N. GRAY, JR.

PAPER CUTTING MACHINE.

APPLICATION FILED APR. 16, 1912.

1,084,006.

Patented Jan. 13, 1914.

Fig. 1.

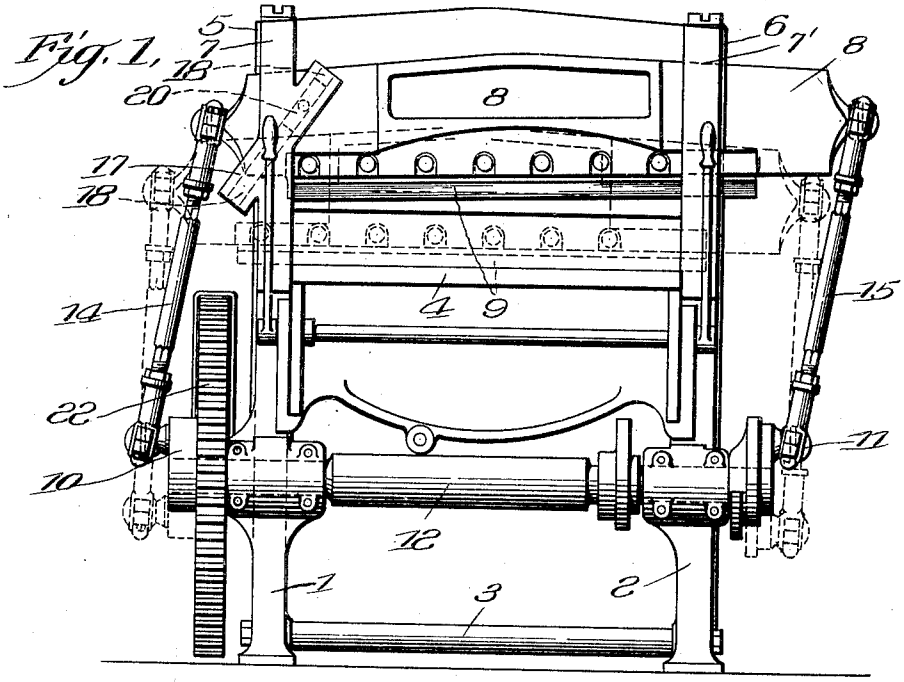


Fig. 2.

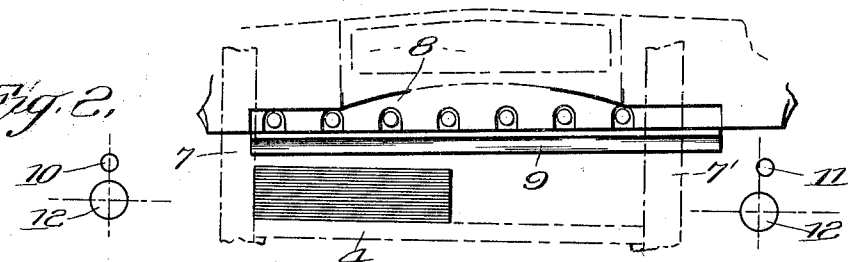


Fig. 3.

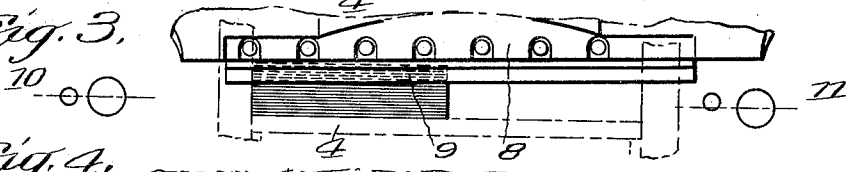
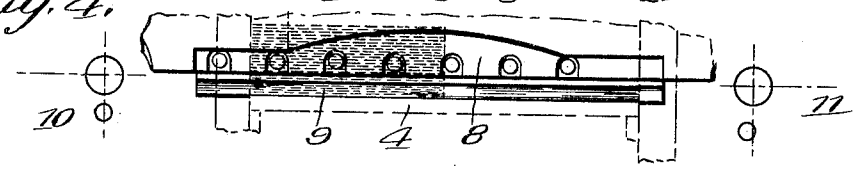


Fig. 4.



Witnesses:

J. C. Millward

Allan N. Goode.

Inventor

Niel Gray Jr.

By his Attorney

Alfred Wilkinson

COLUMBIA PLANOGRAPH CO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

NIEL GRAY, JR., OF OSWEGO, NEW YORK.

PAPER-CUTTING MACHINE.

1,084,006. Specification of Letters Patent. Patented Jan. 13, 1914.

Application filed April 16, 1912. Serial No. 691,170.

To all whom it may concern:

Be it known that I, NIEL GRAY, JR., a citizen of the United States, residing at Oswego, in the county of Oswego and State of New York, have invented new and useful Improvements in Paper-Cutting Machines, of which the following is a specification.

This invention relates to paper cutting machines and consists in an improved arrangement and mode of operation whereby the resistance to the knife during the cutting of the stock will be rendered substantially uniform at all times thus to promote an easier and smoother cutting operation. Furthermore the use of my improved arrangement will be accompanied by a material reduction in strains and in the power required in the cutting of certain classes of work. An important feature of my invention is to maintain the knife cutting edge in an inclined relation to the stock during the cutting stroke. The advantages attending the use of this feature are important and are more pronounced in the trimming of pads, bound pamphlets, books, etc., wherein layers of harder cardboard are present. As ordinarily occurs in the cutting of such stock the knife descends always parallel to the table and to the sheets of the stock thereon, and consequently the whole of the knife cutting edge will pass into the tougher material at one instant. The result is that the resistance becomes a considerable factor and tends to cause the knife to move in a jerky manner and moreover causes springing of the knife so as not to make an absolutely smooth cut and also subjects the mechanism to undue strains. These objections have all been overcome in an effective manner by my arrangement whereby by reason of the angular relation of the knife to the stock, the advanced portion of the cutting edge will have entered harder material before the succeeding portion emerges from the softer material thus to sever the strips at one edge first and to gradually work the cleft across the strip, permitting but a small portion of the cutting edge to be acting on the harder material at any one period.

Other features of my invention are directed to produce an effective inclination to the knife during the stroke and to cause the knife to assume a horizontal position at the stroke end.

A desirable embodiment of the aforesaid and other features of my invention lending to the general effectiveness of my improved machine are shown in the accompanying drawings in which the reference numerals are applied to like parts in all of the views.

Figure 1 shows in front elevation a desirable embodiment of my invention in the usual "shear stroke" trimmer and Figs. 2, 3 and 4 are partial diagrammatic views illustrating, in elevation, the descending knife and the corresponding positions of the knife cranks.

The machine here shown comprises the usual right and left standards 1 and 2 secured at their lower ends by the cross-rods 3 to form the frame support for the table 4 upon which the stock to be cut is placed. Oppositely supported on the frame above the table are the uprights 5 and 6 having their front faces arranged in conjunction with the guide-bars 7—7', to form the slideways for the knife-stock 8 in the usual manner.

The knife-stock, carrying the knife 9, is arranged to reciprocate in the slideways so formed and is operated from the cranks 10—11 on the opposite ends of the drive-shaft 12, through the pitman connections 14—15 connecting said cranks to the ends of the knife stock. By means of the guide-block 17 on guide bar 7, provided with inclined guideway 18 to receive shear block 20 pivotally carried by the knife-stock, the usual longitudinal movement is imparted to the knife during its down stroke thereby to produce the customary and desirable "shear" cutting stroke. The drive-shaft is journaled in the standards 1 and 2 and receives its power from the usual power shaft (not necessary to be here shown) communicated thereto through the large driving gear 22 fixed on the drive-shaft 12. In the construction here shown the left knife crank 10 is formed integral with said large gear.

The construction as described is as customarily employed but which I have altered as hereinafter described to incline the knife so that it never will be completely buried in the harder or softer material alone whereby it always will be cutting both kinds of material with a steady movement and smooth cut.

As a desirable manner primarily to incline the knife during the cutting stroke the pitman connections 14 and 15 may be adjusted to different lengths which I have shown but it is further desirable that the

knife-edge should be parallel to the table at the end of the stroke so as to strike the usual cutting block throughout its length. Therefore, to that end, I have designed that the operating crank of the elevated end of the knife shall have an increased throw, here shown substantially equal to the difference in the connections, thereby operative, when the knife is lowered, to take up the difference in the connections at the end of the knife cutting stroke thus to cause the knife to assume a position parallel to the cutting block (Figs. 1 and 4). As will be noticed by reference to Figs. 1 and 2, in its upper position and during the first half of the cutting stroke the difference in cranks will add to the inclination of the knife but will gradually diminish its inclination during the last half thereof to zero at the stroke end.

The above features are shown in Fig. 1 wherein as a desirable embodiment I have shown the right hand crank 11 the greater in length, for instance $3\frac{11}{16}$ center to center for the crank 10 and $4\frac{1}{2}''$ for the crank 11 thereby to give an elevation of one end of the knife over the other end of about $1\frac{5}{8}''$. As will be readily understood the result of the arrangement as described will be a greater inclination of the knife at the beginning of the stroke with a uniform diminishing of its inclination as the cutting stroke progresses so as to be parallel to the table at the stroke end.

In incorporating the above features in the machine I have set back or retarded the right hand crank 11 with reference to the crank 10, the lead thereby given to the left hand crank 10 is effective to lower its end of the knife with relation to the retarded right end throughout the greater part of the cutting stroke but is practically negligible in effect when the crank is in a vertical position. This effect will be more readily understood by reference to the diagrammatic views wherein the relative positions of the cranks are shown,—the lead of the crank 10 will be seen to be most effective at midstroke (Fig. 3) as in that position the lead is in the direction of the pull on the cranks, that is substantially in a vertical plane, whereas, at the beginning and at the end of the stroke such lead will be substantially at right angles to the direction of pull and practically can have no effect on the knife. The lead of one crank over the other is proportioned so as to offset the diminishing inclination during the down stroke and to preserve an effective inclination of the knife during the cutting. As is here shown, at midstroke the inclination will be about the same as at the top or as will be readily understood the original inclination of the knife might be increased during the stroke as desired.

The coaction of my improved arrangement with the usual shear stroke or longitudinal movement of the knife herein provided for by the inclined guide 17 results in what may be termed a "double shear" stroke, that is a stroke produced both by a longitudinal draw movement and by a rocking of the knife whereby the cutting is more easily accomplished. If further results, owing to a large part of the knife inclination being produced by the retarded crank action, that the incline of the knife in its normal upper position is very slight and thus does not have a distorted or clumsy appearance.

Having described my invention, I claim,

1. A machine of the character described having a supporting frame, a table for the work, a knife stock, a knife carried by said stock, a drive shaft and operating connections from the shaft to the knife stock, said connections being arranged to give an inclination to the knife with relation to the work during the cutting stroke and to support it parallel to the table when in lowermost position.

2. A machine of the character described having a supporting frame, a table thereon for the material to be cut, a knife stock, a knife carried by said stock, a drive shaft, cranks on the drive shaft and connections from the cranks to the knife stock, said cranks being arranged of different throw to give an inclination to the knife relative to the work during the cutting stroke.

3. A machine of the character described having a supporting frame, a table for the work, a knife stock, a knife carried by said stock, a drive shaft and operating connections from the shaft to the knife stock, said connections being adapted to give an inclination to the knife during the cutting stroke and to straighten the knife at the stroke end.

4. A machine of the character described having a supporting frame, a table for the material to be cut, a knife, a crank shaft, cranks thereon, connections from the cranks to the knife, one of said cranks being arranged in a position retarded with relation to the other crank thereby to be effective to incline the knife during the period of cutting and to be ineffective in its extreme upper or lower positions.

5. A machine of the character described having a supporting frame, a table for the material to be cut, a knife, a crank shaft, cranks thereon, connections from the cranks to the knife, said connections being adapted to incline the knife with relation to the work, and one of said cranks having an increased throw to add to the incline of the knife in its upper position and to take up the inclination of the knife when in its extreme lower position and said crank in addition being retarded with relation to the other to effect

further inclination of the knife during the cutting stroke only and means to produce a longitudinal movement of the knife during the cutting stroke.

6. A machine of the character described having a supporting frame, a table for the material to be cut, a knife, a crank-shaft, cranks thereon, connections from the cranks to the knife, said cranks being arranged of different throw to give an inclination to the knife relative to the work during the cutting stroke and said connections being adapted to support the knife parallel to the table when in lowermost position.

7. A machine of the character described, having a supporting frame, a table for the material to be cut, a knife, a crank-shaft, cranks thereon, connections from the cranks to the knife, said connections being adapted to incline the knife with relation to the work, one of said cranks having an increased throw to add to the incline of the knife in its upper position and to take up the inclination of the knife when in extreme lower position and said cranks being arranged one in advance of the other to effect a further inclination of the knife during the cutting stroke only.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

NIEL GRAY, JR.

Witnesses:
P. J. CLANCEY,
JAS. P. KANE.

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