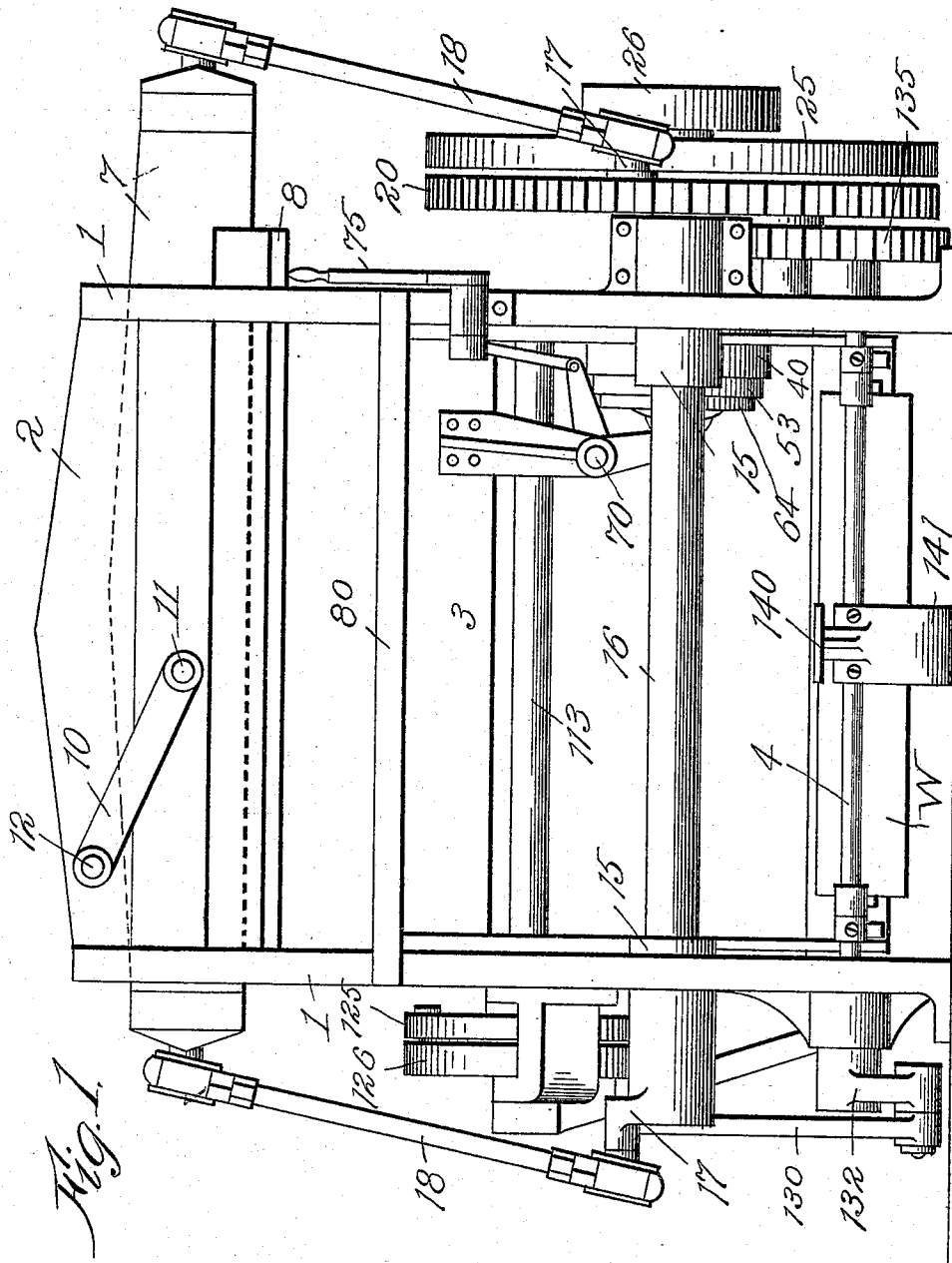


T. C. DEXTER.
PAPER CUTTING MACHINE.
APPLICATION FILED JAN. 21, 1908.

937,514.

Patented Oct. 19, 1909.
6 SHEETS—SHEET 1.



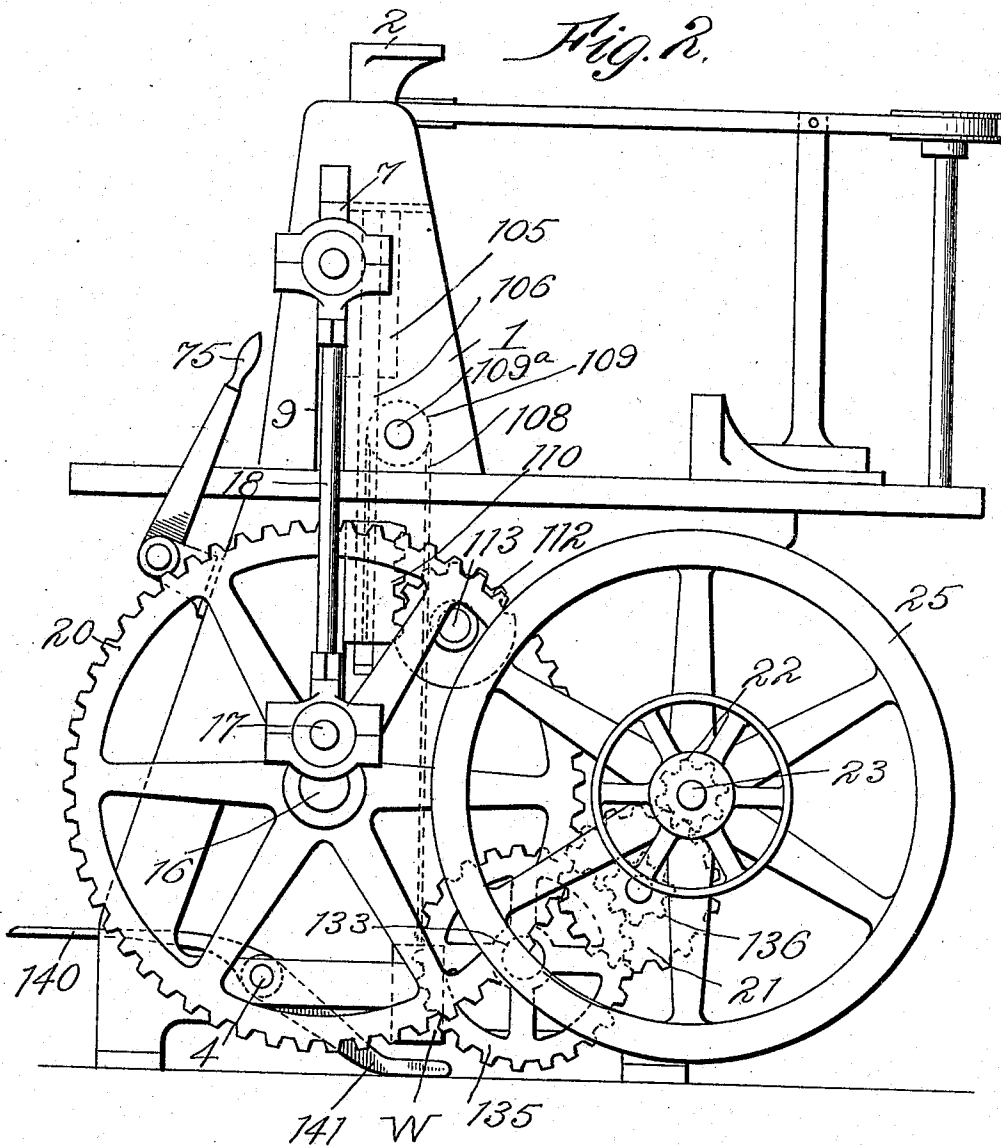
Witnesses:
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Witnesses:
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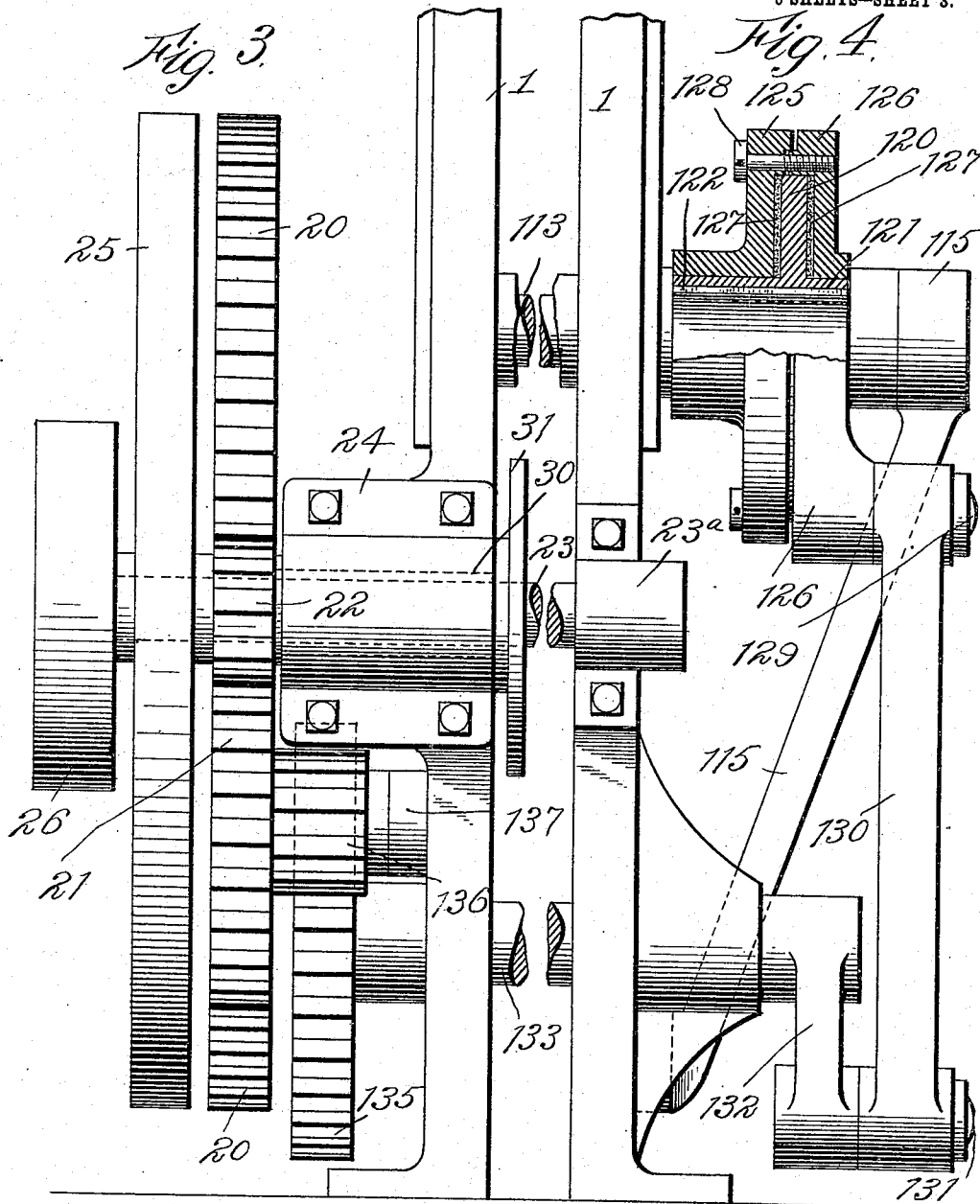
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6 SHEETS—SHEET 3.



Witnesses:
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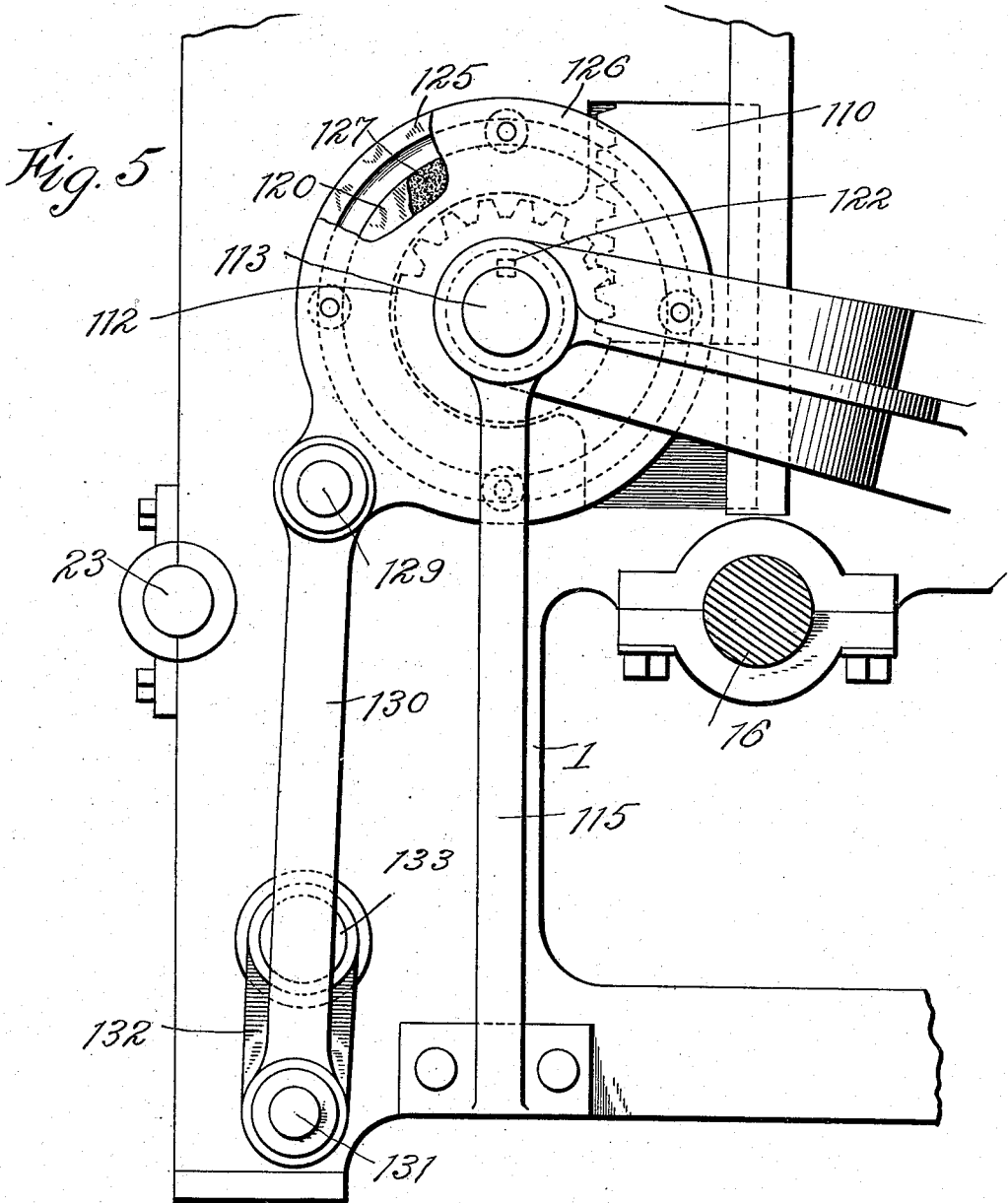
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6 SHEETS—SHEET 4.



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6 SHEETS—SHEET 5.

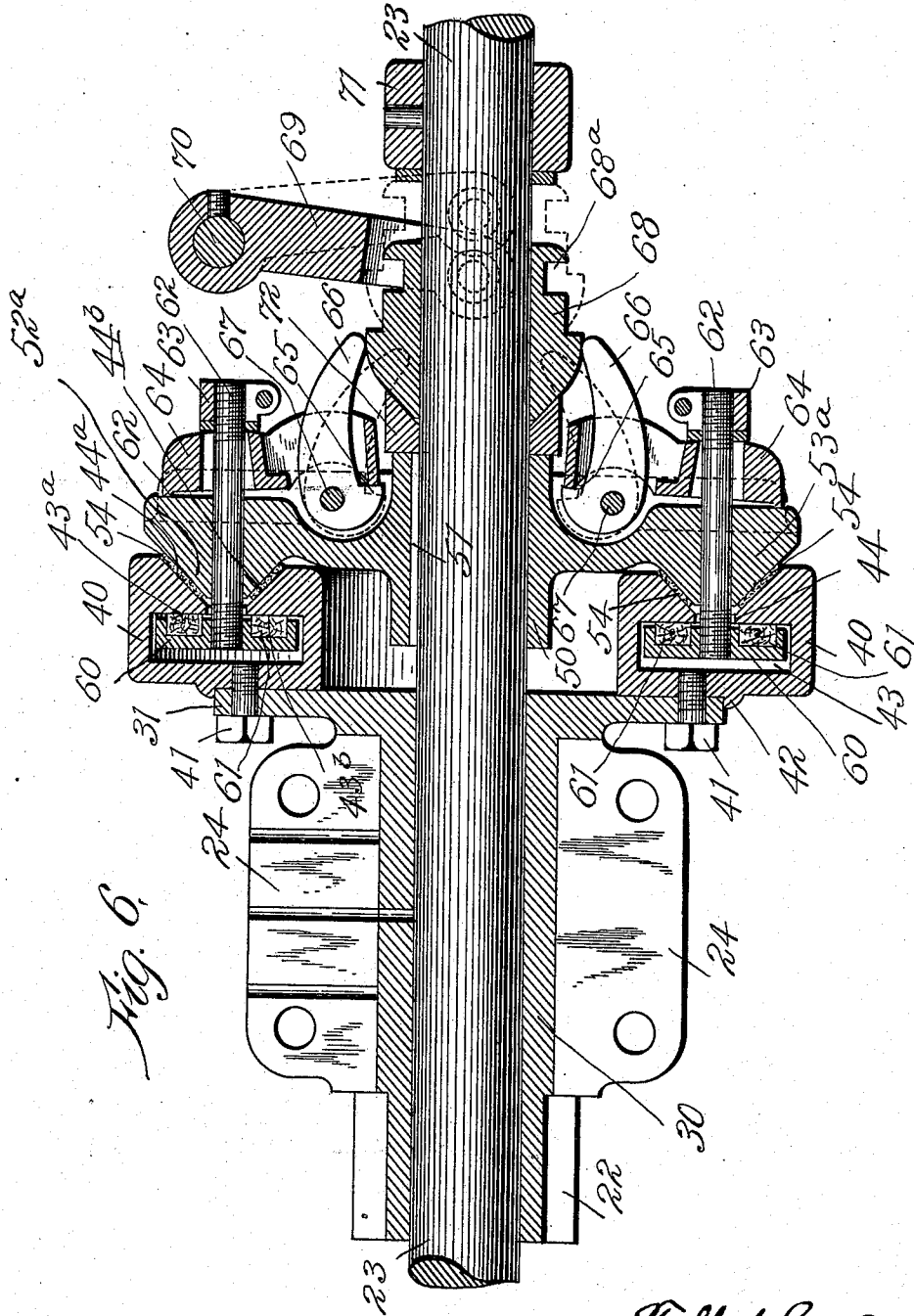


Fig. 6.

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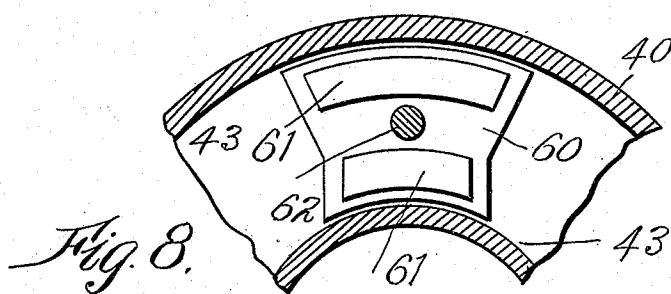
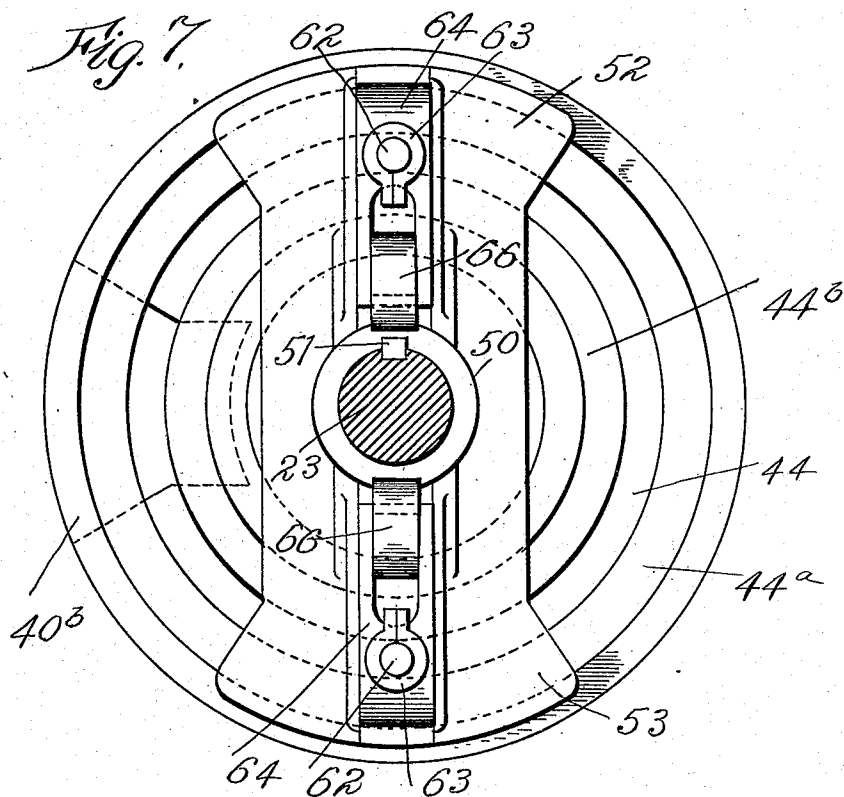
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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

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PAPER-CUTTING MACHINE.

937,514.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, TALBOT C. DEXTER, a citizen of the United States, residing at Pearl River, in the county of Rockland, in the State of New York, have invented certain new and useful Improvements in Paper-Cutting Machines, of which the following is a specification.

This invention relates to improvements in power operated paper cutting machines in which the sheets to be cut are held firmly in proper position upon a supporting table by means of a power operated clamping bar and are acted upon by a vertically reciprocating laterally movable cutting blade which is automatically returned to its initial position and thrown out of operation at the completion of each cutting stroke, the power operated clamping device being adapted to maintain a predetermined amount of pressure upon the pile of sheets during the cutting operation.

In the practical operation of power driven paper cutting machines, one of the most serious defects which is encountered in operating upon some grades of paper is the tendency of the knife to vibrate or chatter as it passes through the pile. This chattering of the knife produces imperfect work, and is sometimes so pronounced that the work is ruined. It is, therefore, of the greatest importance to obviate this objectionable action.

Many theories have been advanced for overcoming the chattering of the knife as it passes through a pile of sheets, but so far as I am aware no one has yet produced a power driven paper cutting machine which entirely obviates this objectionable action of the knife under all conditions. Probably the most generally accepted idea of those skilled in the art is that this objection is more pronounced in the type of machines in which the paper holding clamp is directly connected with and actuated by the knife, in which type of machine the objectionable results are sometimes quite pronounced because of the relative unsteady action of the knife and clamp upon each other. In remedying the described defect in this type of machines it has been proposed to entirely separate the driving mechanisms for the knife and clamp so that their operations shall be entirely independent of each other, as shown, for instance, in the patent of Sterling No. 370,287, dated Sept. 20, 1887, and patent of Seybold No. 731,232, dated June

16, 1903. Such arrangements have not, however, solved the difficulty, and my experience with paper cutting machinery has proven that these arrangements have been constructed upon the wrong theory, for the reason that, under proper conditions, a frictionally driven paper holding clamp has a very beneficial effect upon the operation of the knife, and in arranging the knife and clamp driving mechanism to operate independently of each other, such beneficial effect is entirely lost.

The vibration or chattering of the knife is, of course, caused by the inequalities in the compressed pile of sheets being cut. In my experience with power driven paper cutting machines of practically all well known types, I have found that the chattering action of the knife in passing through the paper is possible because of the lost motion or back-lash, which is necessarily provided in knife driving mechanisms of every construction to permit sufficient freedom of operation. This lost motion or back-lash, while not directly the cause of the chattering of the knife, is the feature in most constructions of paper cutting machines which permits such chattering. Recognizing, therefore, the impossibility of removing the inequalities in the compressed pile of paper which has to be cut in a machine of this type, I have overcome the objectionable chattering of the knife by providing an arrangement of driving mechanism for the machine which will afford a cushioning or shock absorbing effect for the knife to take up the back-lash or lost motion and positively prevent the chattering of the knife. In my new construction I have arranged the driving mechanisms for the knife and clamp in such relation to each other that they will both be driven by the power shaft through a common driving pinion and intermediate gear, in such manner that the clamp and its driving mechanism will act as a cushion or shock absorber for the knife, whereby any chattering tendency of the knife, which would ordinarily be unresisted because of the lost motion and back-lash in the knife driving mechanism, will be effectively counteracted by the clamp driving mechanism which prevents the reflex action of the knife. In practically carrying out this main important feature of my invention I have produced an improved construction of paper cutting machines which I will now proceed

to describe in connection with the accompanying drawings.

In said drawings Figure 1 is a front elevation of a paper cutting machine embodying my invention. Fig. 2 is a side elevation of the same. Fig. 3 is an enlarged detail rear view of parts of the knife and clamp driving mechanisms at the left hand side of the machine. Fig. 4 is a similar view of the parts of the clamp driving mechanism at the right hand side of the machine, the clamp operating friction clutch being shown partly in section. Fig. 5 is an enlarged detail side elevation of the parts of the mechanism shown in Fig. 4. Fig. 6 is a vertical longitudinal sectional view of the main driving clutch. Fig. 7 is a vertical transverse sectional view of the same, and Fig. 8 is a detail transverse sectional view of part of the same.

The operating parts of the herein described paper cutting machine are supported in a suitable framework of any desirable construction best adapted for such purpose. A heavily built framework is shown comprising the side frames or standards 1, firmly braced and connected by the top rail 2, the center rail 3, the bottom rock shaft or rod 4, and the transverse shafts hereinafter referred to. The reciprocating cross head 7, carrying the cutter blade 8, is mounted to slide vertically, and transversely of the machine in the guide slots 9, formed in the side frames or standards 1. The cross head 7 is anchored to the top rail 2 by means of an ordinary link 10, which is pivotally connected at its opposite ends 11 and 12 to the knife supporting cross head and the top rail 2, so as to cause the cross head and knife blade carried thereby to move laterally of the machine as it reciprocates vertically to impart to the knife a shearing cut.

Suitably journaled in the side frames or standards 1 in the bearings 15 is the knife operating shaft 16, carrying at its outer ends the cranks 17, which are connected, through the links 18, with the opposite ends of the knife supporting cross head 7. When the knife operating shaft 16 is rotated, the jointed links 18 will cause the cross head and cutter blade to reciprocate vertically and transversely of the machine in the slotted guides formed in the side frames or standards 1 in a manner well known in the art.

The shaft 16, which operates the knife, is driven by means of a large gear 20, rigidly secured to one end of the shaft 16 (and carrying one of the cranks 17) and meshing with and driven by an intermediate gear 21 which is in mesh with and driven by the pinion 22 loosely journaled upon the main driving shaft 23. This driving pinion 21 is formed integral with an elongated hub or sleeve 30 which surrounds and forms one of the bearings for the main driving shaft 23.

The hub or sleeve 30 is freely journaled in the sectional bearing 24 secured to one of the side frames 1. Formed integral with the inner end of the hub or sleeve 30 is a clutch wheel or rim 31 upon which one member of the main driving clutch of the machine is mounted as hereinafter explained.

The main driving shaft 23 which is journaled adjacent to one end in the hub or sleeve 30, and at its opposite end in a bearing 23^a secured to the other side frame of the machine, projects beyond the driving pinion 22 and has keyed to its projecting end a large fly wheel 25 and the belt driving pulley 26. The fly wheel 25 is secured to the main driving shaft 23 close up to the driving pinion 22 so as to reduce to a minimum the distance between the heavy fly-wheel and the adjacent bearing for the driving shaft. This arrangement is important in relieving the main driving shaft as much as possible of the lateral strain of the fly wheel without the necessity of a supporting bearing for the outer end of the driving shaft as is now commonly employed to prevent the vibration and consequent straining of the shaft.

The integrally formed driving pinion 22, elongated hub or sleeve 30 and clutch wheel or rim 31, are freely journaled upon the main driving shaft 23, the hub portion 30 being in turn freely journaled within the sectional bearing 24 by which it is confined against longitudinal displacement upon the driving shaft. Secured to the clutch wheel or rim 31 is the loose member of the main driving clutch which I prefer to construct in the form of the frictional clutch as specifically shown in Figs. 6, 7 and 8, as now described. The free member of this frictional driving clutch is formed of a heavy steel ring 40 rigidly secured against the face of the clutch wheel or rim 31 concentric with the driving shaft 23, by means of a series of tap bolts 41, an annular flange or rib 42 upon the clutch ring 40 snugly engaging the outer edge of the clutch wheel 31 to assist in holding the parts against lateral displacement. The clutch ring 40 is formed with an annular recess or cavity 43 open at one side through an annular slot 44. The vertical annular walls 43^a and 43^b of the recess or cavity 43 upon opposite sides of the slot 44 constitute internal friction surfaces, while the outer faces of these walls upon opposite sides of the slot 44 are oppositely beveled to form annular inclined frictional faces 44^a and 44^b. The fixed member of the friction clutch coöperates with these frictional faces in the manner which will now be explained.

50 is the hub portion of the fixed member of the frictional clutch, said hub member being mounted upon the driving shaft 23 and splined thereto as shown at 51 in Figs. 130

6 and 7 of the drawings. This fixed member of the clutch is provided with oppositely extending radial arms 52 and 53 which are broadened slightly circumferentially of the clutch and formed on their inner faces with segmental cone-shaped portions 53, 52^a and 53^a, whose oppositely inclined frictional faces are presented parallel with the inclined faces 44^a and 44^b of the clutch ring 40, and carry strips 54 of some suitable friction material, such as leather. Mounted within the recess or cavity 43 of the clutch ring 40 are the two oppositely arranged metal blocks or plates 60, each one of which carries the strips or blocks of wood or other suitable friction material indicated at 61. These blocks 60 are adjustably mounted upon the inner ends of support bolts 62, which pass freely through openings formed in the radial arms 52 and 53, and have mounted upon their outer ends adjustable bearing blocks 63, which engage the rocking yoke-shaped levers 64. These yoke-shaped levers 64 embrace the bolts 62 and project radially inward into engagement with the heels or shoulders 65 formed on the clutch operating arms 66 which are pivotally mounted at 67 in suitable recesses formed in the face of the fixed clutch member 50. These clutch operating arms 66 extend longitudinally of the shaft 23 away from the clutch in position to be engaged by a clutch actuating spool 68 mounted to slide longitudinally upon shaft 23, and formed with an annular groove 68^a in which engage the inwardly projecting pins (not shown) carried by the yoke 69 which is secured upon the end of the operating rod 70 which extends forwardly of the machine and is operated in any suitable manner such for instance as by the hand lever 75 connected with it through the rock arms and link as shown. The clutch operating spool 68 is confined in its movements upon the driving shaft 23 by the fixed collar 71 and the abutment ring or collar 72, which latter rests between the spool and the hub of the fixed member of the clutch. It will be observed that the movement of the spool 68 toward the fixed member of the driving clutch will engage the arms 66 and cause them to rock the yoke-shaped levers 64 upon their fulcrums at their outer ends, which will strain the rods or bolts 62 outwardly and simultaneously force together the frictional surfaces of the fixed and loose clutch members. The friction blocks 60 are inserted within the recess or cavity 43 of the clutch ring 40 through a suitable opening in the back of the ring as indicated at 40^b by dotted lines in Fig. 7 of the drawings.

105 is a paper holding clamping bar, the ends of which are secured to the downwardly extending guide bars 106. The guide bars 106 operate in vertical grooves formed in

the inner faces of the machine side frames 1, said grooves and the guide bars being indicated in dotted lines in Fig. 2. The lower ends of the guide bars 106 are secured in any suitable manner to the ends of sprocket chains 108, which pass up over sprocket wheels 109, journaled upon pins 109^a inside of the side frames 1. The opposite ends of the sprocket chains are connected to a counterweight W for balancing the weight of the clamping bar and attached parts. The lower ends of the guide bars 106 are suitably secured to the rack bars 110 which are in constant mesh with the mutilated gears 112 keyed to the opposite ends of a transversely extending clamp operating shaft 113 which is journaled at its opposite ends in the machine side frames 1, and is driven through the mechanism which will now be described.

The clamp operating shaft 113 is extended beyond the side frames 1 at the left hand side of the machine, and journaled in a bracket bearing 115 by which it is held against lateral vibration. Mounted upon the clamp operating shaft 113 between side frame 1 and bracket bearing 115 is an adjustable frictional slip clutch which may be of any suitable construction, but which is preferably constructed as shown in my drawings, in which the fixed member of the clutch comprises a friction wheel 120 formed integral with the hub portion 121 which is rigidly keyed to the shaft 113 as indicated at 122. Mounted upon opposite sides of this friction wheel 120, and freely journaled upon the laterally extending hub portions 121, are the external movable members 125 and 126 of the clutch. Each of these clutch members 125 and 126 is of circular form, having a dished or recessed inner face to fit over the fixed wheel member 120, vertically arranged rings of friction material 127 being interposed between the frictional faces of the friction wheel 120 and the outer members 125 and 126. Adjusting screws 128 pass freely through openings in the clutch member 125, and are threaded into openings formed in the clutch member 126, so as to hold the members 125 and 126 in frictional engagement with the clutch wheel member 120. By means of the screws 128 the frictional grip of the outer members upon the inner member can be regulated to hold the desired number of pounds pressure.

The clutch member 126 carries an outwardly presented journal pin 129, upon which is journaled the upper end of a pitman 130 extending up from a crank pin 131, carried by a crank 132, which is secured to the outer end of rotary shaft 133, which extends from side to side of the machine, and is suitably journaled in the side frames 1. Keyed to the opposite end of the shaft 133 is a gear wheel 135, which meshes with a pin-

ion 136 secured to the inner face of the gear wheel 21, above referred to. The gear wheel 21 and pinion 136, are suitably journaled upon a boss 137 of one of the side frames 1.

5 From this construction it will be observed that the shaft 133 is rotated by the same gear 21 which drives the knife operating gear 20, and that the rotation of said shaft 133 causes the rotation of the crank 132,

10 which operates through the pitman 130 to rotate the outer clutch members 125 and 126, which carry with them the fixed clutch member 120, and cause the rotation of the shaft 113 for forcing down the paper holding

15 clamp upon the pile of sheets. The clamp is forced against the pile of sheets with any desired pressure determined by the adjustment of the screws 128. When the clamp engages the pile with the desired

20 pressure, which will be the limit of the frictional hold between the driving members 125 and 126 upon the driving clutch member 120, the driving members will slip upon the

25 crank 132. During this slipping action of the clamp operating clutch the knife is passing through the pile of sheets for performing the cutting operation. Just at the completion of the downward stroke of the

30 knife, the crank 132 reaches the limit of its upward throw, and immediately following this, as the knife starts to return upwardly, the crank 132 completes its revolution to

35 raise the clamp away from the pile of sheets. The completion of the revolution of the crank 132 causes the driving clutch members 125, 126, to slip rearwardly upon the

40 driven clutch member 120, the engagement of the clamp with the stop which limits its upward movement, arresting the rotation of the shaft 113 so that the clutch will slip as described.

140 is a centrally arranged foot lever secured to the rock shaft 4, and formed integral with a rearwardly projecting rock arm 141, which rests centrally beneath the counterweight W, by which the clamp can be lowered upon a pile of sheets independently of the power operated mechanism.

50 80 is the pile supporting table or platform upon which the sheets to be cut are placed in the usual manner. It will, of course, be understood that the usual back gage and operating mechanism are employed for positioning the pile of sheets beneath the clamp and paper cutting knife.

The most important feature of my machine as above described is the arrangement whereby the clamp and its driving mechanism will act as a cushion or shock absorber for the knife to overcome any chattering tendency of the knife. It will be observed that the power shaft 23, the main driving clutch 40-50, the driving pinion 22 and driving

65 gear 21 are all parts of the common drive for

the knife and clamp, the gear 21 serving not only to drive the large knife-operating gear 20, but also the small clamp operating pinion 136. The result of this construction is the effective counter-action of any inequalities 70 in the active stroke of the knife in passing through the pile of sheets. The forward stress of the driving gear 21 actuated by power shaft 23 and pinion 22, effectively prevents any backward motion or vibration of 75 the knife operating gear 20 and the knife, while the pinion 136, gear 135 and crank shaft 133, having pitman connection 130 with the movable members of the clamp-operating clutch 120, 125, 126, will effectively prevent any forward racing or vibration 80 of the gear 20 and knife. As stated above the members of the clamp operating friction clutch slip relatively while the knife is passing through the pile of sheets. 85 This slipping action would ordinarily tend to produce vibrations in the clamp driving mechanism, but since such vibrations are of a different character from the vibrations 90 which the knife is subject to as it passes through the pile, the vibrations of the clamp operating clutch will counteract or absorb those of the knife. The clamp and its operating mechanism thereby afford an effective shock absorber for the knife. 95

Another feature of importance in my above described machine is the arrangement of the fly wheel outside of the main frame, and as close as possible thereto upon the driving shaft, with the driving clutch inside 100 of the main frame, with the result that the driving shaft is relieved of all unnecessary strain without the necessity of providing an outside bearing for the driving shaft.

What I claim is:

1. In a paper cutting machine, the combination of a power shaft, a paper cutting knife, a paper holding clamp, a train of gears between the power shaft and the knife, a clamp-operating shaft, a friction slip 110 clutch on said clamp-operating shaft, a crank operating said friction slip clutch, and gearing between said crank and one of the knife operating gears.

2. In a paper cutting machine, the combination of a power shaft, a paper cutting knife, a paper holding clamp, a driving clutch upon the power shaft, a train of gears between the driving clutch and the knife, a clamp-operating shaft, a friction slip clutch 120 on said clamp-operating shaft, a crank operating said friction slip clutch, and gearing between said crank and one of the knife-operating gears.

3. In a paper cutting machine, the combination of the machine frame, a paper cutting knife, a paper holding clamp, a power shaft journaled in the machine frame, driving mechanism for the knife and clamp, a driving clutch mounted upon the power shaft 130

inside of the machine frame, a clutch-sleeve journaled upon the power shaft and in the machine frame, a driving pinion upon said clutch sleeve outside of the machine frame,
5 driving mechanism leading from said pinion to the knife and clamp, and a fly wheel mounted upon the power shaft outside of the machine frame and alongside of said pinion.

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