March 24, 1931. A. E. COLLINS ET AL 1,797,638

CUTTING MACHINE

Filed Jan. 21, 1928 6 Sheets-Sheet 1

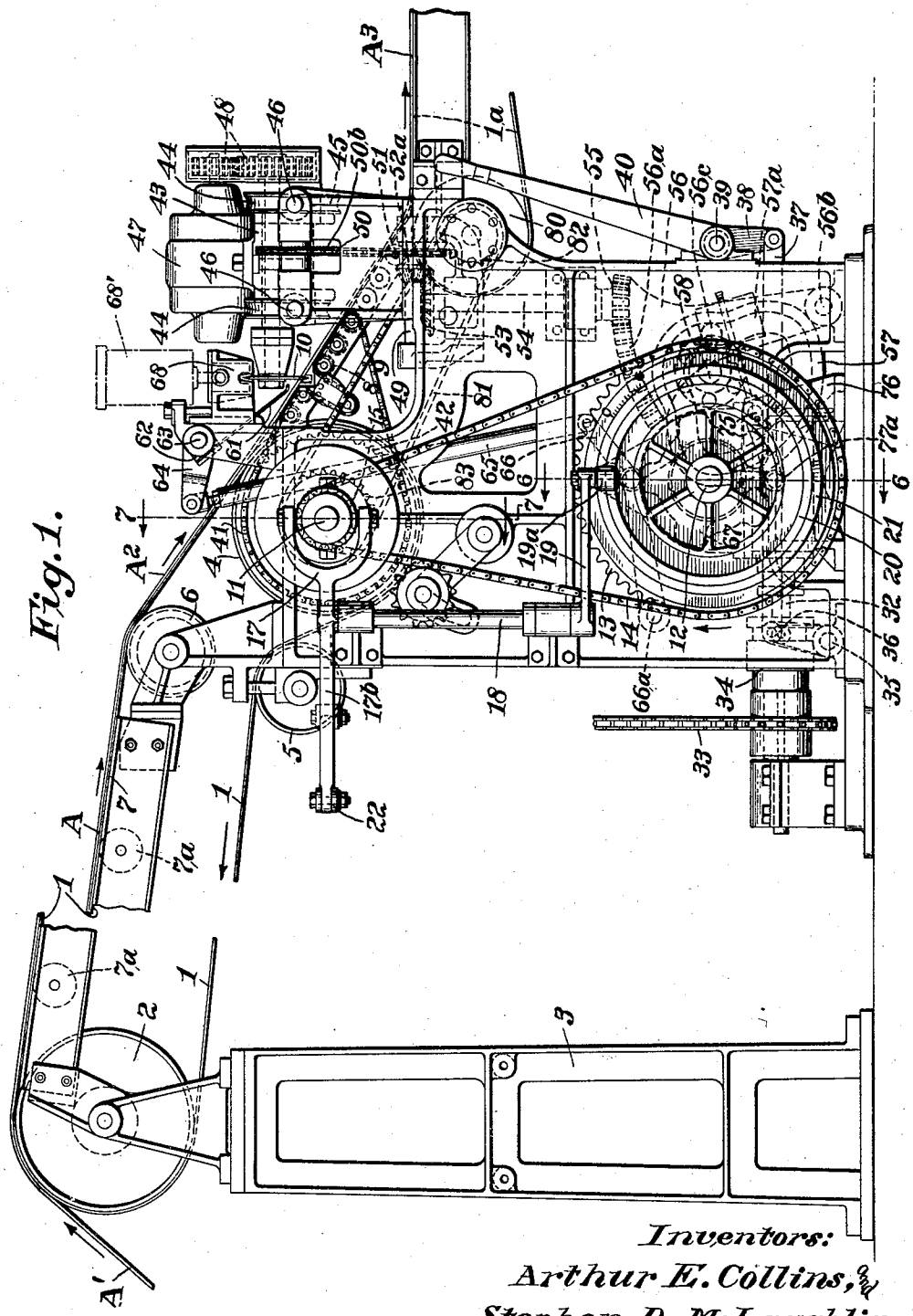


Fig. 1.

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Fig. 2.

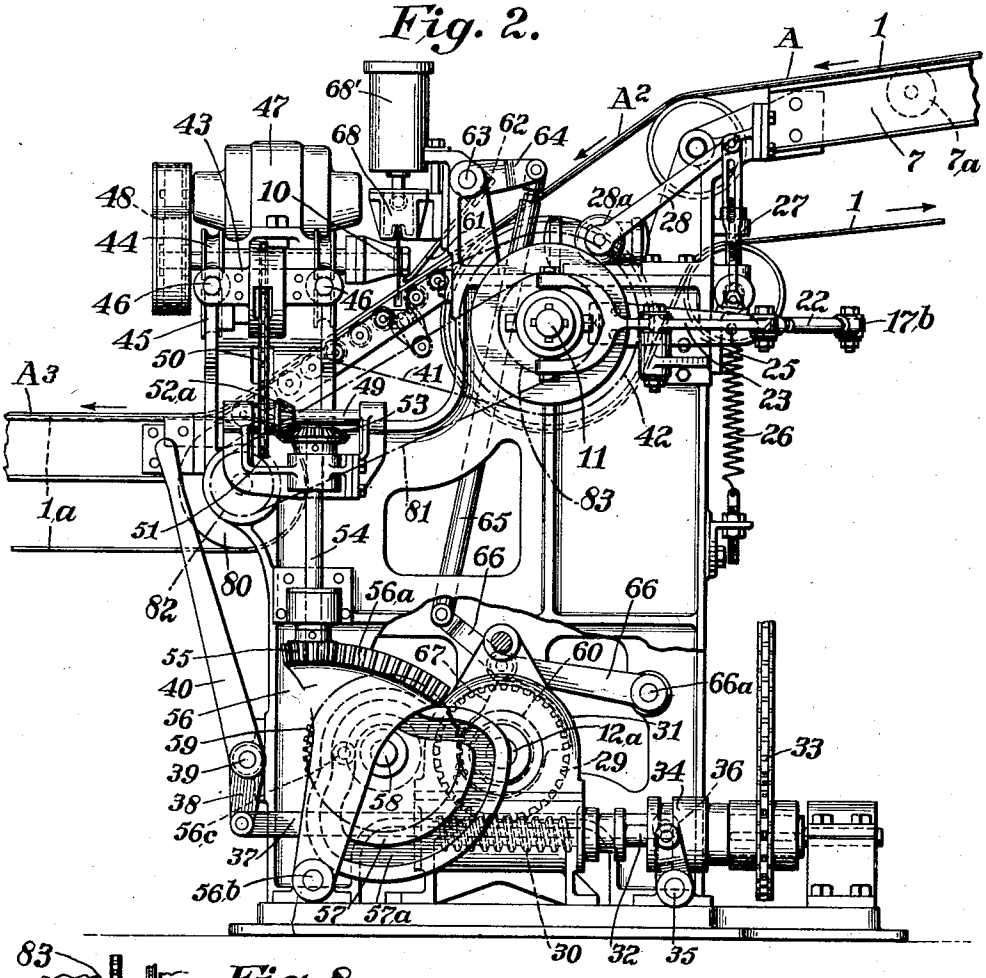


Fig. 8.

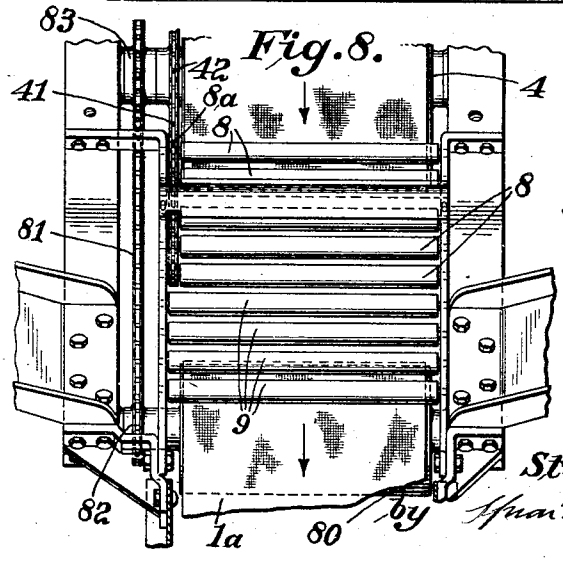
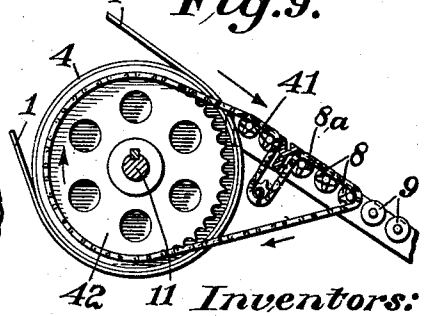


Fig. 9.



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Fig. 3.

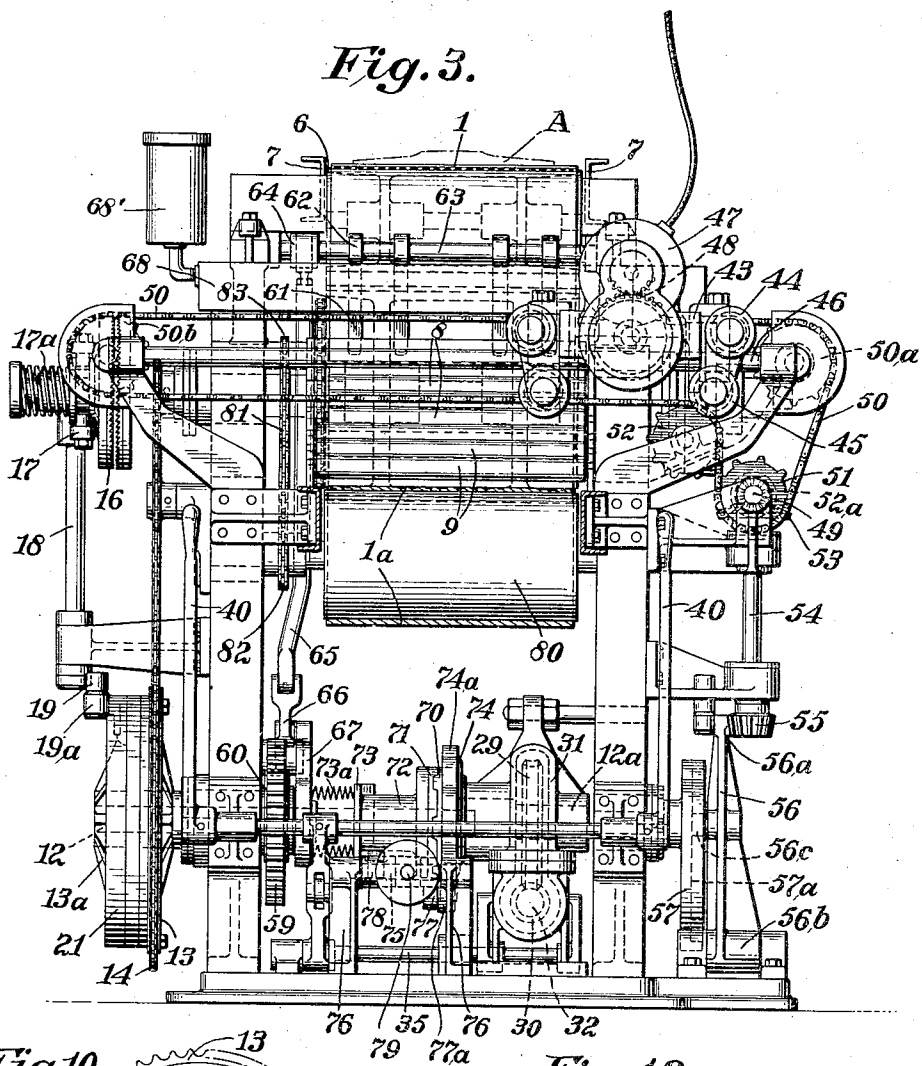


Fig. 10.

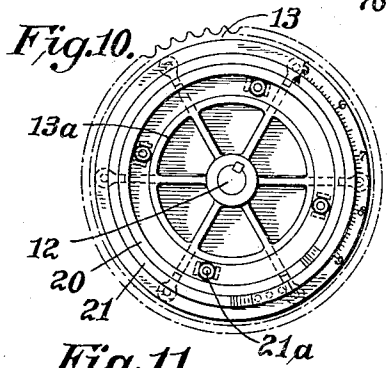


Fig. 11.

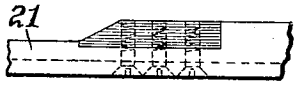
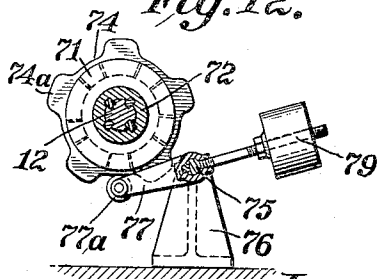


Fig. 12.



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CUTTING MACHINE

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Fig. 4.

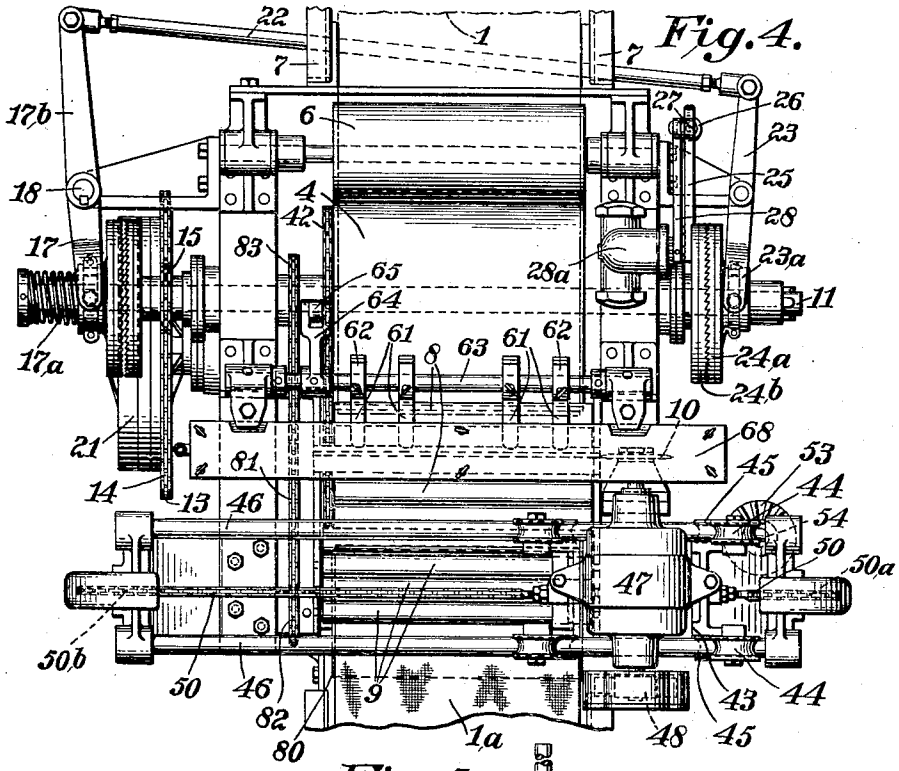
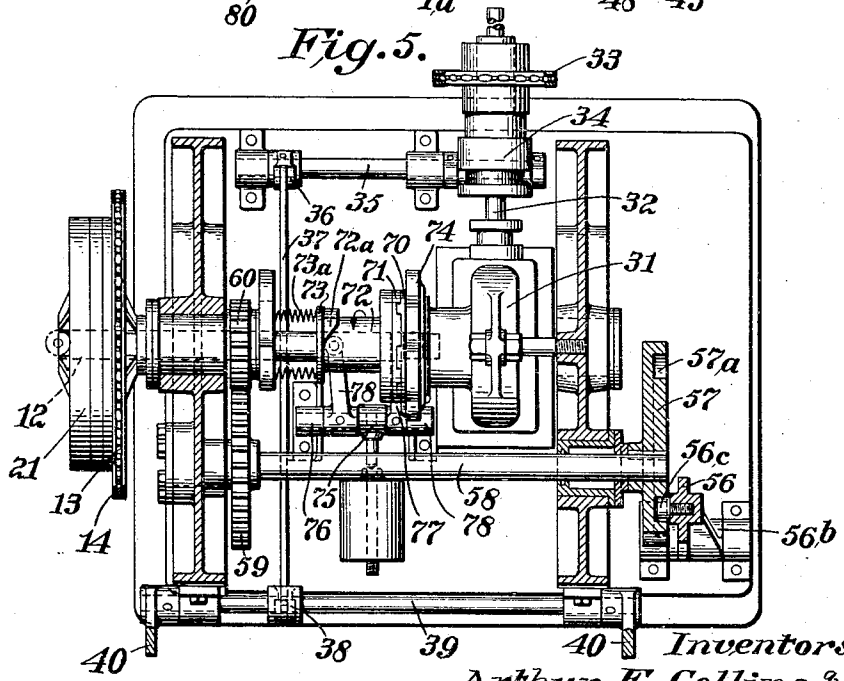


Fig. 5.



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CUTTING MACHINE

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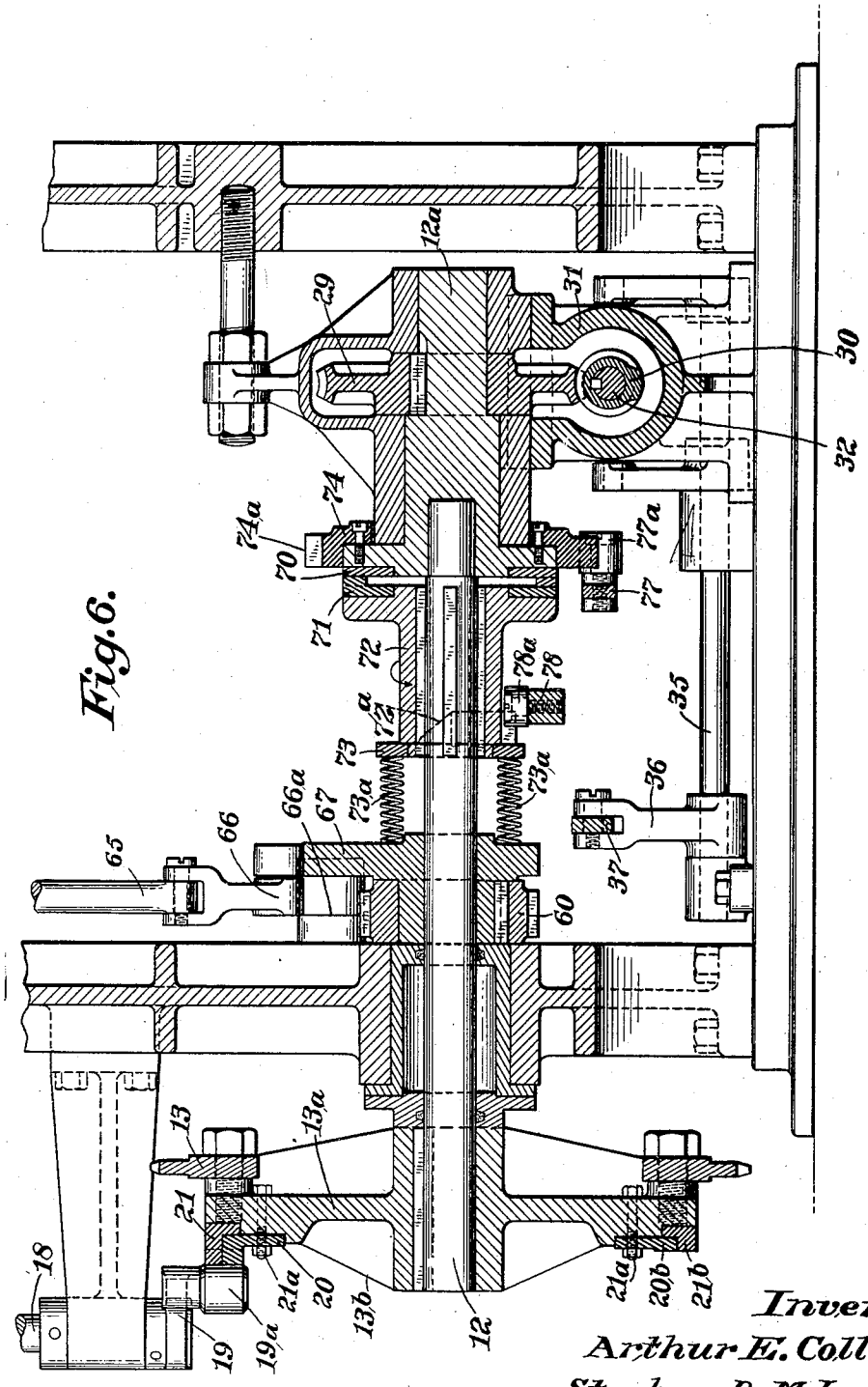


Fig. 6.

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CUTTING MACHINE

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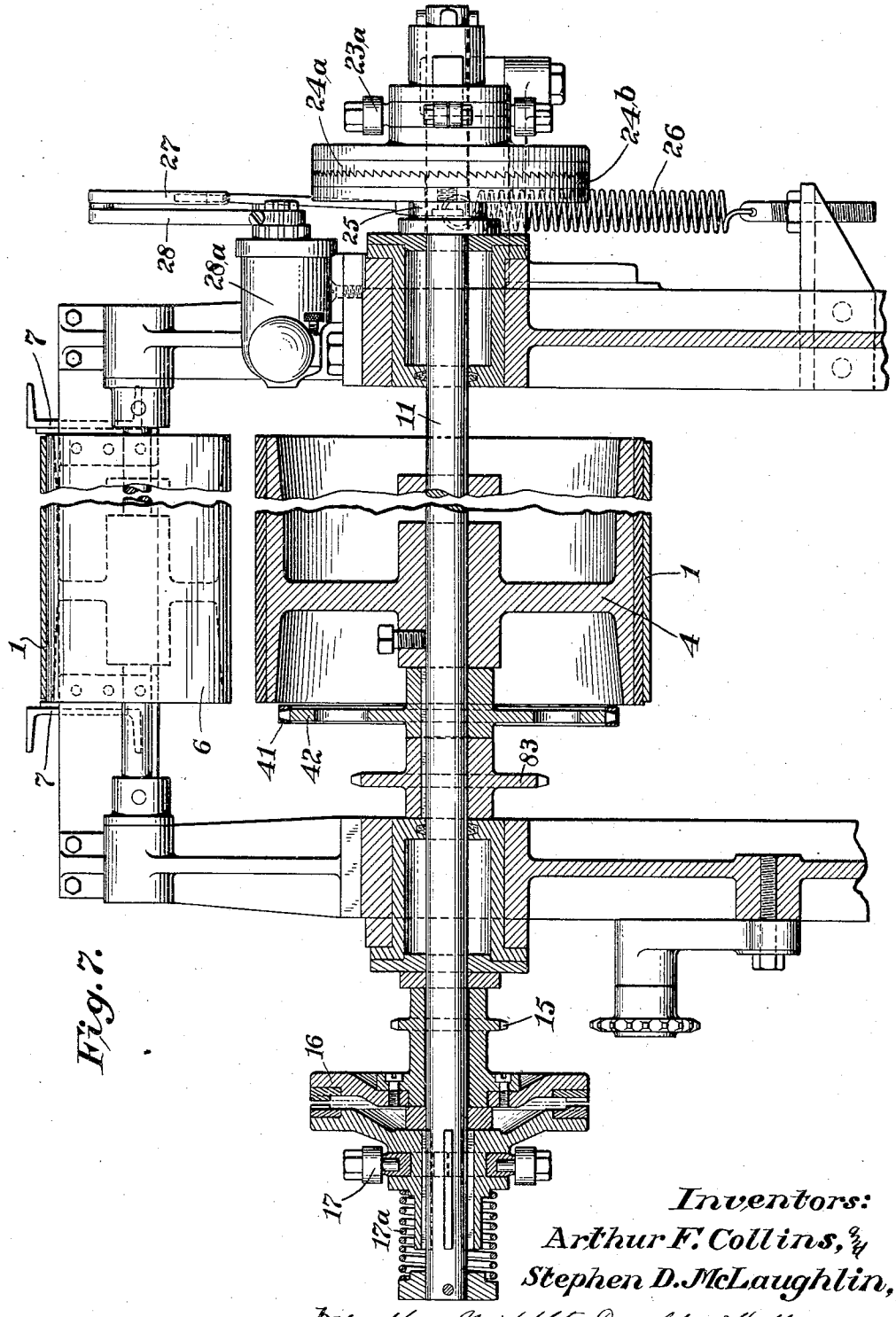


Fig. 7.

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Patented Mar. 24, 1931 1,797,638

UNITED STATES PATENT OFFICE

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CUTTING MACHINE

Application filed January 21, 1928. Serial No. 248,399.

Our said invention relates to means for automatically cutting a continuous web or slab of material into predetermined lengths and is more particularly designed for cutting tread slabs produced by the process disclosed in an application filed on the 18th day of February, 1928, though not limited to such use.

The invention aims to provide a relatively simple, durable and efficient machine which will expeditiously and economically effect the severing of the web or slab, and be automatic in operation.

The invention further aims to provide a machine of this character which will be capable of being rapidly adjusted to cut any desired length of material within prescribed limits.

The invention also aims to provide improved means for feeding the material through the machine to co-operate with the cutter and in a manner to prevent injury to the stock.

With these, and other objects in view which will be apparent from the following specification, the invention includes the novel construction and arrangement and combination of parts hereinafter described and defined by the appended claims.

What we at present consider the preferred embodiment of the invention is illustrated in the accompanying drawings in which:—

Figure 1 is a side elevation of the machine partly broken away.

Figure 2 is a view of the opposite side seen in Figure 1 with parts broken away.

Figure 3 is an end elevation of Figure 1, looking toward the left.

Figure 4 is a top plan view partly broken away.

Figure 5 is a sectional plan of the base portion and associated mechanism.

Figure 6 is an enlarged vertical section substantially on line 6—6 of Fig. 1.

Figure 7 is an enlarged vertical section on the line 7—7 of Fig. 1.

Figure 8 is a detailed view of the feed rollers and associated parts, looking in a direction at right angles to the plane thereof.

Figure 9 is a detail sectional view of the roller drive.

Figure 10 is a detail elevation of the measuring cam and sprocket.

Figure 11 is a fragmentary detail side view of the cam.

Figure 12 is a detail sectional view through the main clutch, showing associated parts.

In the cutting machine which forms the subject matter of this application the cutter operates intermittently upon a correspondingly intermittently fed portion of a continuous web or slab coming from a continuous supply means or source and fed to the intermittent moving means through the intermediary of a slack loop. In the present drawings the web or slab to be severed is indicated at A and a portion of the slack loop at A′ (Fig. 1) the supply means being omitted as forming no part of the present invention.

The rising portion A′ of said slack loop is led to a conveyor belt 1, by which it is conveyed to the cutting mechanism, such belt passing around an idle pulley or drum 2 supported on a suitable pedestal or frame 3 at a desired distance from the cutting mechanism, and also around a driving drum 4 and idle guide drums 5 and 6. The upper portion or run of the belt is preferably supported against sagging by idle rolls 7^a supported by frame members 7. The drums 4 and 6 are so positioned relative to each other that the portion A^2 of the stock is supported by the belt in an inclined position (preferably at an angle of approximately 30°) and after leaving the belt the web or slab passes to a series of supporting rollers 8 and 9 which support the stock in the same inclined plane and enable it to be severed by the transversely moving intermittently operated cutter 10 as hereinafter described.

The severed blanks A^3 are delivered to an endless conveyor 1^a by which they may be conveyed to any desired point. Said belt is driven by roller or drum 80 which in turn is driven by sprocket chain 81 passing around

sprocket 82 on the shaft of roller or drum 80 and sprocket 83 on shaft 11.

The drum 4 is fast on a shaft 11 which is driven from shaft 12 through the intermediary of sprocket wheel 13 fast on shaft 12, sprocket chain 14, and sprocket wheel 15 loose on said shaft 11 and adapted to be clutched thereto by clutch 16 of the positive or interlocking type (Fig. 7) moved by the automatically operated shifter fork 17, against the pressure of spring 17*a*. Said shifter fork is mounted on the upper end of a vertical rock shaft 18 (Figs. 1, 3 and 4) the lower end of which shaft carries an arm 19 provided with a roller 19*a* coacting with cam means carried by shaft 12 whereby the web feeding means is automatically started and stopped. In order that the length of the feeding period may be varied and thus different lengths of blanks cut from the web (for making different sized tires for example) we prefer to make the cam means adjustable and of the construction which will now be described.

Sprocket wheel 13 is preferably formed as an annular toothed ring bolted to the inner face of a carrier member 13*a* (Fig. 6) keyed to shaft 12.

To the outer face of said carrier member 13*a* are secured a pair of cam rings 20 and 21 preferably of substantially L shape in cross section, seated in annular rebates in the carrier member (or the strengthening ribs 13*b* thereof). Cam ring 21 is a floating ring (when released) and has its vertical portion lying behind the outer peripheral portion of ring 20 when the latter is clamped to carrier member 13*a* by the bolts 21*a* which pass through elongated openings in the vertical portion of flange of the ring. The juxtaposed laterally projecting portions 20*b* and 21*b* have an aggregate width corresponding to the width of the peripheral face of roller 19*a* and are provided with relatively high and low parts. By loosening bolts 21*a* ring 21 may be adjusted circumferentially to any desired extent to determine the relative lengths of high and low part. In other words, if ring 21 is adjusted so that its high part coincides with high part of ring 20 the high part is reduced to its smallest linear dimension and the low part correspondingly increased which gives a minimum period of dwell in the stock feed, and maximum period of feed which results in the moving of the maximum length of blanks. Circumferential adjustment of ring 21 increases the aggregate length of high cam part and reduces the length of low part according to extent of movement, and thereby reduces the period of feed of stock and produces shorter blanks.

In order to accurately determine the length of blank to be cut, one of the rings, say 21 is provided with graduations to indicate linear units of measurement, such as feet, as indicated in Fig. 1.

To insure the stock always coming to rest at precisely the same point relative to the line of severance without undue strain on the mechanism due to suddenly checking it on release of the clutch 16, I provide the following mechanism:

Shifter lever 17 is provided with an arm or extension 17*b* which is connected by a link or rod 22 with the one arm of a lever 23 of the first order located on the opposite side of the machine (Fig. 4), the other end of which lever carries a shifter fork 23*a* operating the movable member 24*a* of a clutch of the positive or interlocking type. The co-operating clutch member 24*b* is loose on the shaft 11 but held against axial movement thereon, and said member 24*b* has affixed thereto an arm 25, one end of which is connected by tension spring 26 to a fixed abutment which tends to hold it in the position shown in Figure 2 or to return it thereto if moved upwardly from said position. Said arm 25 is also connected by a lengthwise adjustable rod 27 with the swinging arm 28 of a fluid check of the door check type shown conventionally in said figure at 28*a*. When the clutch 16 is uncoupled and checking clutch 24*a*, 24*b* engaged the inertia of the mechanism tends to or causes an overthrow of the shaft which is yieldingly resisted by the spring 26 which automatically imparts a sufficient amount of counterrotation to the shaft, against the resistance of check 28*a* to bring it to rest at the precise point required.

Shaft 12 heretofore referred to is preferably driven from a worm wheel 29, Fig. 6 in the manner hereinafter described which meshes with a worm 30 (enclosed in gear case 31) fast on shaft 32 driven from any suitable prime mover (not shown). Such drive may comprise a chain and sprocket drive (see right of Fig. 2) the chain 33 of which may be driven through a Reeves variable speed drive (not shown). A clutch is provided at 34 preferably of the friction type the shifter fork of which is mounted on a rock shaft 35 carrying an arm 36 Fig. 1 connected by rod 37 to an arm 38 fast on rock shaft 39 which carries two hand levers 40 disposed on opposite sides of the machine so that an operator on either side may throw out the clutch and stop the apparatus when circumstances render this necessary. As hereinbefore indicated, the web or slab is fed past the cutter in an inclined plane which, in connection with the vertical position of the cutter, produces blanks with beveled edges which is desirable for tread stock as enabling a proper junction of the ends upon application to a tire carcass. After leaving the inclined portion of the belt conveyor the stock or web passes over driven rollers 8 and idle rollers 9, all disposed in a plane coincident with the inclined portion of the belt conveyor.

Rollers 8 are shorter at one end than rollers

9 and carry sprockets 8a which are all engaged by a sprocket chain 41 which passes around a sprocket 42 on the shaft 11.

The cutter 10 of the rotary disk type has its shaft journaled in a carriage 43 provided with upper and lower sets of grooved rollers 44—45 respectively which engage with track rods 46 extending transversely of the machine.

The carriage supports an electric motor 47 which drives the cutter shaft through reducing gearing indicated at 48 (Fig. 1) preferably inclosed in a gear casing. Current is led to the motor through a flexible cable, from an overhead source of supply.

For imparting reciprocating movement to the carriage we employ a sprocket chain 50 Fig. 3 which has one end attached to one end of the carriage (say right hand end Fig. 3) thence passes around an idle guide sprocket 50*a*, a drive sprocket 51 in the form of a depending loop, thence over guide sprockets 52 to and around idle sprocket 50*b* on the opposite side of the machine, and to the opposite end of the cutter carriage to which it is connected.

Drive sprocket 51 is fast on a short shaft 49 journaled in a suitable fixed bearing fork (Fig. 2) which shaft carries a beveled gear 52*a* which meshes with a bevel gear 53 fast on the upper end of a vertical shaft 54 journaled in fixed bearings.

This shaft 54 has fast on its lower end a gear or pinion 55 meshing with an oscillating rack segment 56*a* carried by an arm or quadrant 56 pivoted to oscillate about axis 56*b*. Quadrant 56*a* has a roller 56*c* which engages a cam groove 57*a* in a cam member 57 fast on shaft 58 (Figs. 2 and 5) which shaft is driven by spur gears 59 and 60 from shaft 12 (see Fig. 5).

Cam groove 57*a* has two concentric portions, one relatively near the axis and one remote, and while the roller is traveling in these concentric portions, no movement is imparted to the quadrant, these periods corresponding to the dwell of the cutter carriage at each side of the web, while the movement across the web in one direction is caused by the travel in the cam groove from the inner concentric portion to the outer and vice versa.

The manner in which the oscillations of the segment or quadrant produce the reciprocations of the knife carriage will be obvious from the operating connections above described and further statement thereof is deemed unnecessary.

It is desirable that means be provided to hold down the web or slab adjacent the cutter while it is performing the severing operation. To this end we provide a series of yielding presser fingers 61, Figs. 1 and 2, mounted on carriers 62 fast on transverse rock shaft 63 which is provided with a rigidly attached arm 64 connected by rod 65 with the free end of a lever 66 which has its other end fulcrumed on a fixed pivot indicated at 66*a*. The intermediate portion (elbow) of lever 66 carries a roller which coacts with a cam 67 designed to move the presser fingers, through the connections described, towards and from the web in synchronism with the intermittent movement of the web.

We find it is advantageous to apply lubricant to the cutting disk which facilitates its action on unvulcanized rubber. For this purpose we provide an oil box 68 extending transversely across the machine above the path of the cutter, which box or trough has a bottom of oil absorbent material provided with a slit or channel which receives the edge of the cutter disk as it travels back and forth. Said oil box is supplied with oil from tank 68′.

We have found that in a machine of this character, if the clutch 16, which is in effect a measuring clutch, is engaged with the shaft running at the relatively high speed necessary for quantity production, the fine teeth soon become broken. To avoid this, we provide means by which the entire machine will be stopped momentarily between the cutting of the slabs and automatically restarted, allowing the measuring clutch to be engaged, while free from driving strain. To this end we provide the following mechanism.

Worm wheel 29 is keyed to a supplemental shaft member 12*a* (Fig. 6) which preferably is provided at one end with a recess in which the end of the shaft member 12 is rotatably seated. Said end of shaft member 12*a* carries fast thereon a clutch member 70 of the jaw or toothed type which cooperates with a companion clutch member 71 carried by a sliding sleeve 72 having a splined engagement with shaft 12.

Said sleeve carries at the opposite end an annular flange member 73 which is acted upon by spring means, such as indicated at 73*a*, tending to force the clutch members into interlocking engagement. These clutch members have relatively few teeth which can therefore be made of requisite size and strength to prevent any danger of breakage when connecting the continuously driven shaft portion 12*a* with intermittently driven shaft portion 12.

Shaft portion 12*a* carries an annular cam member 74 which is provided with a plurality of lands or raised portions 74*a* and intervening depressions, five, for example.

A short shaft 75 (Figs. 3, 5, and 12) is pivotally mounted in brackets 76 parallel to shaft 12 and carries fast thereon a pair of arms 77 and 78, the former of which underlies the cam 74 and is provided with a roller 77*a* designed to ride on the lands of the cam and enter the recesses there between, said shaft also carrying a weighted arm 79 which

tends to hold the roller 77*a* in contact with the cam. The other arm 78 carries a roller 78*a* journaled on a vertical axis which cooperates with a dog 72*a* carried by the clutch sleeve 72.

As the cam 74 rotates, driven by the shaft member 12*a*, the roller 77*a* rides on one of the lands and arms 77 and 78 are swung sufficiently to cause roller 78*a* to clear the dog 72*a*, whereupon springs 73*a* will push clutch member 71 into engagement with clutch member 70, causing shaft member 12 to be driven from member 12*a*. The flange 73 will bear against the vertical roller and as the clutch sleeve rotates the dog 72*a* will clear said roller, which will at once be moved by the action of the counterweight into the position shown in Fig. 6, at which time the roller 77*a* will enter one of the recesses of cam 74. Thereafter the inclined or cam face *a* of dog 72*a* contacts with roller 78, causing clutch sleeve 72 to be moved to the left, Fig. 5, against the pressure of the springs, and the clutch members 70—71, to be disengaged.

The parts are so arranged and proportioned that during the engagement of the clutch members 70—71 the machine makes one complete cycle of operations.

The cam 21 is so designed and the parts so arranged that when clutch part 71 is withdrawn from part 70 the ring 21 will stop at such a position that the roller 19*a* is just at the end of the high part of ring 20 and ready as it were, to fall over the precipice.

The roller 19*a* is urged toward the ring 20 by reason of spring 17*a*, and this together with the inertia of the moving parts is sufficient to cause the roller 19*a* to drop off the end of the cam, thereby releasing and engaging the measuring clutch 16 at a time when the clutch members 70—71 are disconnected.

Thereupon, on continued rotation of shaft member 12*a* and cam 74, the roller 77*a* rides upon one of the lands and causes roller 78*a* to clear dog 72*a* and allow clutch members 70—71 to be engaged as above explained. When this occurs, the measuring clutch having already been engaged during the interval of power disconnection, the resumption of the drive will at once start the conveyor belt which will travel a sufficient distance to supply the requisite amount of tread, at which time the measuring clutch will be disconnected and the stock severed as hereinbefore explained.

Having thus described our invention, what we claim is:

1. In a machine of the class described, intermittently operated web feeding means, and means included in said web feeding means for permitting a yielding overthrow of said web feeding means and for returning the same after each overthrow to the normal advanced stopping position.

2. In apparatus of the class described, web feeding means, including an operating shaft, driving connections thereto including a clutch, means for automatically operating said clutch at determined intervals, means for checking the movement of said operating shaft including a movable clutch member loose on said shaft, a clutch member fast on the shaft, yielding means acting to restrain said loose clutch member against rotation, means whereby said loose clutch member is caused to engage the fast clutch member when the first above named clutch is operated.

3. Apparatus according to claim 2 on which the loose clutch member carries an arm that is operatively connected to a fluid pressure checking device.

4. In a cutting machine, web feeding means including an endless conveyor belt and a plurality of supporting rollers providing a support continued in the plane of the delivery portion of the belt, means for intermittently moving said belt and rotating said rollers, and intermittently operated cutting means including a disk moving transversely of the web in line with the space between two of the rollers.

5. Apparatus according to claim 4 in which the terminal portion of the conveyor belt and the rollers are located in an inclined plane and the cutter disk is disposed in a vertical plane.

6. Apparatus according to claim 4, in which presser fingers are arranged adjacent one of said rollers and means are provided for moving them towards and from the roller in synchronism with the feed.

7. Apparatus according to claim 4, in which means is provided for applying lubricant to the cutting disk during its travel across the web.

8. A web cutting machine comprising a conveyor belt having an upper conveying run provided with an inclined terminal portion, a plurality of rollers located in the plane of said inclined portion, certain of the rollers adjacent the belt being driven rollers and the remainder idle rollers, means for imparting intermittent movement to said belt and driven rollers, a disk cutter mounted to traverse the web in line with the space between two of said driven rollers, and conveying means for receiving the severed blanks from said idle rollers.

9. In a cutting machine, web feeding means, means for intermittently operating said web feeding means, including a measuring clutch, intermittently reciprocating web cutting means, power means for operating said web feeding means and reciprocating said cutter means, clutch means for connecting and disconnecting said power means, and means for causing engagement of the members of the measuring clutch after the members of the

second mentioned clutch have been disconnected.

10. In combination, web feeding means, means for intermittently operating said web feeding means including a measuring clutch, intermittently reciprocating web cutting means, power means for operating said web feeding means and reciprocating said cutting means, means for automatically momentarily disconnecting said power means after each cycle of operation, and means for causing engagement of the measuring clutch during such power disconnection.

11. In combination, web feeding means, means for intermittently operating said web feeding means including a measuring clutch and adjustable cam means for operating said measuring clutch, intermittently reciprocating cutting means, power means for operating said cam means and for reciprocating said cutting means, and means whereby said power means is momentarily disconnected from said cam means and cutting means at the end of each cycle of operations.

12. In combination, web feeding means, means for intermittently operating said web feeding means including a measuring clutch and adjustable cam means for operating said measuring clutch, intermittently reciprocating cutting means, power means for operating said cam means and reciprocating said cutting means, and means whereby said power means is momentarily disconnected from said cam means and said cutting means at the end of each cycle of operations, including a two part drive shaft, one part having operating connections to said web driving and cutting means, and the other power means, clutch means for connecting and disconnecting said shaft parts, and means operated by said power driven shaft part for momentarily disconnecting said clutch at the completion of each cycle of operations.

13. Apparatus according to claim 12 having its power shaft provided with a fixed clutch member and an encircling cam member, a slidable clutch carrying sleeve keyed on the driven shaft and yieldingly pressed towards said fixed clutch member, a rock shaft having an arm provided with a contact part yieldingly pressed into engagement with said cam, a dog fast on said power shaft having a circumferential contact part and inclined cam part, and a second arm fast on said rock shaft and having a contact part cooperating with said dog.

14. A web-feeding and cutting machine comprising a member engaging the web for advancing the same, forward-drive means for the web-engaging member, backward-drive means for the web-engaging member, and means for periodically disconnecting the forward driving means from the work-engaging member and connecting the backward-driving means thereto, the backward driving means comprising yielding means adapted to have potential energy developed therein by the over-run of the web advancing means.

15. A web-feeding and cutting machine as defined in claim 14, in which the forward-driving means includes two clutches in series and means for disengaging the clutch operatively nearer to the source of power and holding it disengaged while the other clutch is being engaged.

16. A web feeding and cutting machine comprising a member engaging the web for advancing the same, and forward-drive means for the web engaging member, said forward-drive means including two clutches in series and means for disengaging the clutch operatively nearer to the source of power and holding it disengaged while the other clutch is being engaged.

In testimony whereof, we affix our signatures.

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