

May 5, 1925.

1,536,924

J. N. PIERCE

ROTARY PERFORATING MACHINE

Filed March 19, 1924

4 Sheets-Sheet 1

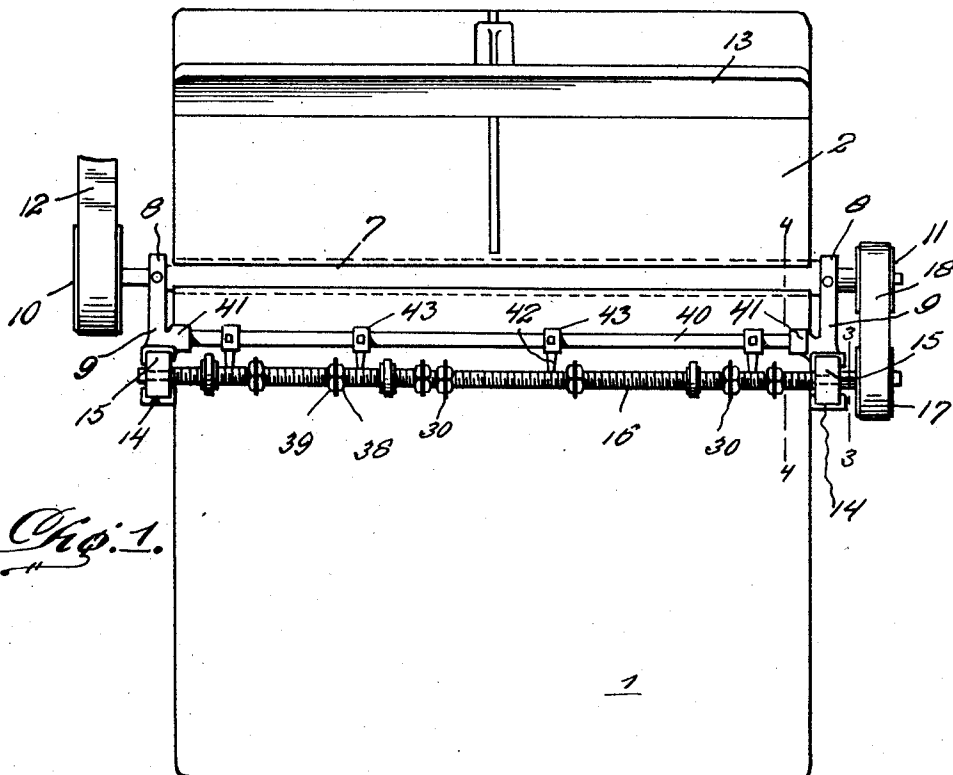


Fig. 1.

Fig. 4.

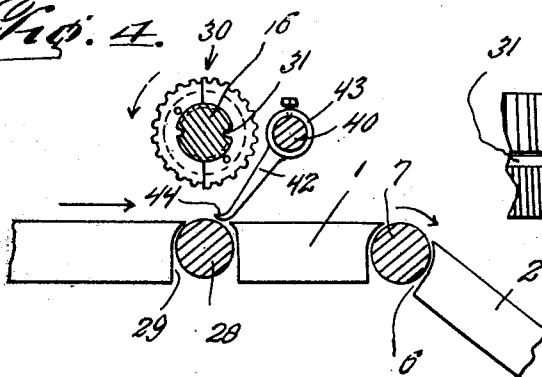
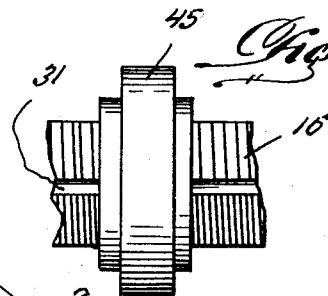


Fig. 11.



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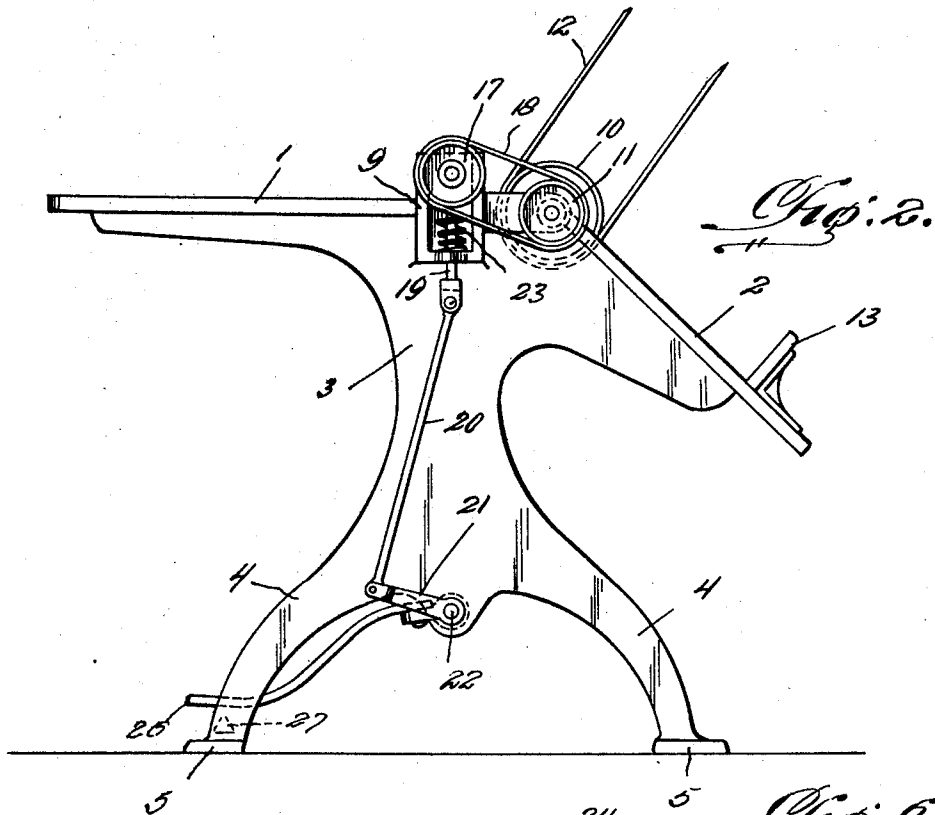


Fig. 5.

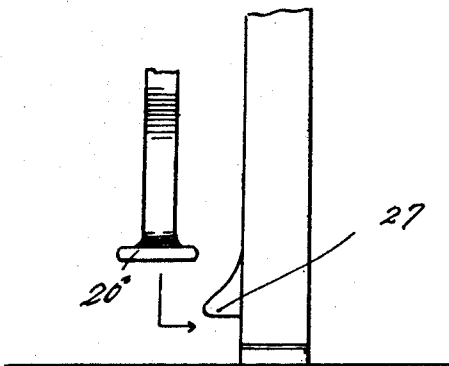
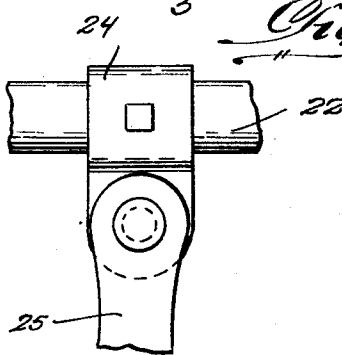


Fig. 6.



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Fig. 3.

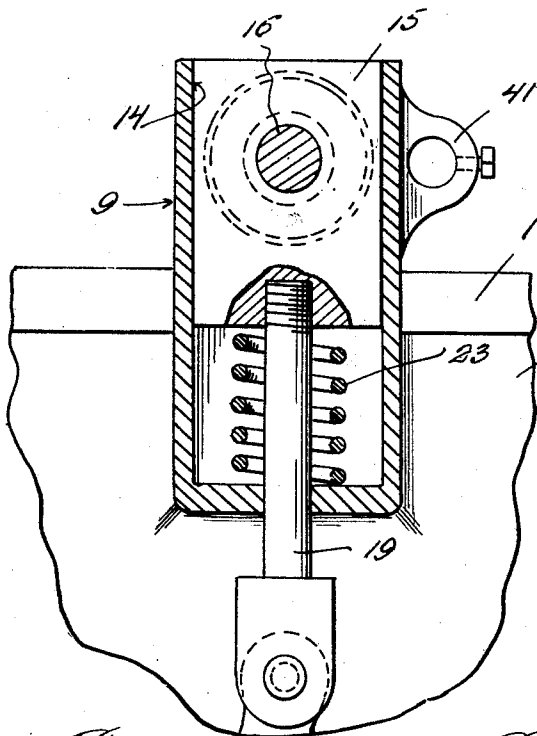


Fig. 7.

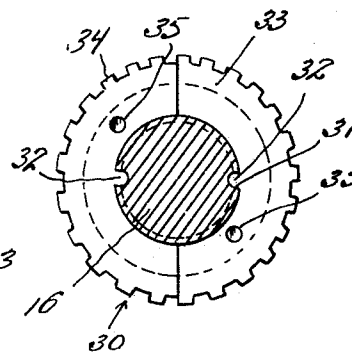


Fig. 8.

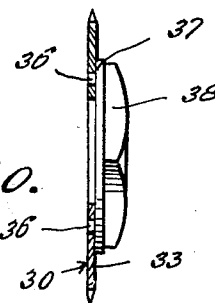


Fig. 9.

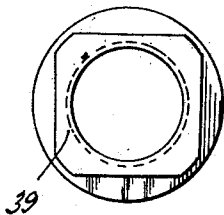
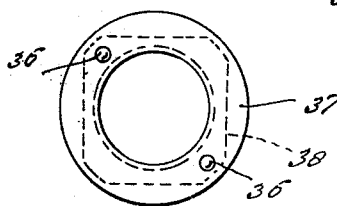


Fig. 10.



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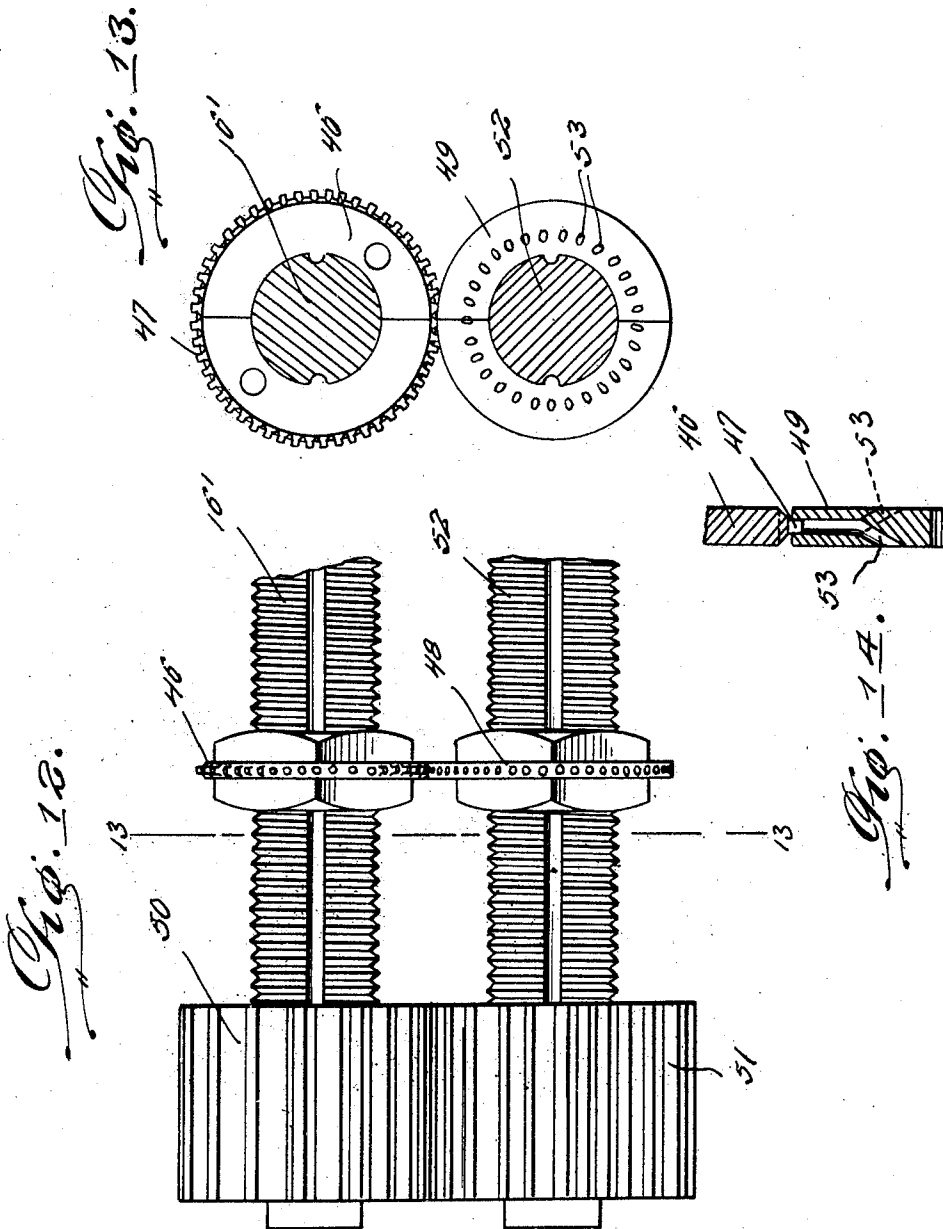
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ROTARY PERFORATING MACHINE

Filed March 19, 1924

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

JOHN N. PIERCE, OF JACKSONVILLE, FLORIDA.

ROTARY PERFORATING MACHINE.

Application filed March 19, 1924. Serial No. 700,354.

To all whom it may concern:

Be it known that I, JOHN N. PIERCE, a citizen of the United States, residing at Jacksonville, in the county of Duval and State of Florida, have invented certain new and useful Improvements in Rotary Perforating Machines, of which the following is a specification.

This invention relates to improvements in perforating machines.

An object of the invention resides in providing a perforating machine wherein rotary perforating elements are provided, for perforating paper in a manner which will enable the same to be readily separated along the line of perforation, and which will reduce the size of the perforations, so that they will be exceedingly small in comparison with perforations formed by the present perforating machines known to the art.

Another object of the invention resides in providing a perforating machine having co-operating rotary perforating elements, one of said elements forming a male or cutting element, while the other element forms a female element for receiving the cutting blade of the male element.

Another object of the invention resides in providing a perforating machine of this character, having a table above which is mounted a cutter shaft provided with a plurality of removable and adjustable cutting elements, adapted to be arranged in any desired spaced relation for cutting any desired number of perforations in a strip of paper passing over said table, said cutting members having a cooperating member for receiving the cutting edges of the cutter over which the paper rides in the perforating operation.

A further object of the invention resides in providing a perforating machine having a table provided with rollers extending across the surface of the table and set in recesses therein, so that the periphery of the rollers will project slightly above the surface of the table, a cutter shaft being mounted above one of said rollers for adjustably and removably receiving a plurality of cutter elements adapted for rotary movement, said cutter shaft being mounted in slidable guide blocks for permitting a movement of the cutter shaft upward or downward relative to said roller, so that the

paper may be inserted between the cutter element and the roller, and the shaft moved downwardly to force the cutter element into cooperation with the roller, so that the knife edges of the said elements will perforate the paper passing over the table and being cushioned over said roller, the rod extending transversely above the table carrying a plurality of holding fingers for engaging the upper surface of the paper and holding it in contact with the periphery of the roller for operating with the cutter element while the same is being moved down to engage and perforate the paper.

The invention includes other objects and improvements in the details of construction and arrangement of the parts, which is more particularly pointed out in the following description and claims, directed to a preferred form of the invention, it being understood, however, that variations may be made in the specific construction of the parts including the cutter elements, within the scope of the invention as described and claimed.

In the drawings:

Figure 1 is a plan view of a perforating machine constructed according to this invention.

Figure 2 is a side elevation thereof.

Figure 3 is a detail sectional view, taken on the line 3—3 of Figure 1, showing the adjustable mounting for the cutter shaft.

Figure 4 is a detail sectional view, taken on the line 4—4 of Figure 1.

Figure 5 is a detail view of one of the legs of the perforating machine, showing the foot pedal for operating the cutting shaft in illustrating the manner of securing said foot pedal for holding the cutter shaft in operative engagement with its cooperating roller.

Figure 6 is a detail view, showing the manner of mounting the foot pedal on the operating shaft connected for operating the cutter shaft.

Figure 7 is a detail sectional view, showing the manner of mounting the sectional cutter element, on the cutter shaft.

Figure 8 is an enlarged detail view, showing one of the flanged nuts, which is threaded on the cutter shaft for securing the cutter element thereto.

Figure 9 is an end view of one of the flanged nuts.

Figure 10 is a view showing the flanged

side of the nut having projections for receiving the sectional cutter blades and projecting through the openings therein.

Figure 11 is an elevational view of the portion of the cutter shaft showing one of the paper holding rollers mounted thereon.

Figure 12 is an enlarged elevational view, of a cutter shaft and an operating shaft in geared connection therewith provided with a slightly different form of cutter elements, the operating shaft being provided with a special form of female element, for cooperating with the cutter element.

Figure 13 is a detail sectional view, taken on the line 13—13 of Figure 12.

Figure 14 is a detail view, showing the manner in which the cutting elements cooperate with the female member.

The perforating machine has a main horizontal chamber portion 1, at the forward end thereof, and a downwardly inclined portion 2, at the rear end thereof, supported upon a suitable frame 3, having legs 4 terminating in suitable supporting feet 5 at the lower end for securing said machine in rigid position on a floor. There is a slot 6 between the main table portion and the inclined portion 2, which receives a drive roller 7, rotatably mounted in bearings 8, projecting from bearing members 9 secured to the frame 3, at opposite sides of the table. Shaft extensions from the ends of the roller 7 receive pulleys 10 and 11, the pulleys 10 having a belt 12 passed thereover, driven from a suitable source of power for rotating the rollers 7 in the bearings 8, and adapted to carry the perforated paper away from the perforating element, to be delivered to the inclined portion 2 of the table, and held thereon by suitable abutment members 13, adjustably mounted on the inclined portion of the table, as shown. The bearing members 9 are formed with guide ways 14, for slidably receiving slide blocks 15, which rotatably mounts the cutter shaft 16, which is threaded throughout its length between the bearings, and which has one end portion projected beyond one of the slide blocks and receiving a pulley 17 over which is passed a belt 18, also passed over the pulley 11, for driving the cutter shaft in the operation of the drive roller.

Slide rods 19 extend through openings in the bottom of the bearing members, and through the central portion of the guide ways formed therein, and are mounted in the lower ends of the slide blocks 15 rotatably mounting the cutter shaft 16, the lower end of said slide rod being provided with bifurcated heads, with which are pivotally connected links 20 extending downwardly and pivotally connected to crank arms 21 on the operating head 22, which is adapted for rotation to operate the crank arm and pull the slide blocks downwardly in the

guide ways of the bearing members against the tension of the spring 23, for a purpose which will be presently described.

Between the legs 4 of the frame 3, the operating shaft 22 which is rotatably mounted in said frame, is provided with a collar 24, having a projection thereon pivotally mounting a foot lever 25 as illustrated in Figure 6, the end of the foot lever having an enlarged foot engaging portion 26, which is adapted for engagement under a lug 27 on the inner side of the forward leg 4 of the frame, as shown in Figure 5, so that said foot lever may be held in depressed position, for holding the slide blocks in the bottom portion of the guide ways of the bearing members 9, the purpose of which will presently appear.

A wooden cushioning roller 28, is rotatably mounted in the slot 29 formed in the table 1, directly below the cutter shafts 16, so that the surface of the roller projects slightly above the surface of the table 1, adapting said roller for cooperation with suitable cutter elements indicated generally at 30, mounted on the cutter shaft 16.

The cutter shaft is provided at opposite sides with key way slots adapted to receive tongues 32 formed in the central portion of semi-circular cutter elements 33, provided on the outer periphery with suitable perforating knife projections 34, a pair of said semi-circular cutting elements being adapted for cooperation to form a complete rotary cutter on the cutter shaft 16, as clearly shown in Figures 1 and 4. The semi-circular cutter elements are formed adjacent corresponding ends with openings 35, into which are adapted to project pins 36 projecting in axial relation on the annular flange 37 of the nut 38, which is screw threaded on the operating shaft, and is adapted to mount said cutter element 33 in rigid connection on said shaft in cooperation with a cooperating flanged nut 39, similar in all respects to the nut 38, but lacking projection similar to the projection 36, which projects into the opening 35 of the cutter blade, and terminates flush with the opposite face thereof, so that the cooperating nuts 39 will have their flanges fit flat against the other face of the cutter element. If it is desired to cut a plurality of perforations at spaced intervals in a relatively wide piece of paper adapted to extend entirely across the table 1 of the perforating machine, the desired number of cutter elements may be mounted in the desired spaced relation on the cutter shaft 16, by positioning the nuts 38 thereon, in the proper spaced relation, so that the faces of the flanges 37 will receive the cutter elements at the proper points for cutting a plurality of spaced perforations in a manner similar to that indicated in Figure 1.

From this construction, it will be readily seen that all of the cutter elements are interchangeable and are readily removable from the cutter shaft 16, by a slight movement of the flanged nut 39, away from the nut 38 with which it cooperates, so that the blades may be removed from the projections 36, on the flange 37, making a very convenient structure for readily renewing the blades in case they become dull, or some of the knife projections are broken off. A rod 40 is mounted in suitable sockets 41, in the bearing members 9, in the rear of the shaft 16, and carries a plurality of paper holding fingers 42, having power portions 43 adjustably mounted on the rod 40, in order that the flanges may be positioned, so that the curved ends 44 may be projected into close proximity with the periphery of the cushion rollers 28, for holding the paper to be perforated in close contact with said roller, to prevent bulging thereof, in order that the cutter element will make straight parallel cuts in the paper and bulging thereof between the cutters prevented. A plurality of pressure rollers 45 are also adjustably mounted on the shaft 16, so that the resilient peripheries thereof, which are formed of rubber or the like, are adapted to additionally press the paper, into contact with the rollers 28 and assist in preventing bulging of the paper relative to the roller, and also in assuring and assisting in the speeding of the paper over the rollers, so that the cutter elements will properly perforate the same.

It will now be seen that when the drive roller 7 is rotated from the source of power through the belt 12, the cutter shaft 16 will be rotated through the belt connection 18, with the pulley 11 on the driver roller, and that upon depression of the foot pedal 25, the operating shaft 22 will rock the crank arms 21 to exert a downward pull through the connections 20 on the slide link 19, so that the slide block 16 will be moved downwardly in the guides of the bearing members, and the knife projections 34 will engage the surface of the cushion rollers 28, the same being of wood permitting the sharp edges of these knife projections to embed in the rollers and cushion the same without dulling the edges of the projections, so that when a sheet of paper is fed to the rollers 28 and passed under the curved ends 44 of the fingers 42, the knife projections will cut through the paper, and perforate the same, as the paper is fed through the machine and over the rollers 28, the driving rollers 7 subsequently receiving the paper, and serving to seat it onto the inclined rear end 2 of the table, the rollers 45 assisting in the feeding operation of the paper over the cushion rollers 28. With the form of the cutter element above

described with the projections 34 of knife type, it will be apparent that the paper will be provided with a plurality of aligned slits which will permit the ready separation of one strip of the paper from the other along this slitted portion or portions.

If it is desired to provide a plurality of small perforations in the paper, instead of the elongated slits, as above described, suitable perforating elements are provided, as indicated at 46, in Figures 12 to 14, which are of annular form and composed of semi-circular sections identical in construction with the sections 33 of the cutter elements 30, the only difference in this construction being the formation of the projections, which as indicated in Figures 12 and 13 at 47, are of substantially circular cross section terminating in square ends, these perforating projections being adapted to extend into openings 48 formed in the periphery of a cooperating female member 49, also formed in semi-circular sections, as clearly shown in Figure 13 of the drawings. The operating shaft for the perforating cutter element 46 is similar in all respects to the shaft 16, as indicated at 16', the ends of the shaft 16' however, being rotatably mounted at the ends in suitable bearings, and provided with a gear 50, on one end, intermeshing with the gear 51 on the shaft 52, which is similar in construction to the shaft 16', and which takes the place of the rollers 28 of the construction shown in Figure 4, the female elements 48 receiving the projecting ends of the perforating projections 47 of the male cutter element as clearly shown in Figure 14, this action being similar in all respects to the wooden roller receiving the knife projections of the cutter elements 30. The openings formed in the periphery of the female elements 48 are extended radially inwardly, and then inclined outwardly, as indicated at 53, through the side of the element, in order that the pieces of paper punched out by the projections 47 may be discharged outwardly of the female member.

From the construction shown in Figures 12 to 14, it will be clear that the cutter element 46 and the female elements 48 are adjustable on the shafts 16 and 52 respectively, to any desired position, in order to perforate paper passed therebetween at a desired point, it being understood that a plurality of these cooperating perforating elements, may be provided on the shaft 16' and 52, in the same manner that a plurality of cutter elements are provided on the shaft 16, the operation being similar in all respects, but producing a series of small perforations in the paper in the place of a series of small slits, which is desirable, in providing a line for separation of certain kinds of paper. It will

thus be seen that when the shaft 16' is driven in the same manner as the shaft 16, a corresponding driving movement will be imparted to the shaft 52, so that the openings 48 will always be in mesh, or at proper relation for receiving the projections 47 of the male perforating elements as they perforate paper passing therebetween.

10 From the foregoing description, it should be clear that a very simple form of perforating machine has been provided, which will efficiently perforate or slit paper, in any desired manner, and which comprises relatively simple means for effecting the desired result, and producing perforations or slits of a size substantially smaller than is now generally used in the art, in order to provide a more easily perforated edge or line of perforation, in a sheet of paper. It should also be clear that cutting and perforating elements of special form have been provided which are simple in construction, and are readily removable and interchangeable on the operating shaft 16, the securing means therefor being readily adjustable axially of the shaft for holding said cutter elements in a desired position thereon.

30 What is claimed is:

1. A perforating machine including a table, a pair of bearing members mounted on opposite sides of the table, said bearing members being provided with slidable bearing blocks, a rotary cutter shaft mounted in said slidable bearing blocks, means for rotating the said cutter shaft, a plurality of removable and adjustable cutter elements mounted on said cutter shaft, a cushion roller mounted for rotation in said bearing members and extending through a slot in said table, and means for moving said slide bearings for projecting said cutter elements into engagement with said cushioning roller.

ioning roller for effecting perforation of a sheet material fed between said cutter elements and said roller, a rod mounted in said bearings and extending transversely of the table above the same, and a plurality of fingers adjustably mounted on said rods having the end portions extending into proximity to the cushion roller for holding the sheet material in contact with said rollers.

2. A perforating machine including a table, a pair of bearing members mounted on opposite sides of the table, said bearing members being provided with slidable bearing blocks, a rotary cutter shaft mounted in said slidable bearing blocks, means for rotating said cutter shaft, a plurality of removable and adjustable cutter elements mounted on said cutter shaft, a cushion roller mounted for rotation in said bearing members and extending through a slot in said table, means for moving said slide bearings for projecting said cutter elements into engagement with said cushioning roller for effecting perforation of a sheet material fed between said cutter elements and said roller, slide bars connected with said slide bearing blocks, and slidably mounted in said bearing members, links connecting with said slide bars, an operating shaft mounted for rotating movement below the table, a foot pedal for operating said operating shaft, said operating shaft having crank arms thereon connected with said links, and means for normally projecting said slide bearings upwardly in the bearing members, said foot pedal serving for operating said slide bars for lowering the operating shaft to project the cutter elements into engagement with said cushioning roller.

In testimony whereof I affix my signature.

JOHN N. PIERCE.