G. R. CLARKE.

Machines for Cutting Paper.

No. 199,146. Patented Jan. 15, 1878.

Fig. 2.

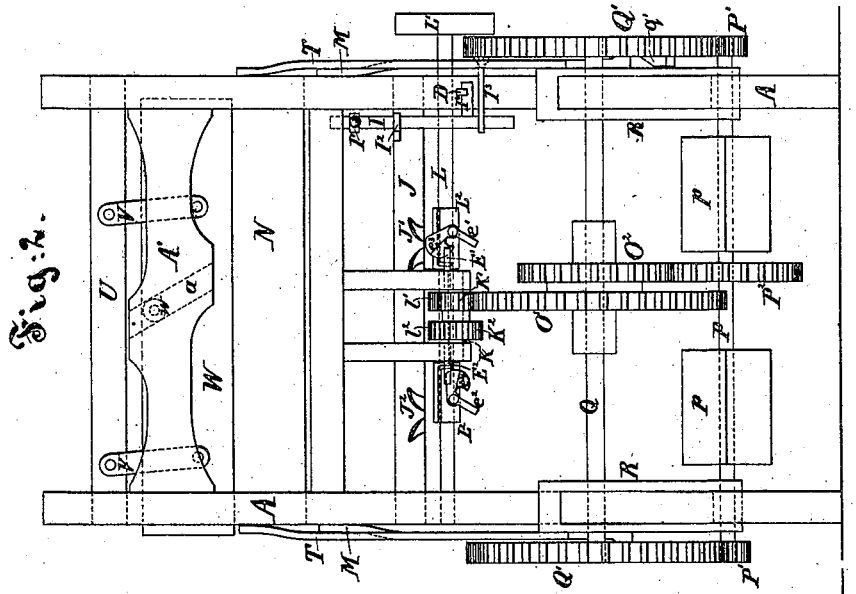

Fig. 3.

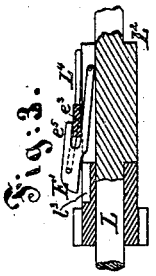

Fig. 1.

Witnesses:

A. Henry Gentner 2

H. A. Johnstone.

Inventor:

Geo. R. Clarke,

by his attorney

T. D. Stetson

New York

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GEORGE R. CLARKE, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN MACHINES FOR CUTTING PAPER.

Specification forming part of Letters Patent No. **199,146**, dated January 15, 1878; application filed April 27, 1877.

To all whom it may concern:

Be it known that I, GEORGE R. CLARKE, of Brooklyn, Kings county, in the State of New York, have invented certain new and useful Improvements in Paper-Cutting Machines, of which the following is a specification:

The invention relates to the means for communicating motion to the cutting-knife, and to the clamp for firmly compressing the pile of paper on which the knife acts.

I have devised means whereby the clamping-piece and the knife are operated by the same train of mechanism, the clamp being brought down first upon the pile of paper, and by using the resistance of the paper as a fulcrum the motion is afterward communicated to the knife. I can vary the proportionate amounts of the forces applied on the clamp and on the knife by changing the wheels.

The accompanying drawings form a part of this specification, and represent what I consider the best means of carrying out the invention.

Figure 1 is a side elevation, and Fig. 2 a front elevation. Both figures show the clamp depressed and the knife about commencing to be depressed. Fig. 3 represents a small portion on a larger scale.

Similar letters of reference indicate like parts in all the drawings.

A is a fixed frame-work of cast-iron or other suitable material. It is formed with an extended level portion, serving as a table, on which the paper may lie, and with a strip of wood or lead flush therewith, upon which the knife may strike after having divided the paper. W is the knife, properly sustained in the vertical plane by supports at each end, and guided to induce the proper drawing cut by a roller, *w*, mounted in a pin on the face of the knife, and running in an inclined groove, *a*, formed in a cross-piece, A′, of the frame. The knife is forced downward by links V, which connect it to a cross-head, U, which is guided by the frame-work, and is free to move only vertically.

The arms U′ are rigidly connected to the cross-head, and traverse in vertical ways in the framing at each side. They are connected by links T to peculiar double levers R, turning loosely on a shaft, Q, and carrying at their opposite ends a loaded shaft, P, the weight of which tends constantly to elevate the links T, and consequently the cross-head and knife.

There is a link, T, and double lever R, at each side of the machine. A small gear-wheel, P^1, fixed on each end of the shaft P engages with a large gear-wheel, Q′, fixed on each end of the shaft Q.

A gear-wheel, P^2, fixed on the shaft P, engages with a gear-wheel, O^2, which is bolted on the side of a larger gear-wheel, O^1. Both O^2 O^1 turn loosely on the shaft Q.

Assuming the shaft Q and wheels Q′ to be held stationary, a rotary motion, communicated to the wheel O^1 and thus to the shaft P, causes this shaft P to climb, by the action of the wheels P^1, on the wheels Q′, and thus to depress the knife. On the liberation of the parts the weight *p* on the shaft P promotes the descent of this shaft and the consequent elevation of the knife.

N is a clamping-bar, guided in the frame-work, and capable of only a vertical motion. At each end is a link, M, which connects it to a pin, *q*, on the adjacent wheel Q′. A partial turning of the wheels Q′ depresses the clamping-bar N. The wheels Q′ are both rigidly connected to the shaft Q and turn together.

On commencing to operate the mechanism the first effect of turning the wheels O^1 O^2, and thus communicating motion to the shaft P, is to turn the wheels Q′ and depress the clamping-bar N. As the clamping-bar is depressed so as to feel the resistance of the paper, the rotation of the wheels Q′ begins to be resisted, and when these wheels are sufficiently retarded the continued rotation of the shaft P overcomes the weight *p* of that portion of the apparatus, and the shaft P commences to climb and to depress the opposite end of the levers R and operate the knife W. When this latter action has proceeded until the knife touches the paper, the resistance to the depression of the knife contributes to the force of the weight *p* to resist the further climbing of the shaft P on the peripheries of the wheels Q′.

At this stage the turning of the levers R is retarded, and the rotation of the wheels O^1 O^2, instead of wholly elevating the shaft P and its connection, commences to again rotate the

wheels Q′, inducing a very strong depression of the clamping-bar N, and a consequent firm holding of the paper. While the resistance thus induced again brings the wheels Q′ to rest, the shaft P climbs farther by its continued rotation, and depresses the knife until the paper is severed.

The clamping-bar N always bears upon the paper before the knife is depressed, and as the resistance to the knife increases, the pressure of the clamping-bar increases, the latter serving as a fulcrum for the application of the power to the knife. So long as the clamping-bar can be pressed down farther the knife will wait, and only when the clamping-bar has induced a sufficient pressure upon the paper to make a firm resistance will the knife be efficiently depressed and make a continuous movement down through the pile of paper upon the bed. Self-acting clutches then come into action and reverse the motion, allowing first the knife and afterward the clamping-bar to rise to their original positions. When this is attained, the clutches again act to arrest the motion until such time as the attendant shall determine.

The motive power is applied through a belt (not represented) from a steam-engine or other motor, working on the pulley L′, fixed on the shaft L. This shaft L is turned continuously, whether the machine is desired to operate or not; but it turns idly until the attendant, by means of the hand-lever I^1, turns the shaft I, and thus, by means of the arm I^2, moves the sliding bar J. This bar J carries two curved plates, J^1 J^2, having each a deep notch with a flaring mouth. These notches are adapted to receive levers e^1 e^2, which form parts of peculiar clutches E^1 E^2, which respectively engage and release separate gear-wheels l^1 l^2, which are loosely mounted on the shaft L, between the clutches, and are capable of being revolved independently.

The wheel l^1 engages directly with the wheel O^1, and when it is at work the pressure-bar N and the knife W are elevated rapidly.

The gear-wheel l^2 engages indirectly with the wheel O^1 through the medium of a pair of wheels, cast together or otherwise firmly fixed together on a separate shaft, K, and marked, respectively, K^2 K^1.

The wheel K^2 is largest, and the motion being received from the wheel l^2 through this large wheel K^2, and given off to the wheel O^1 through the smaller wheel, K^1, it follows that the motion thus imparted is not only in the opposite direction to that received through the wheel l^1, but is slower and more forcible in the ratio of the wheel K^2 to the wheel K^1. The slow and strong motion thus communicated is that which depresses the clamping-bar N and the knife W.

The flaring grooves in the plates J^1 J^2 are at a less distance apart than the centers of the levers e^1 e^2 of the clutches E^1 E^2. When the bar J is thrown to the extreme left position it throws the clutch E^2 into engagement, and the clutch E^1 out of engagment. When the bar J, on the contrary, is thrown to the extreme right position, it puts the clutch E^1 into engagement and the clutch E^2 out of engagement. But I take care to so proportion the parts that there shall be an intermediate position in which the bar J may be set, in which both clutches will be thrown out of engagement.

This position is induced by means of a wedge-cam, q', on the face of the adjacent wheel Q′, which, when the knife and clamping-bar have each attained their highest positions, strikes an arm, I^3, fixed on the upright shaft I, and turns it to a just sufficient extent to move the bar J into the middle position and throw the entire mechanism out of action.

When the pile of paper has been placed in position on the table, and it is desired for the machine to act, the attendant turns the handle I^1, and, by throwing the slide J to the left, engages the clutch E^2, and, through the wheels l^2 K^2 K^1, operates the mechanism in the proper direction, and depresses first the clamping-bar N and afterward the knife W. The reversing action, when the knife has fully descended, is automatic.

D is a slide, capable of moving longitudinally in a recess provided in the frame-work. It engages at one end with a short arm, I^4, on the upright shaft I. The other end stands in the proper position to be struck by one of the levers R when the knife has been fully depressed. The movement of this slide turns the shaft I, and moves the slide J strongly to the extreme right, with the effect to disengage the clutch E^2 and to engage the clutch E^1. Immediately on this change of condition, and the consequent reversion of the direction of the motion of the wheels O^1 O^2, the continued rotation of the shaft P proceeds to turn the levers R and wheels Q′ back to their original position. This motion is aided by the weight p, and is more rapid than the motion in the reverse direction by reason that the reducing-gears K^2 K^1 are now inoperative. So soon as the levers R have assumed their original position, and consequently the knife W has been fully raised, the continued rotation of the shaft P turns the wheels Q′, and correspondingly raises the clamping-bar N until the action of the cam q' throws the slide J into its middle position, and again disengages both clutches.

The clutches E^1 E^2 are peculiarly adapted to perform in these relations. L^2 L^2 are large bosses on the shaft I. The levers e^1 e^2 are pivoted thereon, and the turning of the levers e^1 e^2 moves wedge-arms e^3 e^4, which work under the arms e^5 of levers E^1 E^2, working in longitudinal recesses in the bosses L^2.

The two clutches are alike, except that the parts are in reversed positions. Both let go by movement of the respective levers e^1 or e^2 toward the center-line of the machine. Such movement lifts the respective lever E^1 or E^2 out of engagement with the stop l^3 on the adjacent wheel l^1 or l^2 and sets that respective

wheel free, while the movement of the arms e^1 e^2 in the opposite direction away from the center-line of the machine liberates the levers E^1 E^2, and allows them to move inward and engage with the stops l^3.

L^4 is a spring on each clutch, which tends to force the levers E^1 E^2 into the engaging position.

I esteem it well to guard the clutches by a light casing or framing, (not represented,) to prevent the delicate levers e^1 e^2 from being affected by contact with any object as they rotate.

A screw, *r*, tapped through the lever R, forms the striking-piece, by which the motion is communicated to the slide D to reverse, the motion. By setting this screw in or out, the period in the elevation of the levers when the reversion takes place may be accelerated or retarded.

In exchanging wheels to vary the ratio of the forces on the clamping-bar N and knife W, the wheels which will ordinarily be most conveniently changed are the overhung wheels Q′ and P^1; but the wheels O^2 and P^2 can be exchanged instead.

Instead of changing the wheels, a more convenient mode of adjustment, under many circumstances, will be to attach the link M to the wheel Q′ at varying distances from the center. This may be effected by setting the pin *q* in a slot in the wheel Q′ and changing the position of the pin outward and inward in that slot, as may be required. Of course, shifting it outward from the center will give a greater range of motion to the clamping-bar N, and less purchase or less force relatively to the force with which the knife W descends.

The knife may be controlled laterally by other means than the groove *a* and the roller *w* running therein. It may be controlled without any lateral motion, and consequently without any drawing cut; or a drawing cut may be induced by various other means.

It will be observed that the operation of the mechanism is first to depress the clamping-bar gently upon the paper, in which condition the paper may be moved a little, if it shall be found by the operator to be desirable; but so soon as the climbing of the shaft P and the consequent movement of the levers have depressed the knife so that it begins to bear upon the paper, the climbing will be temporarily arrested and the clamping-bar further depressed, so as to hold the paper more firmly, after which the knife will traverse down through the paper. I esteem this an important quality.

I claim as my invention—

1. The combination of the levers R R, carrying the shaft P, with its gear-wheels P^1, operating the knife by the climbing of the wheels P^1 upon the wheels Q′, which operate the clamping-bar, substantially as herein specified.

2. The clamping-bar N and knife W, with their respective operating mechanisms, constructed substantially as described, combined and arranged as shown, so that the clamping-bar shall first be depressed with moderate force, then the knife sink and commence to cut, then the clamping-bar be more forcibly depressed, and lastly the knife move farther and sever the paper, all substantially as herein set forth.

3. The intermediate gear-wheels K^2 K^1, in combination with the wheels l^1 l^2 and clutches E^1 E^2 on the driving-shaft L, adapted to both reverse the motion and impart a stronger and slower descending than ascending motion to the clamping-bar and knife, as herein specified.

4. The slide D and shaft I, with arms I^2 I^4, in combination with the lever R and its connections and with the slide J, provided with the flaring plates or guiding-surfaces J^1 J^2, clutches E^1 E^2, wheels l^1 l^2, and connected mechanism adapted to reverse the direction of the motion when the knife has been fully depressed, as herein specified.

5. The cam *q′* on the wheel Q′, in combination with the arm I^3 and suitable connections to the slide J, adapted to throw the latter into the middle position and induce a state of rest of the knife and clamping-bar, as herein specified.

In testimony whereof I have hereunto set my hand this 21st day of April, A. D. 1877, in the presence of two subscribing witnesses.

GEO. R. CLARKE.

Witnesses:

THOMAS D. STETSON,

CHAS. C. STETSON.