J. G. HARDIE.

PAPER CUTTING MACHINE.

APPLICATION FILED JUNE 22, 1909.

1,066,492.

Patented July 8, 1913.

5 SHEETS—SHEET 1.

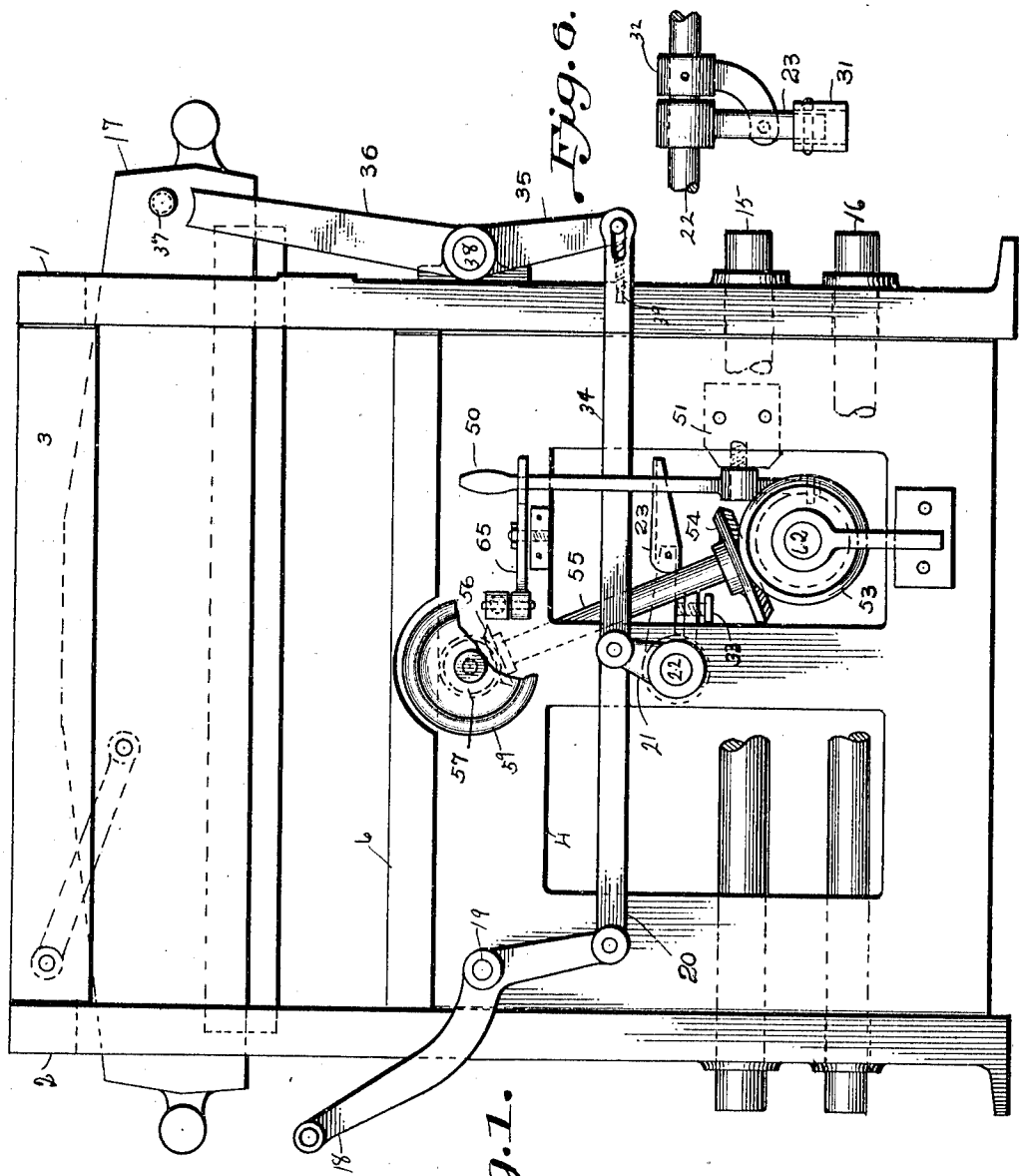


Fig. 6.

Fig. 1.

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5 SHEETS—SHEET 2.

Fig. 7.

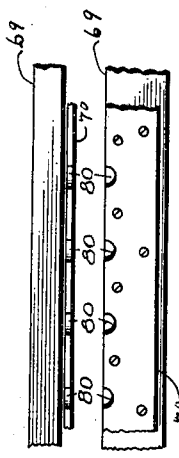


Fig. 2.

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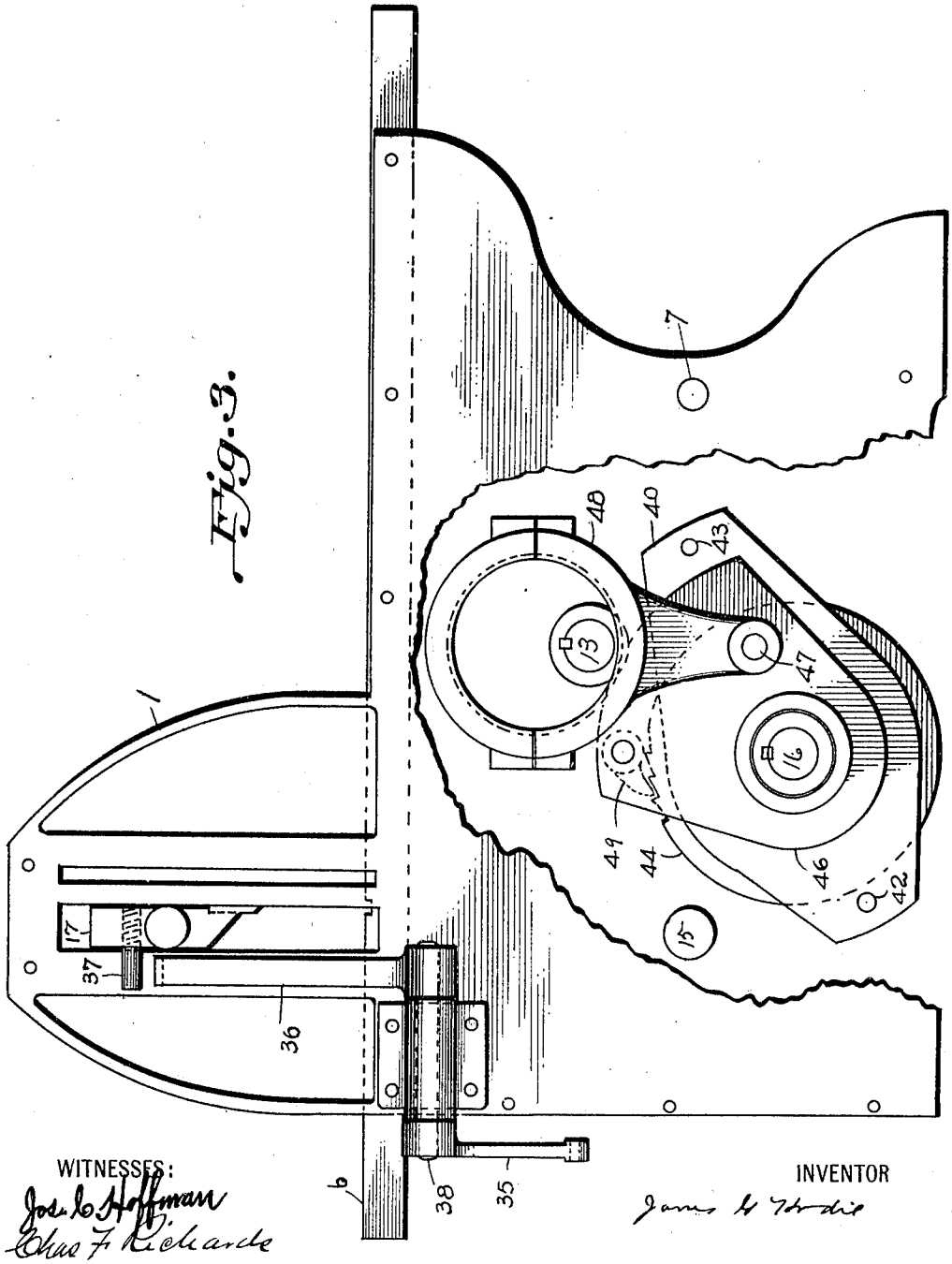
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5 SHEETS-SHEET 3.

Fig. 3.



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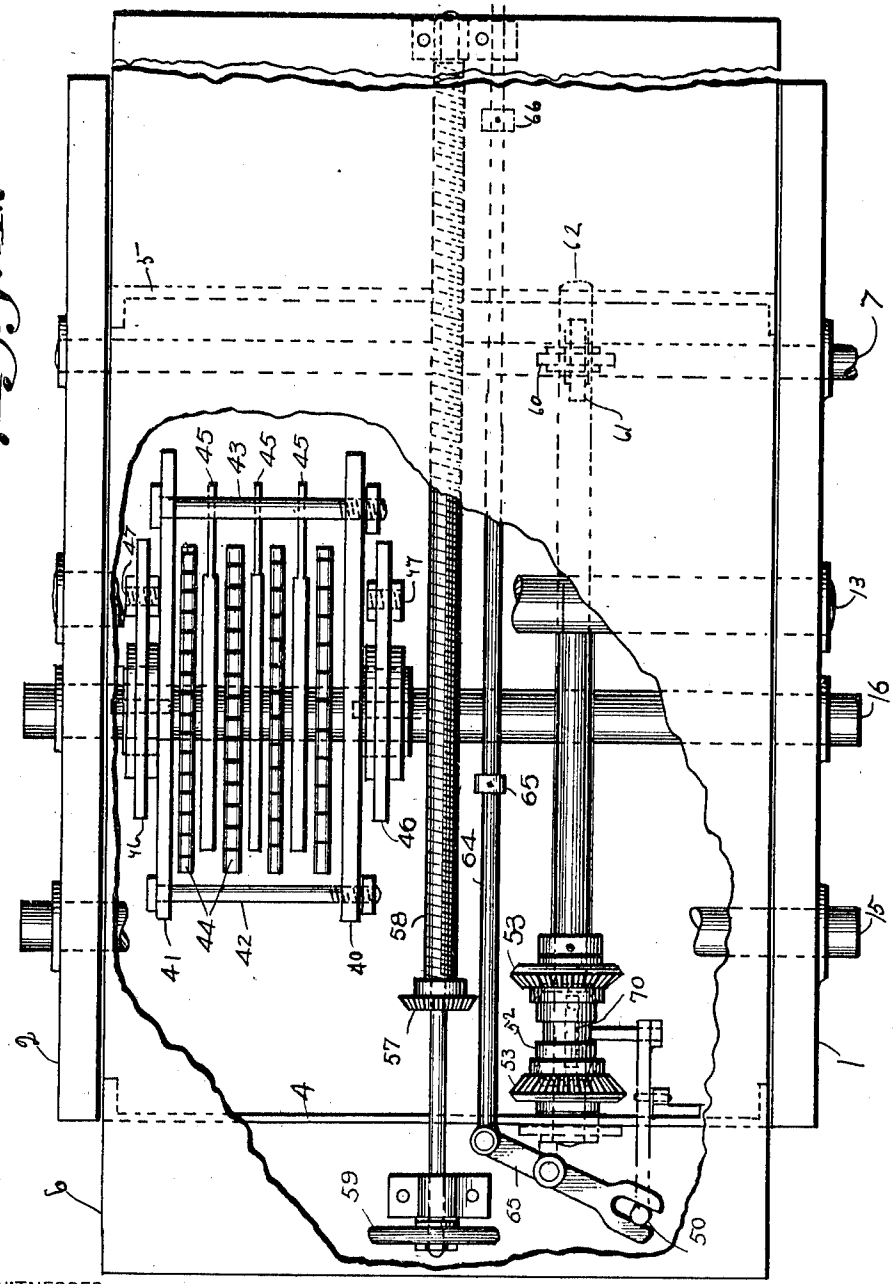
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5 SHEETS—SHEET 4.

Fig. 4.



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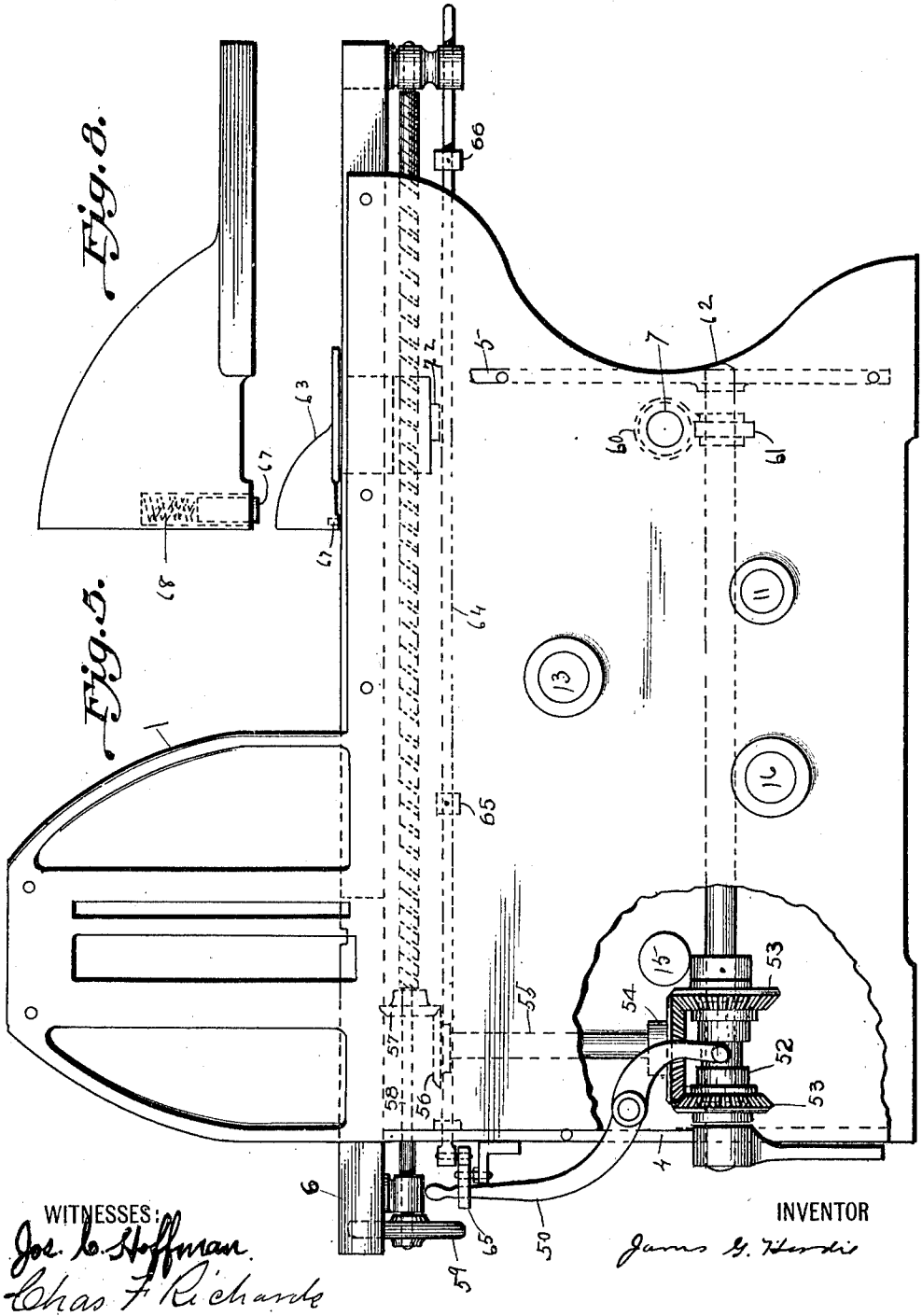
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5 SHEETS—SHEET 5.

Fig. 8.

Fig. 5.



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PAPER-CUTTING MACHINE.

1,066,492. Specification of Letters Patent. Patented July 8, 1913.

Application filed June 22, 1909. Serial No. 503,756.

To all whom it may concern:

Be it known that I, JAMES G. HARDIE, a citizen of the United States of America, and a resident of Canton, county of St. Lawrence, State of New York, have invented certain new and useful Improvements in Paper-Cutting Machines, of which the following is a specification.

My present invention relates to that type of paper-cutting machines in which a stack of paper is placed upon a table, and while the cutting is being done the stack is held firmly in place by a clamp-bar descending upon it, all of which mechanism is power operated.

My invention relates to improvements of construction particularly, as follows: 1, a safety-lock which prevents the machine from starting, unintentionally, while the driving-clutch is thrown out of action. 2, a clamping mechanism which consists of a plurality of friction-disks and means whereby the pressure of the clamp-bar is added gradually. 3, a power-operated back gage which will be automatically stopped at either end of its movement. 4, a stopping mechanism which is operated by a weight falling by gravity. 5, a clamp-bar which is fitted with a flexible-shoe. 6, means to prevent the lower sheets of the stack from getting in between the gage and the table.

In order that my invention may be fully understood, I will first describe the same with reference to the accompanying drawings and afterward point out the novelty of each feature in particular.

In the accompanying drawings, which form a part of my specification, similar figures refer to similar parts throughout.

Reference is also made to my Patent, Number 823,119, in which are illustrated parts not shown in my present drawings; but as those parts are well known to the trade and as they can be used in connection with this invention, for these reasons, I have not shown them herein.

Figure 1 is a front elevation showing the safety-lock in operative connection with the starting-lever, and the manner in which it will contact the knife-bar. Also the hand-lever and gear mechanism of the power-drive for the back gage are shown, and a trip-arm which the gravity-weight contacts when it descends. Fig. 2 is a side elevation showing, in dotted line, the train of gears which rotate the arbors, also the vertical arbor on which is placed the gravity-weight which operates the stopping mechanism. Fig. 3 is a side elevation with part of the side broken away to show the clamping mechanism, also an end view of the safety-lock. Fig. 4 is a plan view with a portion of the table broken away to show the clamping mechanism, also the back gage power-drive mechanism. Fig. 5 is a side elevation with a portion broken away to show the power-drive mechanism, and an end view of the back gage. Fig. 6 is a plan view of the trip-arm. Fig. 7 illustrates a part of the clamp-bar with the flexible-shoe attached. Fig. 8 is an end view of the back gage.

Manner of operation.—The power is applied by drawing inwardly the hand-lever 18, which rocks the arbor 22, and upon this arbor is a double arm, not herein shown but illustrated in my Patent, Number 823,119, to which reference is made, and the double-arm, drive and brake-clutches therein shown will be used in this present invention; therefore they are not herein shown. As the arbor 22 is rocked, the driving-clutch becomes operative, connecting the driving-pinion 8, and the driving-arbor 7; thus making operative the train of gears shown in Fig. 2. To the knife-bar arbor 15 are attached cranks and connecting-arms, similar to those in my Patent 823,119. At each revolution of the gear 14 the knife-bar will descend and return, and in doing so the stud in the gear 14 will carry upwardly the weight 24, which is slidably mounted upon the vertical-arbor 25, which in its descent will contact the arm 23, which is rigid upon the arbor 22, and thus rock the arbor in the opposite direction to that in which it is operated by the starting-lever, making inoperative the driving-clutch and making operative the brake-clutch, as shown in my Patent 823,119. The back gage is movable to and fro upon the table, as shown in my Patent 823,119, but has in addition thereto, and instead of the side-screws therein shown, a power-driven mechanism to move the gage, instead of operating it manually, the operation of which will be explained later in detail. In a general way, this is the manner of operating my invention herein illustrated, but I will now separately explain more fully the operation of each part.

The safety-lock.—In my Patent 823,119 I illustrated and described a stopping and braking mechanism which is effective in doing that work; yet there is danger of the parts of that mechanism getting out of adjustment and allowing the machine to start, unexpectedly, while the operator's hands are beneath the knife. To practically eliminate the harm that might be done, should such a condition of adjustment arise, I have designed an additional safety device which will stop the knife-bar from descending should the braking mechanism fail to work. This safety device consists of the arm 36, mounted rigidly upon the arbor 38, and placed normally in the pathway of the stud 37, which is rigidly set in the knife-bar, so that should the knife-bar start to descend the stud 37 would contact the arm 36.

The safety-lock is in operative connection with the starting-lever 18, and the link 20 is pivotally attached to the lever. The link 34 is pivotally attached to the arm 36, it being rigid upon the same arbor as the stop-arm 36, the link 20 and link 34 are both placed upon a stud in the arm 21, upon arbor 22. Hence as the starting-lever is drawn inwardly and oscillates the arbor 22 to the left, it will start the gear mechanism and at the same time swing the stop-arm 36 out of the pathway of the stud 37 in the knife-bar. But when the gravity-weight falls upon the trip-arm 23 and rocks the arbor 22 to the right, the knife-bar will be halted at its highest point and the stop-arm will again be swung into the pathway of the stud 37.

In the link 34 there is a slot to admit of the arm being crowded backwardly by the stud, in case the cutter is stopped when the knife-bar is only part way down. A spring 39 is so placed as to normally hold the stud in the arm 35, in the outer-extreme of the slot.

Though I have shown and claimed this locking device in connection with a reciprocating member, it is as applicable to a rotating member, therefore I do not restrict its use to the reciprocating member shown, or to any reciprocating member in particular but wish to use it in connection with a rotating member when such use is preferable, and the claims are drawn with this construction in view.

Thus in the workings of the mechanism of the safety-lock, the arm 36 will normally stand in the pathway of the stud in the knife-bar, but when the cutter is started by the operation of the starting-lever it will swing the stop-arm 36 out of the pathway of the stud 37, and then when the cutter proper is stopped, the arm 36 will again swing into its normal position and stand in the pathway of the stud.

Stopping mechanism.—A serious defect, in paper-cutting machines in the past, has been an inadequate means to move the driving-clutch fully out of working position, and to move the braking mechanism fully into working position. This was owing to the fact that the driving and braking mechanisms were operated by moving parts of the machine proper, so that as soon as the driving-clutch was partly moved out of working position its driving-power ceased to be capable of driving the mechanism further in order to throw it entirely out of position. Thus the driving-clutch was left partly out of position, and nearly capable of starting the mechanism, which it did occasionally do when conditions were extra favorable for its starting the machine. The same can be said of the braking mechanism; for the working mechanism would come to a stop before the braking mechanism was fully moved into working position. Hence the machine stood, with its driving mechanism not fully thrown out, nor its braking mechanism fully thrown into working position. This is why paper cutters occasionally start, unexpectedly, and catch the operator's hands below the knife. In my invention I have eliminated this feature of partially operating either the driving or braking mechanism, for I have invented means by which these parts are operated by a heavy weight being carried to a certain height, while the machine is in proper working position, allowing the weight to drop by gravity, and in its downward passage it will push the trip-arm, on the rock-shaft, out of its pathway and still pass on downwardly below the trip-arm. Therefore by this mechanism, the operations of the driving and braking mechanisms are not dependent upon a further movement of any part of the machine proper, in order to fully move either of the parts its full distance, for when the machine proper has carried the gravity-weight to a certain height, the weight will then operate the clutch independently of any further operation of any part of the machine proper.

In Fig. 2, 25 is a vertical-arbor, suitably attached to the frame, upon which is mounted the gravity-weight. In arbor 25 is a spline 29, which receives the feather 30, which is rigid in the gravity-weight 24. In the gear 14 is a stud 26, which in rotating contacts the weight 24, carrying it upwardly until it moves out from below the weight and allows the weight to drop onto the cushion 27, which latter may be made of any flexible material. While the weight 24 is falling, it contacts the trip-arm 23, which is rigid upon the arbor 22, and in so falling rocks the arbor 22, until the trip-arm is moved to such an angle as will allow the weight to pass it. The weight and the trip-arm are so proportioned that in their opera-

tions the arbor 22 will be rocked sufficiently to move the driving-clutch entirely out of working position and the braking-clutch entirely into working position. Thus the working efficiency of either the driving-clutch or the braking-clutch will be sufficient to fully accomplish the desired results.

A compound trip-arm.—It is necessary that the gravity-weight may fall past the trip-arm, so that the arm will be free to be raised to a point above the gravity-weight and also to allow the weight to pass it in its upward course. To accomplish this, I have invented a compound trip-arm, formed as follows: 32 is a bracket rigid upon the arbor 22, and so shaped as to terminate below the trip-arm 23. In the bracket 32 is an adjusting-screw upon which the arm rests. The trip arm 23 is loosely mounted upon the arbor 22, and its outer end is pivotally attached to a finger so shaped that it will turn upwardly upon the arm, but will not turn downwardly below the arm. As the weight is carried upwardly it raises the finger 31, and the weight passes above the arm 23; to a certain point the finger 31 is turned upwardly and as the weight passes above the arm 23 to a high point the finger 31 will fall under the weight, and thus be in position to contact the weight when it falls.

Clamp-bar friction.—In automatic power-clamping paper-cutting machines trouble has been experienced in the clamping mechanisms not being sufficiently strong to hold all kinds of paper, against the draw of the knife, especially when it became dull. The friction would not slip and pull with the same force each time when a cut was being made. Also a serious trouble has been found when the clamp-bar contacted the stack of paper, with its full power of the clamping mechanism in operative position, it would strike the stack with a hard blow which would damage the paper to a certain extent, besides bringing an undue strain upon the machine in general. To overcome these defects I have invented certain forms of mechanisms by which means there can be large frictional surfaces brought into action whenever desired and means by which these surfaces will be brought into successive action so that the clamp-bar will contact the paper with a light pressure at first, but before the knife reaches the stack of paper all of the friction surfaces will have been brought into action in quick succession.

In Fig. 3 is shown a side elevation of the clamping mechanism. I have not shown the clamp-bar nor the connections between the clamp-arbor 16 and the clamp-bar, as the same form of a clamp-bar and connections as are shown in my Patent 823,119, may be used in this invention, or their equivalent in the form of a rack and segment. In the workings of the paper-cutter the arbor 13 is rotated by the train of gears shown in Fig. 2, and upon the arbor 13 is a pair of eccentrics, which are pivotally attached to a pair of arms 46, which are pivotally mounted upon side-plates 40 and 41. These side-plates are keyed upon the clamp-arbor 16 and are attached together by bolts 42 and 43. Between the friction-sides 40 and 41 are placed a series of ratchet-disks 44, and friction-plates 45. Between each of the disks and plates is inserted a filler of fiber or other suitable frictional material, which is not shown, and all taken together will fill the space between the sides 40 and 41, so that as the bolts 42 and 43 are drawn up there will be created the desired amount of friction between the various parts in this combination. In the arms 46 and 46 is placed an arbor, upon which are mounted a series of pawls which engage the friction-ratchets 44. Each of the friction-plates 45 has a finger which reaches out and under the bolt 43, to keep them from rotating when the ratchets are rotated. Thus in the operation of the clamping mechanism the arbor 13 makes a complete revolution at each cut, and as it is rotated by the eccentrics it draws upwardly the arms 46 which carry the pawls 49 which engage the teeth in the ratchets and so carry forward the pawls and the ratchets, and the ratchets will slip while the plates 45 are held stationary upon the clamp-arbor. The friction thus created makes the pressure of the clamp-bar upon the paper and it follows that the more bolts 42 and 43 are tightened the greater will be the pressure of the clamp-bar upon the stack of paper. Also it is very desirable that the pressure of the clamp-bar upon the stack of paper shall be applied gradually to avoid the paper being contacted in the form of a blow. This I accomplish by cutting a different number of teeth in each ratchet, hence the disk having the greatest number of teeth will operate first, and the other disks will each act in succession according to the number of teeth it contains.

The back gage.—A feature in many cutters which has been a great annoyance to the operator is that the bottom sheet in the stack of paper would lag and get in between the back gage and the table. To overcome this difficulty I have designed a gage having forwardly-pointing fingers, as illustrated in my Patent 823,119, and in the bottom and near the front edge of these fingers I place a vertical plunger with a spring adapted to continuously press the plunger upon the table.

In Fig. 8 is shown an end view of the back gage with the plunger 67 inserted in the finger and held downwardly by the spring 68. Thus as the gage is moved to and fro upon the table the plungers will always stand vertically to the table, and although the table

should become uneven so that the gage does not fit it at all points the plungers will form a barrier to prevent the sheets getting below the gage fingers.

A power-operated gage.—Especially in the larger sizes of power paper-cutting machines, to move the back gage to and fro requires much power, and when operated manually the work becomes laborious. Therefore to overcome this I have designed a power-driven mechanism with which to move the back gage, and supplemented the operation by a hand-wheel with which to make fine adjustments.

Fig. 5. shows a side view of the drive mechanism. Fig. 1 is a front view of the same, and Fig. 4 is a plan view.

7 is the driving-arbor of the machine proper, and 62 is the driving-arbor for the power-drive mechanism. Between the two arbors is a pair of spiral-gears 60 and 61, through which power is transmitted from one shaft to the other. Loosely mounted upon the arbor 62 is a pair of bevel-gears 53, which engage a bevel-gear 54. Between the gears 53 is a sliding-sleeve of a male and female-clutch; the flange of the gears 53 constituting the female member and the sleeve the male member. The sleeve 52 is in working contact with the arbor 62, by the means of a feather in the arbor which enters a spline in the sleeve, thus the sleeve is continuously rotated by the arbor while it is slidably mounted upon it.

50 is a hand-lever pivoted to the frame and engaging the sleeve. 63 is the back gage which slides to and fro upon the table, and has a depending-arm passing down through a slot in the table, which terminates in a finger 72. The screw 58 is suitably journaled to the table and passes through a threaded part of the depending-arm of the back gage. Parallel with the gage-screw is the rod 64, which is suitably journaled and carries two stops 65 and 66. These stops contact the finger 72, and as a result the rod is moved endwise. Pivotally attached to one end of the rod 64 is the arm 65, which is suitably pivoted to the frame, and the loose end of which engages the starting-lever 50. Thus when the lever 50 is moved in either direction the sleeve will cause one of the gears 53 to be rotated, which in turn will rotate the arbor 55, and the pair of bevel-gears 56 and 57, the latter being rigid upon the gage-screw 58. Thus as the screw is rotated it will carry the gage in a certain direction, until the finger 72 engages one of the stops upon the rod 64, which in turn will draw the lever 50, to the center, making the clutch 52 and 53 inoperative. Thus the power-driven mechanism will be automatically stopped by the back gage when it reaches its extreme point of travel in either direction.

A flexible-clamp shoe.—A constant loss has been caused in the past from using many paper-cutters having clamp-bars which crease and mar the top sheets of the stacks of paper, because metallic clamp-bars make indentations at the points of contact. To overcome this loss, I have invented a certain design of flexible-shoe which may be attached to the automatic clamp-bar proper, or to a subclamp-bar, or to a detachable-shoe used in connection with the clamp-bar.

My invention consists mainly of a flexible-strip of material, of any compressible nature, such as leather, felt or the like, attached in any suitable manner to the bottom of the clamp-bar, having notches or recesses cut at intervals in the front edge. The object of this is to allow the operator to see the front edge of the metallic clamp so as to set the stack of paper accurately when a cut is to be made. A flexible-shoe with a full, straight edge will flatten out from use and the edge of the shoe will turn up in front of the metallic surface of the clamp-bar proper, but by cutting notches at intervals in the front edge of the flexible-shoe the operator can see the front edge of the metallic-clamp and with the clamp-bar locate the right cutting point in the stack of paper.

Fig. 7 shows a portion of the clamp-bar with the flexible-shoe attached. 69 is a metallic clamp-bar, 70 is the flexible-shoe, and 80 the notches cut in the front edge.

Having thus described my invention, what I claim is:

1. In a paper-cutting machine the combination therewith of a reciprocating member carrying a stud, an arm pivoted to the machine and normally in the pathway of said stud, means to manually move the arm out of the pathway of the stud, and means to automatically return the arm into the pathway of said stud.

2. In a paper-cutting machine the combination therewith of a reciprocating member carrying a stud, an arm pivoted to the machine and normally in the pathway of the stud, a starting-lever and connections between the starting-lever and the arm whereby the arm is moved out of the pathway of said stud, means to return the arm into the pathway of said stud.

3. In a paper-cutting machine the combination therewith of a starting mechanism and a stopping mechanism, a reciprocating member carrying a stud, an arm pivotally mounted upon the machine and normally in the pathway of said stud, connections between said arm and the starting mechanism, connections between said arm and the stopping mechanism, whereby the starting mechanism moves said arm out of the pathway of said stud, and the stopping mechanism moves said arm into the pathway of said stud.

4. In a paper cutting machine the combination therewith of a clamp bar movable in ways, a power oscillated clamp-arbor, suitable connections between said arbor and clamp-bar, suitable side plates rigid upon said clamp-arbor, tie rods connecting said side plates, ratchets between the said side plates and mounted loosely upon said clamp-arbor, friction plates mounted loosely upon said clamp arbor between said ratchets and having projections contacting said tie rods, arms mounted loosely upon said clamp arbor, and carrying pawls which engage said ratchet, means to reciprocate said arms.

5. In a paper cutting machine the combination therewith of a clamp bar movable in ways, a power oscillated clamp arbor, suitable connections between said arbor and clamp bar, suitable side plates rigidly mounted upon said clamp arbor, suitable tie rods connecting said side plates, ratchets having varying number of teeth mounted loosely upon said clamp arbor, friction plates mounted loosely upon said clamp arbor between said ratchets and having projections contacting said rods, arms mounted loosely upon said clamp arbor and carrying pawls which engage said ratchets, means to reciprocate said arms.

6. In a paper cutting machine the combination therewith of a power driven arbor carrying a pair of gears mounted loosely upon said arbor, each gear having an inwardly projecting flange, a sleeve suitably keyed upon said arbor and means to reciprocate it, a gear engaging the loose gears upon the arbor, a screw suitably journaled and in operative connection with the back gage, suitable connections between said screw and the loose gears upon said arbor.

7. In a paper-cutting machine the combination therewith of a power-driven arbor having a pair of gears mounted loosely upon it and having inwardly projecting flanges, a sleeve slidably keyed upon said arbor and adapted to engage either of said flanges, a lead-screw suitably journaled and in operative connection with the back gage, suitable connections between said screw and said loose-gears, means whereby either of said gears is made operative to rotate said screw, a rod suitably pivoted, carrying two stops, means whereby said back gage will contact said stops.

8. In a paper-cutting machine the combination therewith of a power-driven arbor having a pair of gears mounted loosely upon it and having inwardly projecting fingers, a sleeve slidably keyed upon said arbor and adapted to engage either of said flanges, a lead-screw suitably journaled and in operative connection with the back gage, suitable connections between said screw and said loose-gears, a rod parallel with said screw and suitably pivoted and carrying stops adapted to engage the back gage, whereby said rod will be moved endwise, connections between said rod and said sleeve upon the driving-arbor.

9. In a paper-cutting machine the combination therewith of a driving and braking-clutch mechanism, a rock-arbor in connection therewith, a trip-arm upon said rock-shaft, a vertical-arbor having a weight slidably mounted thereon, means for raising said weight and to allow it to fall by gravity upon said trip-arm and adapted thereby to rock said arbor.

10. In a paper-cutting machine the combination therewith of a driving and braking-clutch mechanism, a rock-arbor in connection therewith, a trip-arm consisting of a bracket, rigid upon the rock-arbor, an arm loosely mounted upon the rock-arbor and resting upon said bracket, a latch pivoted in the end of the loose-arm and adapted to contact a weight, mechanically elevated and lowered by gravity.

11. In a paper-cutting machine having a knife-bar and means to operate it the combination therewith of a power-operated clamp-bar, a subclamp-bar manually operated having a flexible shoe attached to the bottom surface of said subclamp-bar; said flexible shoe extending to the front edge of said subclamp-bar and having notches cut in the front edge of said flexible shoe.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."