of the magnets when a predetermined length of material has passed the roller. Any desired number of these rollers may be provided and each operating to control a separate cut-off mechanism. As there may be any desired number of cut-off mechanisms arranged in series along the path there may be a corresponding number of rollers which may also be arranged in series, or side by side. The particular position of one roller in respect to the others is immaterial.

In the specific construction illustrated, I provide a shaft or rod 45 extending transversely of the material and above the same, and intermediate of the feeding mechanism and the slitters, and serving as a support for the circuit controllers. A roller 46 is journaled in the lower free ends of a pair of arms 47 and 48 which are supported by and journaled on the rod 45. The roller rests directly upon the material and may be of any desired size or material. It is preferably of such weight or so pressed against the material that it will have firm engagement with the latter and its surface is roughened, rubber-coated, or otherwise formed so that the roller will be accurately and positively rotated by the material as the latter advances and without liability of any slipping or other lost motion.

Connected to the roller and rotating therewith is a gear wheel 49 and loose on the rod 45 is a gear wheel 50. Meshing with both of these gears is an intermediate gear 51 carried by an arm 52 adjacent to the arm 48 and pivoted to swing about the shaft of the roller 46 as an axis. By swinging the arm 52 in respect to the arm 48, the gear 51 will remain in mesh with the gear 49 but may be moved into or out of mesh with the gear 50. Thus, the gear 50 may be removed and replaced by a larger or smaller gear and the gear 51 brought into mesh therewith. Suitable clamping means are provided for locking the arms 48 and 52 together so as to hold the parts in proper position. As shown, the arm 52 has a curved slotted branch 53 receiving a clamping bolt carried by the arm 48. It will be noted that as the material advances, the roller 46 will be rotated and this rotary motion will be transmitted through the gearing to the gear 50. With the gears 49 and 50 of the same diameter, one complete revolution of one will effect a complete revolution of the other, while by replacing the gear 50 by a larger or smaller one, a complete revolution of the roller will give more or less than one complete revolution of the gear 50. By properly selecting the gear ratios and the circumferences of the roller 46, the gear 50 can be made to complete one revolution while the material is advancing through any predetermined distance.

Suitable circuit closing means are provided for closing the electric circuit of one of the magnets when the gear 50 is rotated through a complete revolution. Such circuit closing means may be of any desired character, delicacy and accuracy. Merely as an example of such circuit closing means, I have shown the gear 50 as having a disk 55 secured thereto. This disk has a series of small closely spaced apertures adjacent its periphery into any one of which a pin 56 may be placed. Mounted on the frame of the machine is a contact member 57 extending into the path of the pin. By insulating the contact member 57 from the frame of the machine and by connecting one pole of the battery to this contact member and the other pole to the frame of the machine, the circuit will be closed when the disk has been rotated to such a position that the pin engages with the contact. With one of the electro-magnets in circuit, the corresponding cut-off mechanism will be caused to operate each time the disk 55 makes one complete revolution. It is of course evident that if it is desired to cut the material into shorter lengths, a plurality of pins may be inserted in the disk 55 so that the circuit will be closed a plurality of times during each complete revolution of the disk 55. Each separate cut-off mechanism has its electro-magnet controlled by a separate disk rotated by a separate roller. Thus, the advancing of the material operates all of the circuit closers, but the gear ratios, the roller circumferences, and the pin spacing or placing may be different for each individual roller and thus the cut-off mechanisms will be operated independently of each other and each to cut its particular strip into independently selected lengths.

For convenience in selecting the particu-

lar gears for any particular length, I preferably make the rollers of an exact number of feet or inches in circumference and use gears with comparatively small teeth. By making the roller of exactly six feet in circumference and providing the gear 49 with one hundred and forty-four teeth, the use of a gear 50 with one hundred and forty-four teeth will operate the cutter to produce sections exactly six feet in length. The substitution of another gear 50 with one hundred and forty-three or one hundred and forty-five teeth, will operate to give sections of five feet, eleven and one-half inches or six feet and one-half inch in length. Any particular length of section may be secured by selecting a gear 50 having a number of teeth greater or less than one hundred and forty-four, and for each change of one tooth, there will be a corresponding change of one-half inch in the length of the produced section. I, of course, do not desire to be in any way limited to such circumferences or gear ratios, but merely cite them as an example. The gears 49 and 51 may be removed and replaced one by a larger and the other by a smaller gear if sections exceptionally long or short in respect to the circumference of the roller are desired.

Although I prefer to employ electrical means for releasing and starting the cutter when the gear 50 has rotated a predetermined angular distance, I may employ other means, so far as my broad invention is concerned. For instance, the valve 37 or an equivalent valve might be placed in a portion of the supply conduit 38 and so positioned that the valve lever would be directly acted upon and operated by the engagement of the pin 56 therewith. Mechanical connections might also be readily designed which would operate to pull out the pawl 30 when the gear 50 had rotated through one complete revolution or through any predetermined angular distance.

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

1. A machine for subdividing comparatively stiff sheet material, including sheet delivering mechanism, slitting mechanism for subdividing the sheet lengthwise, a plurality of cut-off mechanisms each operating on a separate strip of said sheet, and means operated by the advancement of the material for independently controlling said cut-off mechanisms.

2. A machine for subdividing comparatively stiff sheet material, including sheet delivering mechanism, slitting mechanism for subdividing the sheet lengthwise, a plurality of cut-off mechanisms each operating on a separate strip of said sheet, and means for independently controlling said cut-off mechanisms upon different predetermined advancing movements of the material whereby the separate strips are subdivided into sections of different lengths by said cut-off mechanisms.

3. A machine for subdividing comparatively stiff sheet material, including sheet delivering mechanism, slitting mechanism for subdividing the sheet lengthwise, a plurality of cut-off mechanisms each operating on a separate strip of said sheet, and means for independently controlling said cut-off mechanisms upon different predetermined advancing movements of the material whereby said cut-off mechanisms are operated at different frequencies and subdivide the strips into sections of different lengths.

4. In combination, mechanism for delivering the material to be operated on, slitting mechanism for subdividing it lengthwise, a plurality of cut-off mechanisms, each operating on a separate strip of said material, and a plurality of members each engaging with the material and operated by the advancement thereof and each connected to a different cut-off mechanism for controlling the latter.

5. In combination, mechanism for advancing the material to be operated on, a plurality of cut-off mechanisms arranged in succession along the path of delivery of the material, and means operated by the advancement of the material for independently controlling said cut-off mechanisms.

6. In combination, a sheet delivering mechanism, a normally stationary cut-off mechanism, driving means therefor, a roller engaging with the material and rotated thereby, and means operated upon a predetermined rotation of said roller for effecting operative connection between said cut-off mechanism and said driving means.

7. A machine for subdividing sheet material, including a normally stationary cut-off mechanism, driving means therefor, a roller engaging with the sheet and rotated thereby, and means for effecting operative connection between said driving means and said cut-off mechanism upon a predetermined rotation of said roller, said means including a rotary member and interchangeable gearing for driving said member at any desired speed in respect to said rotor.

8. In combination, a cut-off mechanism, driving means therefor, an electro-magnet for controlling the operative connection between said driving means and said cut-off mechanism, a roller engaging with the material to be cut, and rotated thereby upon the advancement of said material, a rotary circuit closer for said magnet, and interchangeable gearing for rotating said circuit closer upon the rotation of said roller and at any desired speed in respect to said roller.

9. In combination, slitting mechanism for subdividing a sheet lengthwise into a plu-

rality of strips, a separate cut-off mechanism for each strip, a plurality of rollers engaging with the strip and rotated thereby, and connections between said rollers and said cut-off mechanisms for independently operating each cut-off mechanisms upon a predetermined rotation of a separate roller.

10. In combination, means for advancing a sheet, slitting mechanism for subdividing the sheet lengthwise into a plurality of strips, a cut-off mechanism for subdividing one of said strips into sections, a roller engaging with the sheet and rotated thereby, and means for intermittently operating said cut-off mechanism upon successive predetermined rotary movements of said roller.

11. In combination, a cut-off mechanism for sheet material, a roller engaging with the sheet and rotated thereby, an arm having one end pivoted about a fixed axis and having the opposite end serving as a bearing for the axis of said roller, a circuit closing member rotatable about said fixed axis, a removable gear member connected to said circuit closing member, means for rotating said gear member upon the rotation of said roller, and electro-magnetic means for effecting the operation of said cut-off mechanism upon a predetermined rotation of said circuit closing member.

12. In combination, a cut-off mechanism for sheet material, a roller engaging with the sheet and rotated thereby, an arm having one end pivoted about a fixed axis and having the opposite end serving as a bearing for the axis of said roller, a member rotatable about said fixed axis, a removable gear operatively connected to said member, means for rotating said gear upon the rotation of said roller, and means for effecting the operation of said cut-off mechanism upon a predetermined rotation of said member.

Signed at New York city in the county of New York and State of New York this 6th day of January A. D. 1916.

SAMUEL M. LANGSTON.

Witness:
C. W. FAIRBANK.