No. 612,703. Patented Oct. 18, 1898.

D. S. CLARK.

ROTARY PAPER CUTTING MACHINE.

(Application filed Jan. 27, 1896.)

(No Model.) 4 Sheets—Sheet 1.

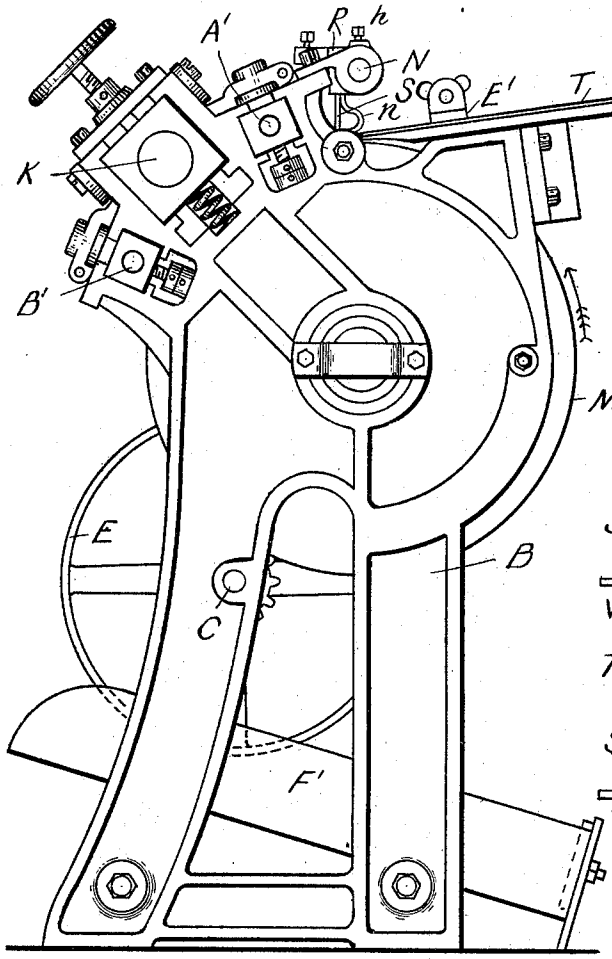


Fig. 1.

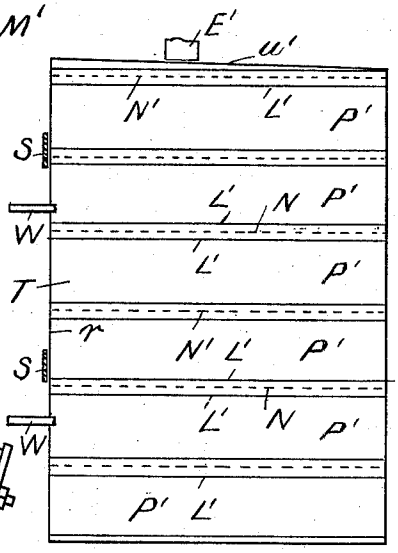


Fig 7

WITNESSES
Leona C. Arno
Luella M. Marr

INVENTOR
Dwight S. Clark,
Per Edwin W. Brown,
Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 612,703. Patented Oct. 18, 1898.

D. S. CLARK.

ROTARY PAPER CUTTING MACHINE.

(Application filed Jan. 27, 1896.)

(No Model.) 4 Sheets—Sheet 2.

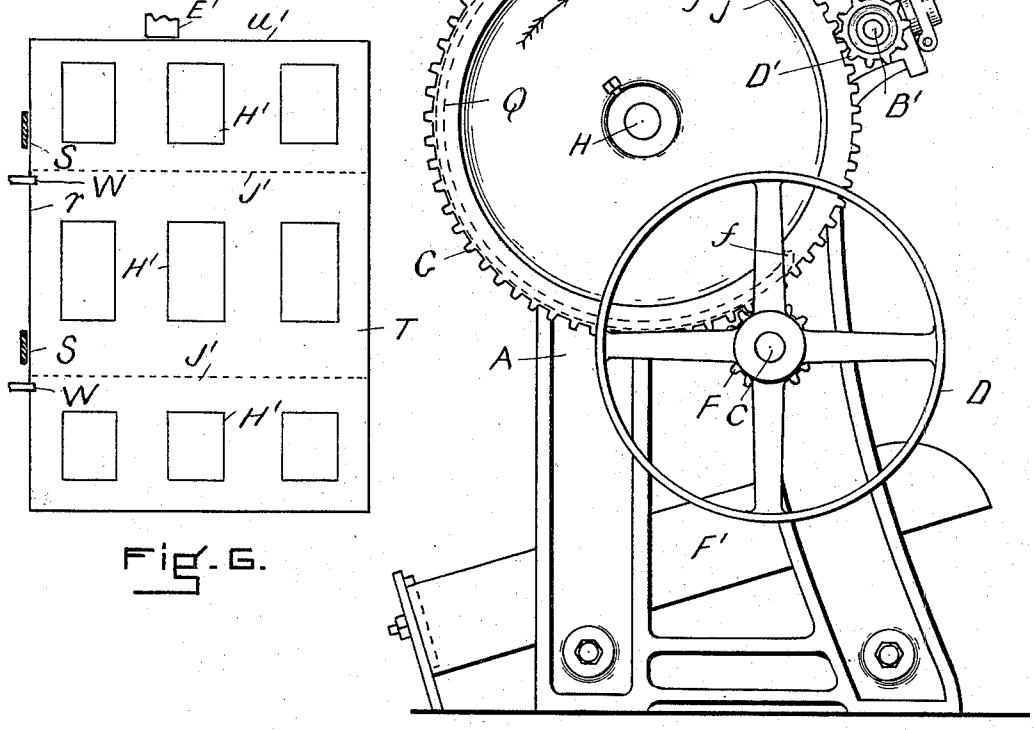


Fig. 6.

Fig. 2.

WITNESSES

Lyonia G. Amo.

Luella M. Hart.

INVENTOR

Dwight S. Clark,

Per Edwin W. Brown,

Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 612,703. Patented Oct. 18, 1898.

D. S. CLARK.

ROTARY PAPER CUTTING MACHINE.

(Application filed Jan. 27, 1896.)

(No Model.) 4 Sheets—Sheet 3.

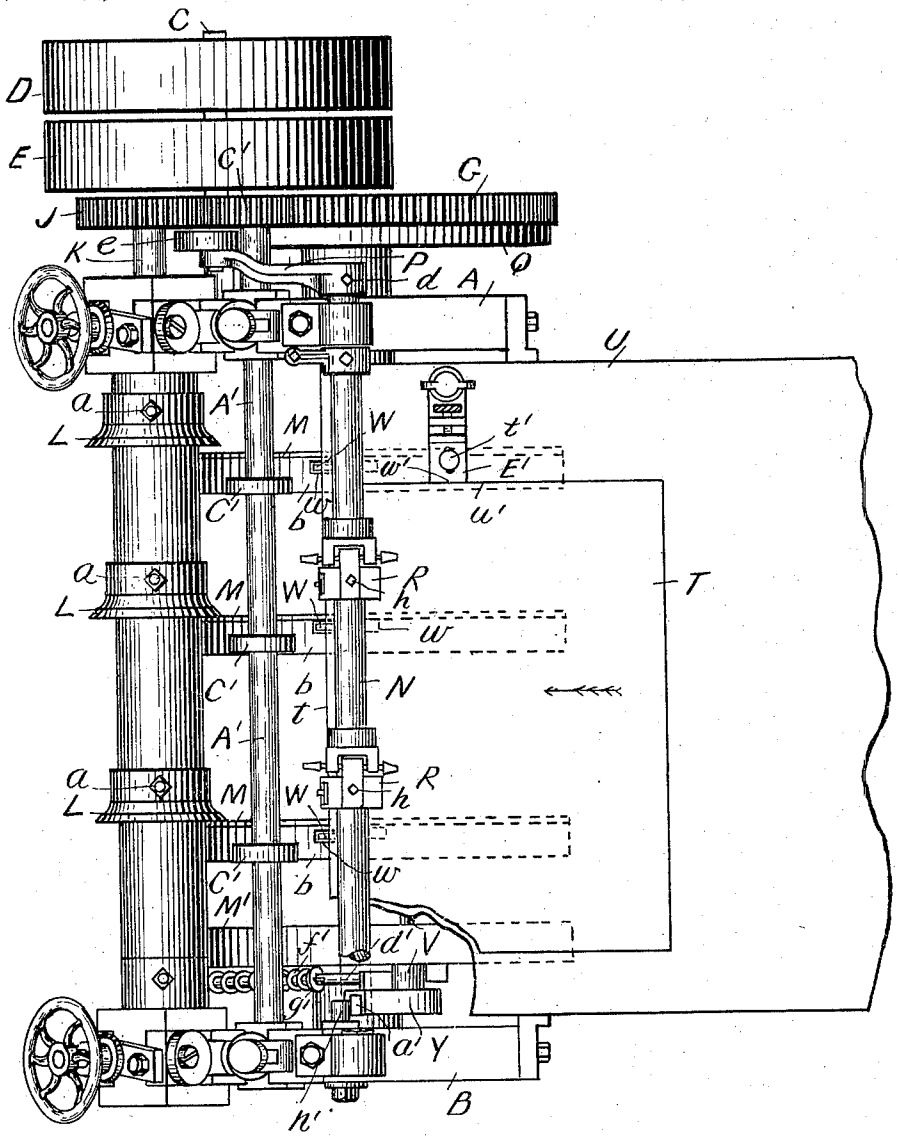


Fig. 3.

WITNESSES

Leona C. Amo.

Luella M. Starr

INVENTOR

Dwight S. Clark,

Per Edwin W. Brown,

Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 612,703. Patented Oct. 18, 1898.

D. S. CLARK.

ROTARY PAPER CUTTING MACHINE.

(Application filed Jan. 27, 1896.)

(No Model.) 4 Sheets—Sheet 4.

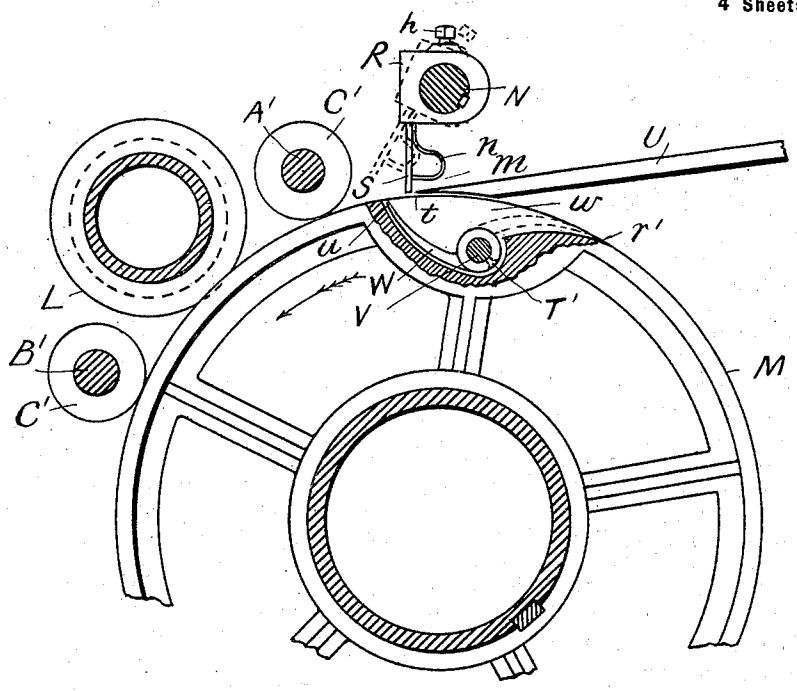


Fig 4

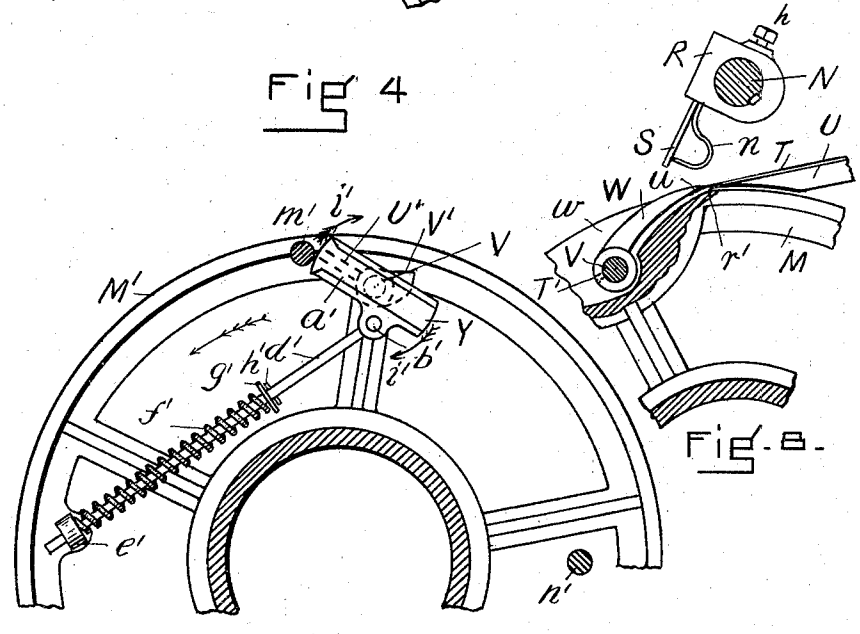


Fig. 6.

Fig. 5

WITNESSES

Lyona S. Arno

Luella M. Starr

INVENTOR

Dwight S. Clark,

Per Edwin W. Brown,

Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

DWIGHT S. CLARK, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE FORBES LITHOGRAPHIC MANUFACTURING COMPANY, OF SAME PLACE.

ROTARY PAPER-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 612,703, dated October 18, 1898.

Application filed January 27, 1896. Serial No. 577,023. (No model.)

To all whom it may concern:.

Be it known that I, DWIGHT S. CLARK, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Rotary Cutting-Machines, of which the following is a full, clear, and exact description.

This invention relates to a rotary cutting-machine having certain mechanism applied thereto by which are fed and cut sheets of paper or other like sheet material having matter printed thereon in sections or blocks or spaces or lines true and in line with the printed matter thereon without regard to the outline or edges of the sheet; and the invention consists, in a rotary cutting-machine for cutting sheets of paper or other like sheet material, in the combination, with the rotary cutters of such machine, of means for guiding the sheet to be cut in proper manner for the cutting of the same into strips or parts as desired true and in line with the printed matter thereon, all substantially as hereinafter fully described; and the invention also consists, in a rotary cutting-machine for cutting sheets of paper or other like sheet material, in the combination, with the rotary cutters of such machine, of means and mechanism to feed the sheet to and through the cutters in a positive manner and on a true line in relation to printed matter thereon, all substantially as hereinafter fully described, reference being had to the accompanying sheets of drawings, in which is illustrated a rotary cutting-machine for the cutting of paper or other like sheet material having this invention applied thereto.

Figure 1 is a view in side elevation. Fig. 2 is a view in side elevation opposite to Fig. 1. Fig. 3 is a plan view. Fig. 4 is a detail side view of a cutter and its cutting-ring, with parts broken out and in cross-section. Fig. 5 is a detail side view of a ring on the cutting-ring shaft, with parts in detail section and side view. Figs. 6 and 7 are plan views of sheets of paper to be cut in the machine and having a representation of printing matter thereon. Fig. 8 is a detail section and side view of parts in Fig. 4, but in different positions. Figs. 4, 5, and 8 are enlarged.

In the drawings, A and B represent two end uprights of a frame, which are braced and connected together by horizontal cross-rods in any suitable manner for supporting and carrying the various parts of the machine.

C is a horizontal shaft turning in bearings in the two uprights and having on its end, outside of upright A, a loose pulley D and a tight pulley E, by which it is driven by a belt (not shown) running from any suitable main driving-shaft. Secured to this shaft C is a small gear F, which engages with a large gear G on a horizontal shaft H, turning in suitable bearings in the uprights. This large gear G engages on its front upper side with another smaller gear J on the end of a horizontal shaft K, turning in bearings in the uprights parallel with the main shaft C, and on this shaft K are cutters L, which cutters are annular and of the usual form in rotary cutter-machines and are adapted to be moved along the shaft longitudinally and secured in place, as desired, by set-screws *a*.

Secured to the large gear-shaft H are cutting-rings M, as many as there are cutters L, which cutters M make, with the cutters L, the cutters between which the paper sheet to be cut is passed in the usual manner of rotary cutting-machines. The peripheries *b* of these cutting-rings are widened somewhat, as shown, for purposes to be hereinafter described. These cutting-rings M are arranged on their shaft H in such manner as to be moved longitudinally thereon, so that with the adjustment of these cutting-rings and the cutters on their respective shafts different lines of cuts can be made for wide and narrow strips, as usual.

N is a horizontal rock-shaft above the cutting-rings M, adapted to rock in bearings in the upper ends of the uprights, and on one end of this shaft, beyond the upright A, is secured an arm P by a set-screw *d*, which arm projects forward substantially in a horizontal direction and has in its free end a vertical roller or wheel *e*, journaled thereto, which is adapted to rest at certain portions of the revolution of the gear-shaft H on a rib-cam Q, secured to the inner side of the large gear G near its edge, which cam Q extends nearly around the gear and concentric with its shaft, as shown in Fig. 2 in dotted lines, its two ends

bending inward, as at *f g*, respectively, as shown. On this rock-shaft N are two blocks R, which are arranged to be moved back and forth along the rock-shaft and be secured in desired positions by set-screws *h*. From each block R depends a flat arm S, its lower end *m* about on the same horizontal planes of the upper edges of the cutting-rings on cylinder *m*, said flat arm, guide, or stop S having on its rear side a bent guard-piece *n*. Against the back side of these arms S, under their guards *n*, the front edge *r* of the paper sheet T is placed when desired to cut it in the machine, and arms S constitute the front guides for the paper sheet. As the large gear G revolves it carries with it the cam-rib Q, and as its end *g* passes under the wheel *e* of the arm P it raises the arm and swings its shaft N so that the front guides S are swung up forward, as shown in Fig. 8, sufficiently for the paper sheet to be freely moved under them in its travel through the machine. As the end *f* of the cam-rib Q reaches the arm P it allows the roll and its arm to fall, which correspondingly swings the front guides down into position for the next paper sheet to be set by its front edge against them, as before, and as soon as the other end *g* of the cam-rib passes under the arm-roll it causes the shaft N to again swing the guides S up out of the way, as before, and so on every revolution of the gear G.

U is the feed-board, which extends across and over the machine, its front edge *t* being just back of the front guides S when down, and on this feed-board is laid the sheet of paper to be cut, for its front edge *r* to rest against the guides S when they are down.

V is another horizontal rock-shaft carried by the shaft or cylinder H and turning in bearings in the cutting-rings M, and to this shaft are connected grippers or fingers W, one to each ring, which grippers are curved as shown in Fig. 4, each having a long thin flat end *u*. These grippers are located, respectively, in recesses *w* in the cutting-rings. On one outer end of this rock-shaft V is secured an arm Y, having a longitudinal groove *a'* on its outer side, and connected to it by a pivot *b'* is a rod *d'*, which extends across the side of the outer ring M' on shaft H, which in the present case is not a cutting-ring, and passes freely through an opening in a lug *e'* on the side of the ring. Encircling this rod is a spiral spring *f'*, bearing by its ends, respectively, against the lug *e'* and a plate *g'*, held by a cross-pin *h'* on the rod *d'*, the tension of this spring bearing outward.

Secured to and projecting from the inner side of the upright A are two short pins *m' n'*, the one, *m'*, radially farther distance from the cutting-ring shaft than the other, *n'*, as shown in Fig. 5, and the object of these pins is to cause the shaft V, by the travel of the grooved arm Y thereover, to turn a certain distance, so that the grippers W can be swung back and forth within certain limits, for their ends *u* when swung in one direction (or backward) to lay over and upon the faces of their respective cutting-rings just beyond their recesses *r'*, so as to press the front edge *r* of the paper sheet to be cut upon the cutting-rings and firmly hold it there by the tension of the spring *f'* to feed the sheet in the turning of the cutting-rings, and when swung in the other direction to release such hold upon the paper sheet and to swing forward into the recesses below the cutting-ring faces out of the way to allow the paper sheet to be freely fed over them, as will be more fully described. This is accomplished by the groove *a'* in the arm Y passing over the pin *m'*, (see Fig. 5,) and as it travels the arm is swung in the direction of the arrows *i'*, Fig. 5, until the rod-pivot *b'* passes over the other side of the arm-shaft V, when from such position the spring *f'* will hold it there until it reaches in the revolution of the ring the pin *n'*, when groove *a'* in the arm Y travels over the pin *n'*, which swings the arm, and thus its shaft V, back into the first position, and in such operation the grippers or fingers W are swung from their position shown in Fig. 4 in full lines, into the position shown in Fig. 8, they then pressing the front edge of the paper and holding it firmly on the face of the cutting-rings at *r'* until the grooved arm reaches the pin *n'*, when the grippers are swung up and back into their first position out of the way, and so on with each revolution of the cutting-rings.

A' and B' are two horizontal shafts, one, A', above and the other, B', below the cutter-shaft K, and both arranged to turn in bearings in the uprights, and secured to these shafts are a series of short rolls C', which are over, respectively, the cutting-rings and bear and run upon the same and serve, in conjunction with the cutting-rings, as feed-rolls to the paper sheet. To cause the surfaces of these feed-rolls A' B' and the surfaces of the cutting-rings to travel together in the same time, so that the paper sheet will be fed positively even and true, each shaft A' B' has a gear D', which gears mesh with the large gear G. The diameters of these gears and the diameters of the cutting-rings and feed-rolls, respectively, correspond to accomplish such result in a manner well known.

The cutting-rings have their faces widened to form a bearing for the short feed-rolls C', these feed-rolls being short, so as not to interfere with the grippers as they travel by thereon.

On the feed-board U is a narrow flat strip or plate E', secured by set-screws *t'* thereto, and strip E' is of sufficient thickness for the paper sheet by its side edge *u'* to abut against its end *w'*. This guide-plate E' is the side guide for the paper sheet when placing the sheet on the feed-board to be cut in the machine.

The operation of the machine is as follows:

With the machine set in motion place the paper sheet T by its front edge r against the front guides S and its side edge u against the side guide E'. When the cutting-rings have moved round for their grippers to have passed by the longitudinal line of the front guides, the grooved arm Y of their shaft will pass over the pin m', and in such movement the shaft will be turned and its grippers swung over quickly, and their ends come down upon the paper sheet at its front edge and press it on the face of the cutting-rings at r' just beyond the recesses, and as the cutting-rings continue to revolve they carry the paper sheet with it; but just before the grippers grasp the paper sheet the arm P of the shaft N by its roller e passes up onto the cam-rib Q at its end g, which swings the shaft, and thus the front guides, up and holds them there out of the way of the free travel of the paper sheet actuated by the grippers and cutting-rings M, which carry it to the first feed-rolls C', which, with the cutting-rings, then feed the paper sheet to and between the cutters, which cut the sheet, and then to the other feed-rolls C', which serve to guide the cut strips of the paper sheet after it has passed the first feed-rolls and the cutters until the strips so cut drop into a receptacle F' in the under part of the machine. When the sheet has passed between the cutters in the travel of the rings M, the arm P runs off the end f of the cam-rib Q, which allows it to drop for its guides to be in position for the next sheet. Also in the continued movement of the cutting-rings the grooved arm Y passes over the pin n' and acts to return the grippers to their place of rest preparatory to again moving them at the proper time to grasp the next sheet, and so on.

The special advantage of the grippers to grasp the sheet and carry it to the feed-rolls and cutters insures that first the sheet will be grasped and held by the grippers in a positive manner and carried to the feed-rolls and cutters true and even, and as the feed-rolls are positive the sheet is fed by them in a continued true line until delivered by the last feed-rolls properly cut into the receptacle.

In laying the sheet of paper on the printing-press to be printed it is laid against two narrow front guides or stops and one narrow side guide or stop, and in adjusting the front and side guides in the cutting-machine they are moved and secured so as to be in the same relative positions in relation to the sheet as on the printing-press, so that when the paper sheet is placed on the feed-board of the cutting-machine the front and side stops will be in position for the same parts or places on the front edge and side edge of the sheet to bear as in the printing-machine. Said guides being narrow, it will make no difference whether the side edge of the sheet is true or not—whether it is cut at an angle or not to the front edge. The paper sheet will be laid upon the feed-board of the cutting-machine in the same relation to it as it was on the printing-press, so that, then, if the cutters are adjusted on their respective shafts to cut on the lines desired between the printed matter the paper sheet will be cut true in relation thereto, and every sheet thereafter having the same printing-matter thereon will be cut the same.

Figs. 6 and 7 show in plan view two paper sheets with printed matter thereon placed against the guides of the cutting-machine in the same position as on the printing-press on which they were printed, the printed matter in Fig. 6 being represented by squares H' and the lines of cut by dotted lines J', which, as will be seen, are in line with the printed matter. Fig. 7 shows parallel lines L' close together as the printed matter and the dotted lines N' the lines of cut, this sheet being intended to be cut into narrow strips P', having the lines L' for border-lines, which strips are intended for use as binders for small articles, &c. It will be seen by the two figures, especially Fig. 7, the necessity of cutting the sheet in lines parallel with the print and the great advantage of a cutting-machine that will do such work. As shown in Fig. 6, the side edges Q' R' are parallel with the line of cut, but in Fig. 7 it is seen that the edge S' is not parallel, but at an angle; but notwithstanding this, having the guides arranged in the same relation to each other and the printed lines as on the printing-press, with the cutters properly arranged on their shafts, this sheet requiring six pairs of cutters, the strips will be cut true on the dotted lines and on lines parallel with the marginal lines L'. The guides are so small and narrow in relation to the size of the paper sheet to be cut that practically they have no effect on the paper sheet to alter its position in relation to the cutters. Thus in this cutting-machine sheets of printed matter can be cut perfectly true in relation to the printing without regard to the shape of the paper sheet and with only the usual care of laying the sheet against the guides or stops.

In rotary cutting-machines now in use the paper is generally placed up against only one guide, which is the side one, and then fed to the feeding-rolls in front of the cutters by hand, and in such mode of feeding it is very difficult for the operator to feed it just right, so the feed-rolls will grasp it true, as one end or the other is apt to be fed in first, no matter how careful the operator may be; also, in such machines the side guide is a long strip, and, as is obvious, the line of cut will be correspondingly in relation to this guide, and if the sheet is not true on its edge in relation to the printed matter thereon it will be cut wrong and therefore spoiled. With this invention all these objections are obviated and overcome.

Obviously a more or less number of cutters and grippers, &c., can be used; but there are

enough shown in the drawings to fully illustrate the invention; also, more than two front guides can be used, if desired, although two produce satisfactory results.

The grippers can be arranged in any suitable manner with the lower cutting-rings to swing up and over upon the paper sheet to grasp the sheet at the proper time, and moved along to feed the same to and through the cutters; also, they can be arranged independent of the cutting-rings in connection with other rings serving as feed-rolls in front of them; also, they need not press the paper sheet on the faces of the cutting-rings, but can press it into the end of the recess sufficiently to hold it, which in practice is very little.

The various journals of the shaft and bearings for the same can be arranged in any of the usual ways.

The pin n', which operates the grooved arm to return the grippers to their normal position, can be located on the cutting-ring, so that as soon as the feed-rolls take the paper sheet the shaft will be moved to have the grippers release the sheet and then return to their normal position, or it can be located to operate the grippers as described at any time after the sheet has commenced to travel, as desired; also, the grippers, with the cutting-rings, can do all the feeding, dispensing with the other feed-rolls; but it is preferable to use all.

The grippers are arranged to be moved along their shaft V with the rings M, but when used independent of the cutting-rings they are arranged to be moved along the shaft and secured in any suitable manner. They are secured to their shaft by set-screw T', so they can be adjusted along their shaft as desired.

The arm Y has a rib U' on its rear side, which abuts against a lug V' in the ring M' to stop its movements in both directions.

Having thus described my invention, what I claim is—

1. In a rotary paper-cutting machine, a rotatable shaft and a cutting-ring carried thereby, a gripping-finger carried by said cutting-ring, and means for operating said finger to grasp and release the leading edge of the paper sheet, and a second cutting-ring coöperating with the above-mentioned ring to slit the sheet while held by the gripper, in combination substantially as described.

2. In a rotary paper-cutting machine, a power-driven cylinder and a cutting-ring adjustably attached to the periphery thereof, said cutting-ring provided with a gripper-finger and means for operating the same, and a second rotating cylinder parallel with the first and provided with an adjustable cutting-ring, substantially as described.

3. In a rotary paper-slitting machine, the feed-board provided with gages and stops, as common in printing-presses, the rotating cylinder provided with cutting-rings, a plurality of said rings carrying gripper-fingers, means for clasping and unclasping said gripper-fingers, as common in printing-presses, and the second cylinder having rings thereon corresponding in number and position with the rings on the first cylinder, all in combination substantially as described.

4. In a rotary paper-cutting machine, the feed-board, stops, and guides, such as are common in rotary printing-presses, the cylinder provided with cutting-rings, and with gripper-fingers and with means for operating the same to clasp and release the paper sheet, the second cylinder having cutting-rings corresponding in number and position with the rings on the first cylinder, and the feeding-cylinder operating positively with the rings on the gripper-cylinder to feed the sheets after the release of the grippers, all combined.

5. In a paper-slitting machine the skeleton cylinder having its outer surface made up of rings with spaces between, a plurality of said rings carrying gripper-fingers, means for operating said gripper-fingers as the rings rotate, to clasp or release a sheet, the coöperating cutter-cylinder, power-driven to move with the first-mentioned cylinder, and a feed-board and gages by which the sheet can be fed accurately to the gripper-fingers, all combined substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

DWIGHT S. CLARK.

Witnesses:
EDWIN W. BROWN,
LEONA C. ARNO.