April 1, 1924. 1,489,135

S. M. LANGSTON

CUT-OFF MECHANISM

Filed July 3, 1923 3 Sheets-Sheet 1

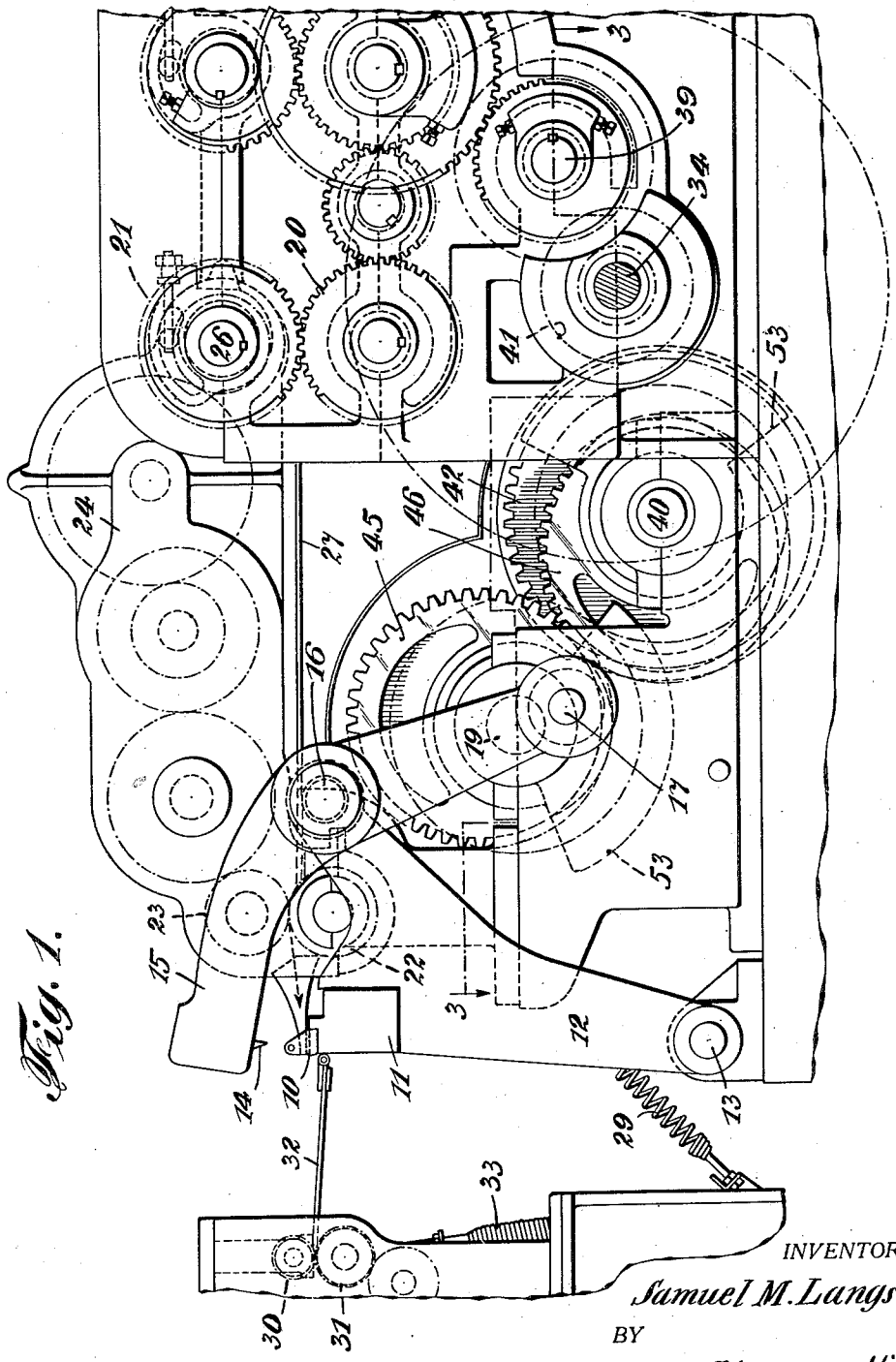


Fig. 1.

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Fig. 2.

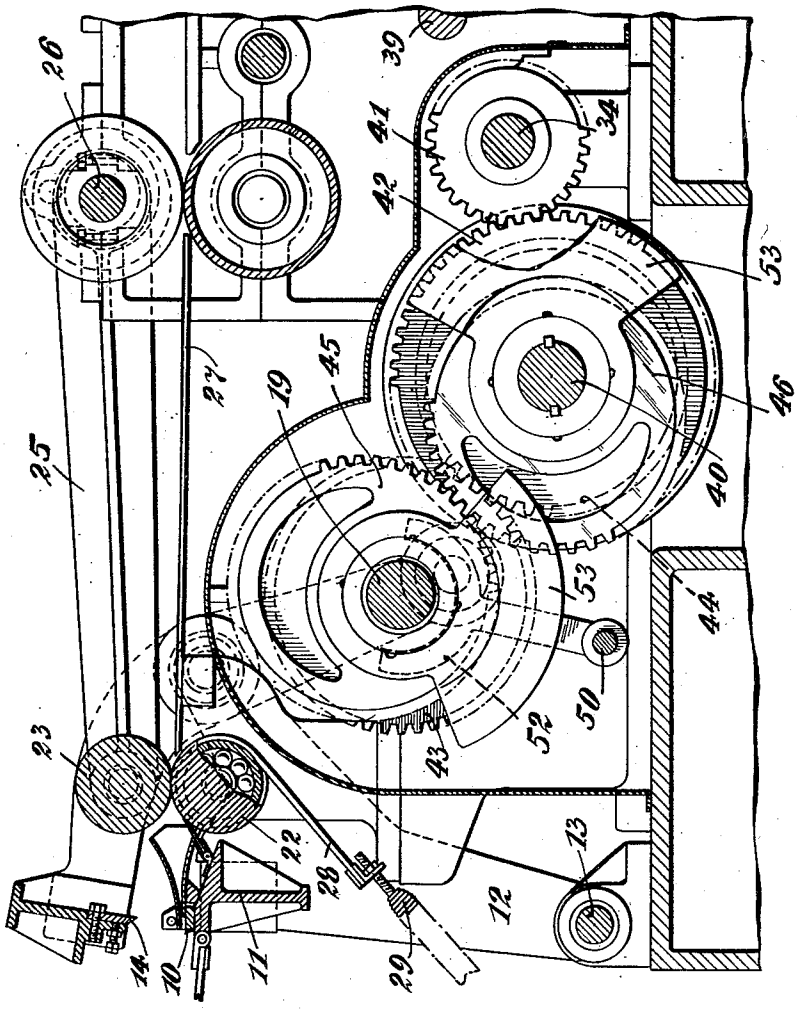
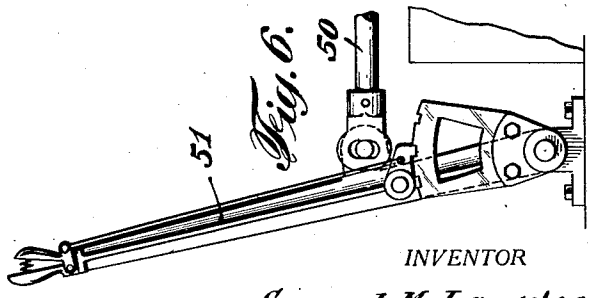


Fig. 6.



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Fig. 3.

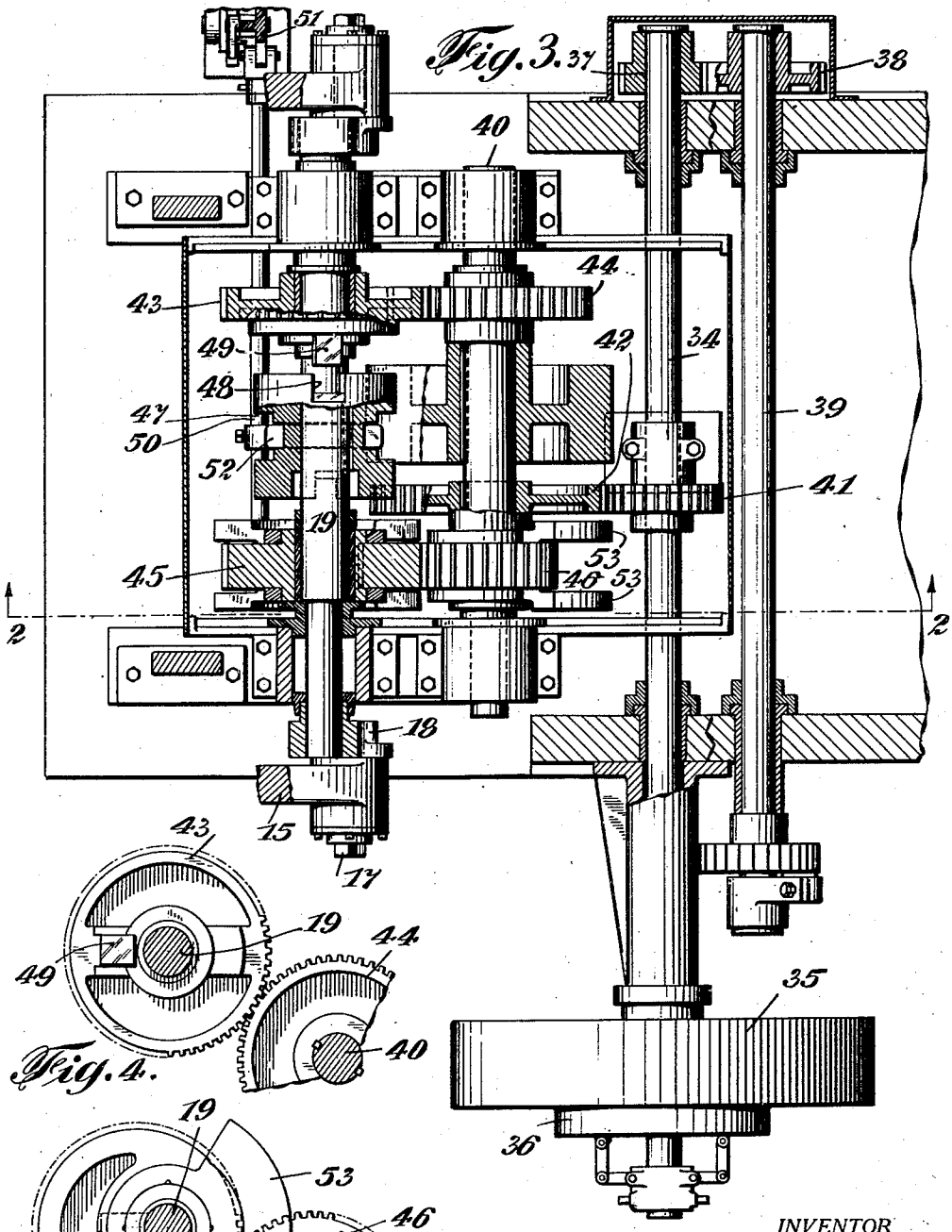


Fig. 4.

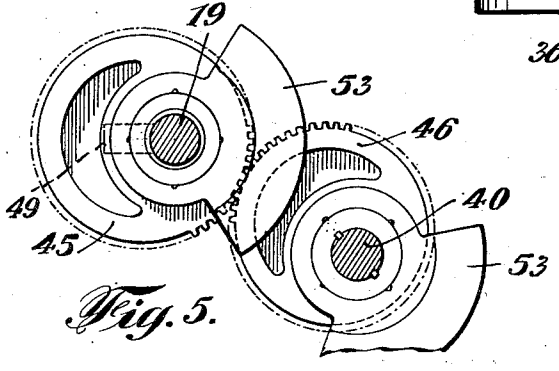


Fig. 5.

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UNITED STATES PATENT OFFICE.

SAMUEL M. LANGSTON, OF WENONAH, NEW JERSEY.

CUT-OFF MECHANISM.

Application filed July 3, 1923. Serial No. 649,282.

To all whom it may concern:

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

This invention relates to that type of cut-off mechanism adapted for use with continuously delivered material in sheet, rod, or other analogous form, and in which mechanism the knives move back and forth in the general direction of the travel of the material, and cut and then separate while traveling with the material.

For some classes of comparatively stiff material, it is important that the rate of travel of the two knives in the general direction of movement of the material at the time of cutting action be substantially the same as the rate of travel of the material. If the knives travel at a very much slower rate than that at which the material is being supplied to the cut-off, said material will be retarded or forced to buckle, while if the knives travel at a very much faster rate than the material, there is a tendency to pull the material along or tear it and prevent the forming of a clean cut. As the cutting action requires but a very short time interval, the speed of the material, and therefore the length of the sections, may vary within certain limits in respect to a given speed of cutter movement, and commercially satisfactory results be obtained.

If longer sections are desired, satisfactory results cannot be secured with a given design and construction of cutter, by slowing down the speed of the cutter drive in respect to the material feed drive, or by speeding up the feed in respect to the cutter drive. Likewise, shorter sections cannot be satisfactorily cut by the reverse adjustments.

The cut-off mechanism may be operated intermittently so that the desired length of material may be permitted to pass between the knives while the latter are at rest. The knives may then be started in motion and go through one complete cycle and come to rest in open position, the rate of travel of the knives in the direction of movement of the material while cutting the latter, being accurately timed to that of the material. Obviously considerable power is required to effect such intermittent stopping and starting of the heavy parts, and there is the initial cost as well as the expense of installation, operation and upkeep of the controlling and operating means for effecting such starting and stopping action.

One object of my present invention is to provide means whereby a given design of cutter of the type shown in my Patent 1,359,076, granted Nov. 16, 1920, may be used to cut longer or shorter sections in a satisfactory manner with the cutter maintained in continuous motion. In this type, one knife moves back and forth in the same path, substantially parallel to the line of feed, while the other knife is carried by a member pivoted to the carrier of the first mentioned knife. I accomplish my object by increasing or decreasing the speed of the feed of the material so that the desired length will pass a given point in the fixed time period of a cycle of the cutter, and I vary the speed of the cutter in the cutting part of its cycle to agree approximately with the speed of the material, but without changing the mean or average speed of the cutter or its time for a complete cycle.

By providing for the continuous but non-uniform movement of the crank which operates the knives, said knives may have their rate of travel during the cutting action substantially the same as that of the material, but the return movement of the knives while separated will be at a very much slower or faster rate, depending upon the length of the desired sections. Thus, if longer sections are desired, the cutters may move fast with the material during cutting, and move at a slower rate during the return part of the cycle, while if shorter sections are desired, the cutter may move slowly with the slower moving material during cutting, but have a very much faster return movement. In other words, each knife moves continuously in its cycle, and always completes a cycle in a given time period, but the rate of movement of each knife during the cutting portion of its cycle will agree approximately with the faster or slower moving material, and during the remainder of the cycle will be such as to complete the cycle on time.

A further object of my invention is to provide mechanism whereby speed of the cut-off knives during the cutting action may

be easily and quickly changed in respect to mean speed for the complete cycle of movement, to accommodate the cutting action speed to different speed of sheet delivery and corresponding variation in the length of the cut-off sectiosn.

In the accompanying drawings I have illustrated one embodiment of my invention, and have illustrated it as incorporated in a machine otherwise substantially the same as that illustrated in my prior application Serial No. 555,936, filed April 22, 1922, Patent No. 1,462,138, issued July 17th, 1923. In these drawings:

Fig. 1 is a side elevation of the portion of the machine embodying my present invention.

Fig. 2 is a section on the line 2—2 of Fig. 3,

Fig. 3 is a section on the line 3—3 of Fig. 1.

Figs. 4 and 5 are vertical sections showing the two trains of gears, and

Fig. 6 is a detail of the gear clutch lever.

In the machine illustrated the cutter is constructed substantially as shown in my prior Patent 1,359,076, issued November 16th, 1920. One knife 10 is carried by a transverse beam 11 which connects a pair of supporting arms 12 pivoted on pivot pins or a rock shaft 13. The other knife 14 is secured to a transverse beam carried by a pair of arms 15 connected intermediate of their ends to the arms 12 by pivot pins 16. The arms 15 have their ends opposite to the knife 14, connected to crank pins 17 on crank arms 18 of a transversely extending crank shaft 19. Thus by rotating the shaft 19 the arms 12 will swing upon their pivotal support 13 and the knife 10 will move back and forth in the general direction of the travel of the material. At the same time the arms 15 swing upon their pivotal support 16 to move the knife 14 toward and from the knife 10. The resultant motion imparted to the knife 14 is substantially an elliptical one barely intersecting the arcuate path of the knife.

The material which is to be cut up into sections may be operated on by any suitable mechanism. As shown, it passes between a pair of rotary members 20 and 21 which may be either feed rollers or may be designed to perform some operation on the sheet such as slitting, scoring, slotting, perforating, etc. As shown, the material also passes betwen a second pair of rotary members 22, 23, which are close to the knives 10, 14, when the latter are in rearward position, and serve as feed rolls. The upper roll 23 may be carried by a pair of pivoted arms 24, 25, one of which may carry a train of gearing from the shaft 26 of the upper rotary member 21. The material may be guided from the members 20, 21 to the members 22, 23, by a platform 27, and may be guided from the feed rolls 22, 23 to the lower knife by a series of belts 28 connected to the beam 11, and extending over idlers on the shaft of the feed roller 22, and thence to tension springs 29 which permit the back and forth movement of the belts, but hold them taut and form a continuous support from the feed rollers to the knives. Beyond the knives there may be a pair of feed rollers 30, 31 for receiving the cut off sections, and the advancing end of the sheet after each cut off operation may be guided to these rollers by belts 32 held taut by springs 33.

The machine is provided with a main drive shaft 34 which is illustrated as being connected to a drive pulley 35 by a clutch 36. The cut-off mechanism and the feed mechanism are independently driven from this shaft. The power transmitting connection between the main drive shaft 34 and the feed rollers is illustrated as including a pair of gears 37, 38, connecting the shaft to an auxiliary shaft 39. This shaft 39 serves as the main drive shaft for the sheet feeding mechanism as well as the mechanism which performs the other operations on the sheet before the cut-off. Any suitable train of gears may connect the shaft 39 to the rotary members 20, 21, and to the other operating parts of the machine.

In order to permit of the cut off of sections of different lengths, I provide for varying the speed of the feeding mechanism in respect to the main drive shaft. This is accomplished by providing a plurality of pairs of gears 37, 38, of different power transmitting ratio, whereby upon removing one pair of gears and substituting another, the shaft 39 may be driven at any desired speed in respect to the shaft 34. Obviously any other suitable power transmitting mechanism might be employed in place of the gears 37 and 38. It is only essential that the shaft 39 be driven from the shaft 34 and that the driving means provide for variation in the speed ratio.

The crank shaft 19 of the cut-off mechanism is driven from the main shaft 34 independently of the shaft 39, and through an auxiliary shaft 40 which serves as the main drive for the cut-off mechanism. The shaft 40 is driven from the shaft 34 by a pair of gears 41, 42.

As an important feature of my invention I provide a plurality of power transmitting mechanisms between the shaft 40 and the shaft 19, whereby a single revolution of the shaft 40 imparts a single revolution of the shaft 19, but the speed of the shaft 19 during that portion of its cycle corresponding to the cutting action of the knives 10, 14, is varied to agree with the faster or slower speed of sheet delivery. As shown, the

crank shaft 19 and the cutter drive shaft 40 are provided with a pair of circular intermeshing gears 43, 44 and a second pair of intermeshing elliptical gears 45, 46. The gears 44 and 46 are keyed or otherwise rigidly secured to the shaft 40, whereas the gears 43 and 45 are provided with means for connecting them to or disconnecting them from the shaft 19 on which they are mounted. The connecting means illustrated includes a clutch collar 47 keyed to but slidable along the shaft 19 adapted to interlock with either of the gears 43, 45. The interlocking connection is of the single tooth type, whereby each of the gears can be locked to the shaft in only a single position in respect to the latter. Thus in connecting either gear 43, or 45 to the shaft 19, the proper timing of the cutter in respect to the other parts of the machine which operate on the sheet is insured. The clutch collar 47 is shown as having a pair of sockets or recesses 48 upon opposite sides thereof, and adapted to receive either of the pair of lugs or teeth 49 one connected to the gear 43 and the other connected to the gear 45. Any suitable clutch shifting mechanism may be employed, as for instance, a transversely extending rod 50 connected to a handle lever 51, and a yoke or collar 52 engaging in a groove in the clutch collar 47.

To prevent vibration from the high speed rotation of the elliptical gears, each gear may have secured thereto a pair of counterbalancing weights 53 projecting opposite to the portion of maximum radial distance. In referring to the gears 45, 46 as elliptical gears, I do not wish to be limited to gears in the form of true ellipses. I include any suitable form of non-circular gears which will impart a varying angular velocity to the shaft 19 during a uniform angular velocity of the shaft 40.

As the gears 43, 44 are circular, they will impart a uniform motion to the crank shaft 19, and in driving the cutters through a single cycle during a single rotation of the main shaft 40, the cutting operation will be at one speed. This will correspond to a predetermined gear ratio at the gears 37, 38, and a speed of the feed approximately equal to the speed by the knives during this cutting part of the cycle. By shifting the clutch collar 47 to the opposite limiting position, the crank shaft 19 will still make a single and complete revolution for each revolution of the shaft 40, but the part of the cycle of the cutters during which the cutting action takes place will be very much faster than the remaining part of the cycle, and will correspond to a different gear ratio at the gears 37, 38, and a higher speed of sheet delivery. If the parts be assembled with the elliptical gears in one position, they will operate the cutter during the cutting action at a slower speed than that which results when the circular gears 43 and 44 come into operation. If the elliptical gears be rotated through 180° on their respective shafts, and the gear 46 be keyed to its shaft in that position, it will be apparent that the cutting action, when the elliptical gears are in action, will be faster than that resulting from the use of the circular gears.

In employing my invention in a machine for making shingles or shingle strips, the operator may select the pair of gears 37, 38 which will advance the material a distance equal to the desired length of the shingle or shingle strip during a single rotation of the main shaft 34. The clutch 47 is then moved to lock either the gear 43 or the gear 45 to the cut-off drive shaft 40, depending upon the gear ratio which is selected for operating the main feed drive shaft 39. The circular gears 43, 44 will take care of different lengths of shingles or shingle strips within a predetermined range, as the speed of the knife does not need to exactly correspond to the speed of the sheet being cut. The elliptical gears 45, 46 will take care of another range of shingle lengths. For ordinary work of this kind, the two pairs of gears will take care of the various lengths which are ordinarily used for this class of material. It will be apparent that if a wider range is desired the elliptical gears may be released, rotated through 180°, and again locked so as to take care of a series of another range of lengths. It will also be apparent that a third or fourth pair of gears might serve to connect the shafts 40 and 19, and operated by suitable clutch mechanism so as to give further range of adjustment, but all such gears should drive the shaft 19 through a single complete revolution during a revolution of the cut-off drive shaft 40.

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

1. A machine for cutting material into sections, including a main drive shaft, a pair of feed rolls, power transmitting mechanism for driving said feed rolls from said shaft, a cut-off mechanism including coacting members movable in the direction of the material during the cutting action and power transmitting mechanism for driving said cut-off mechanism from said shaft, one of said power transmitting mechanisms including a plurality of gear trains, and means for bringing any one of said gear trains into operation, said gear trains giving the same mean velocity, but different velocities during the cutting action of the cut-off mechanism.

2. A mechanism for cutting material into sections, including means for feeding the

material at a rate directly depending upon the length of the sections into which the sheet is to be sub-divided, cut-off mechanism including a pair of coacting members movable in the general direction of the travel of the sheet during the cutting action, a main drive shaft for independently operating said feeding means and said cut-off mechanism, the operating connection between said main drive shaft and the cut-off mechanism including a plurality of pairs of gears having the same mean speed transmission ratio but imparting different velocities to said members during the cutting action, and means for bringing any one of said pairs of gears into operation.

3. A machine for subdividing material into sections, including a pair of cutters movable back and forth in the general direction of the travel of the material, a crank shaft for operating said members, a drive shaft, a pair of circular gears connecting said crank shaft and said drive shaft, a pair of elliptical gears connecting said crank shaft and said drive shaft, and clutch mechanism for bringing either of said pairs of gears into operation.

4. In combination, a pair of cooperating cutter members, a main drive shaft, a pair of circular gears for driving said cutter members from said drive shaft, a pair of elliptical gears for driving said cutter members from said drive shaft, and means for preventing power transmission through either of said pairs and transmitting it through the other.

5. A cut-off mechanism, including a crank shaft, a member mounted to oscillate about a fixed axis, a second member pivotally connected to the first mentioned member and to the crank of said crank shaft, a pair of cooperating cutters carried by said members, a drive shaft, and a pair of elliptical gears connecting said drive shaft and said crank shaft, and imparting to said knives a widely varying speed during their cycle of operation.

6. A cut-off mechanism including a crank shaft, a member mounted to oscillate about a fixed axis, a second member pivotally connected to the first mentioned member and to the crank of said crank shaft, a pair of cooperating cutters carried by said members, a drive shaft, and a pair of elliptical gears connecting said drive shaft and said crank, a pair of circular gears connecting said crank shaft and said drive shaft, and a clutch on one of said shafts for connecting thereto the corresponding gear of either of said pairs.

7. A cut-off mechanism, including a crank shaft, a member mounted to move back and forth in the same path substantially parallel to the direction of feeding movement of the material to be cut, a second member pivotally connected to the first mentioned member and to the crank of said crank shaft, a pair of cooperating cutters carried by said members, a drive shaft, and a pair of elliptical gears connecting said drive shaft and said crank shaft, and imparting to said knives a widely varying speed during their cycle of operation.

Signed at New York, in the county of New York and State of New York, this 27th day of June, A. D. 1923.

SAMUEL M. LANGSTON.