July 16, 1929. W. F. LAUTENSCHLAGER 1,721,486

AUTOMATIC PAPER FEED FOR PERFORATING MACHINES

Filed Oct. 31, 1923 2 Sheets-Sheet 1

Fig. 1

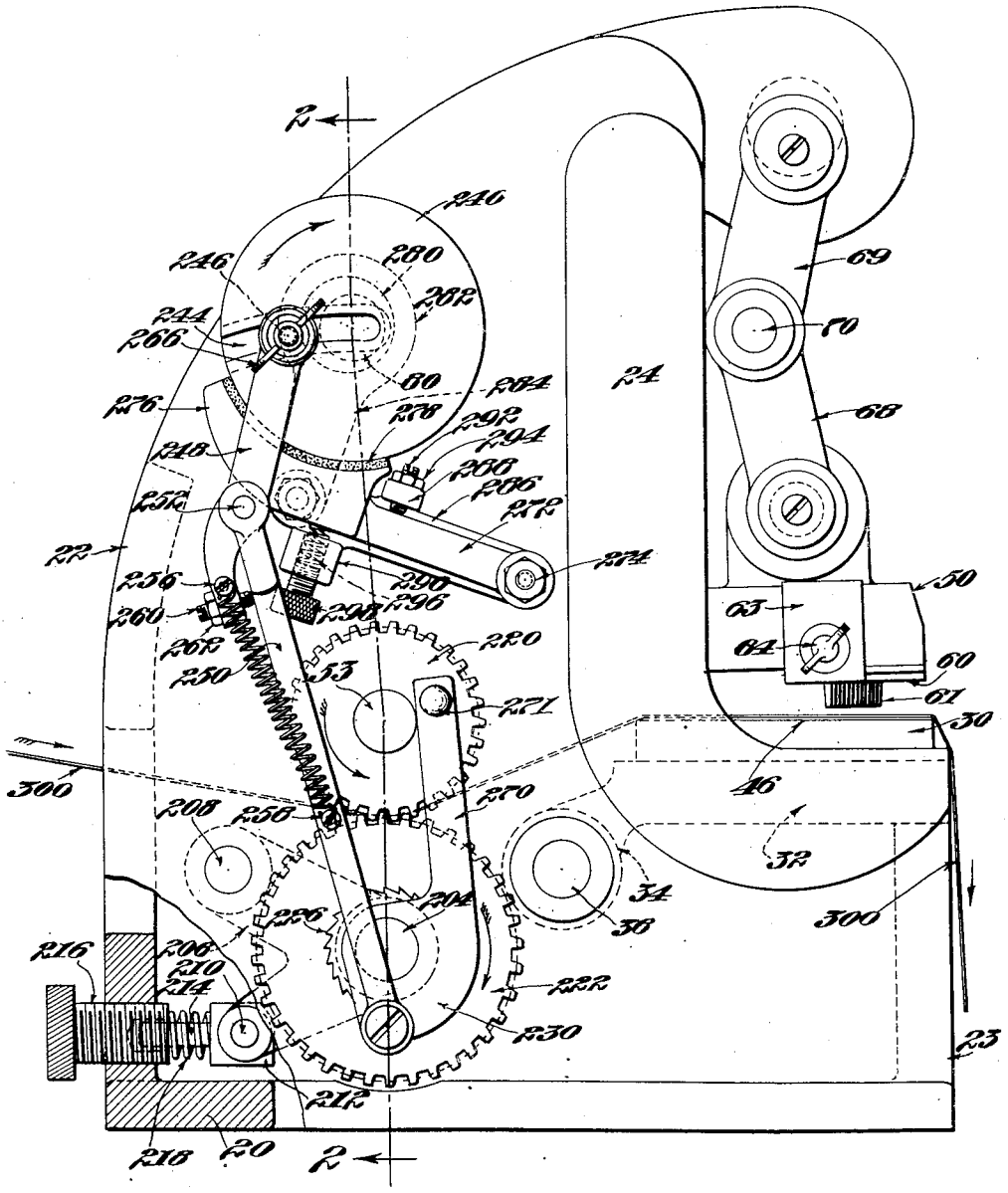

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Fig. 2

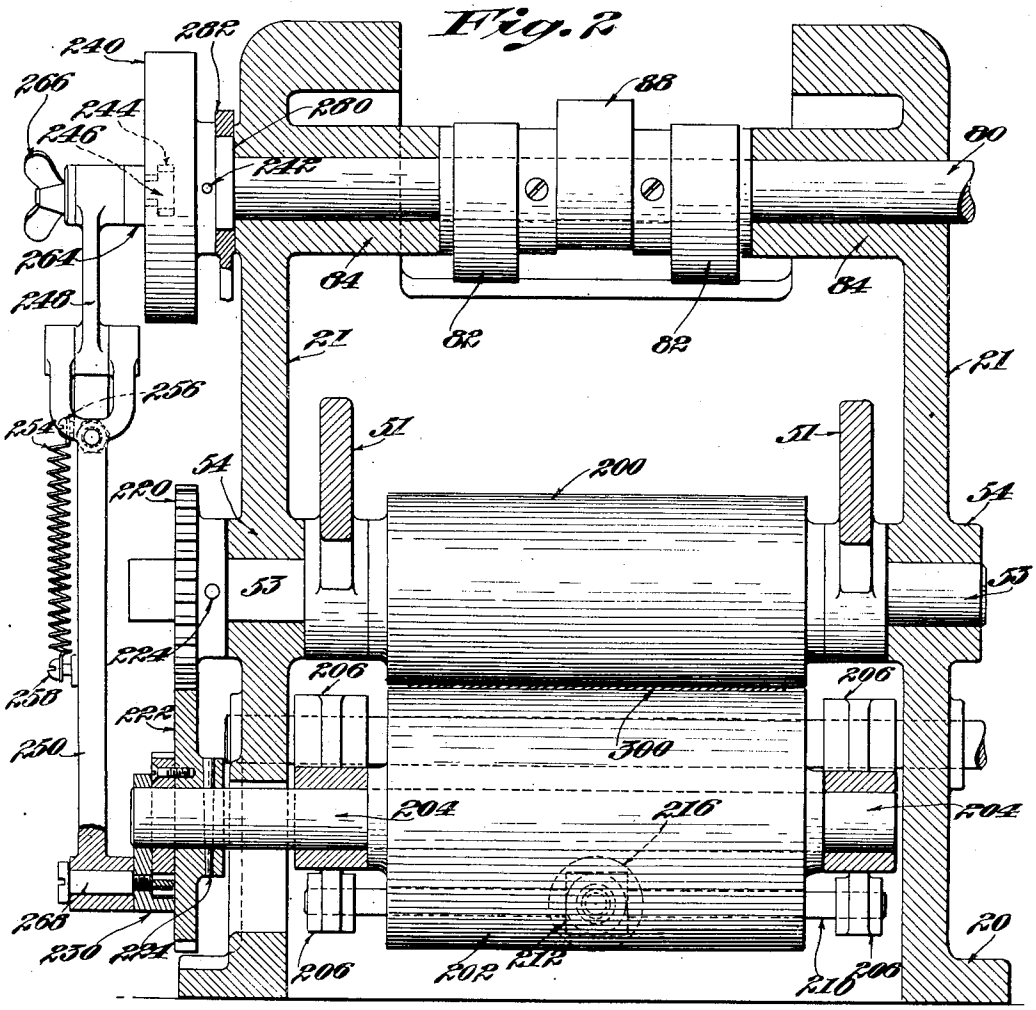


Fig. 4

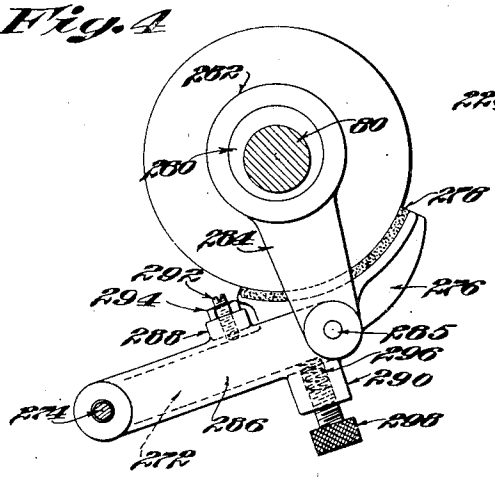
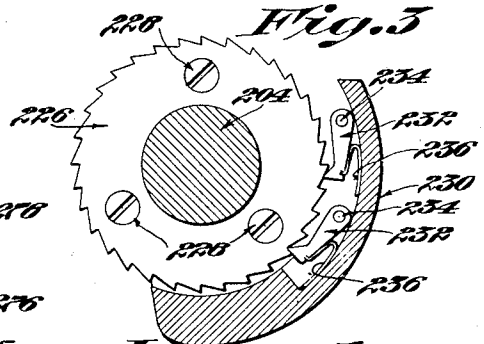


Fig. 5



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Patented July 16, 1929. 1,721,486

UNITED STATES PATENT OFFICE.

WILLIAM F. LAUTENSCHLAGER, OF CINCINNATI, OHIO, ASSIGNOR TO THE PEERLESS MACHINERY COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

AUTOMATIC PAPER FEED FOR PERFORATING MACHINES.

Application filed October 31, 1923. Serial No. 671,905.

This invention relates to an automatic paper feed for perforating machines and although capable of general application is designed with special reference to machines of the general type shown in United States Letters Patent, No. 1,434.060, issued to me October 31, 1922, for a perforating machine, adapted for perforating a complete design at each operation.

In machines of the above character the perforating is accomplished by what are termed "tube" dies; that is, a plurality, or a multiplicity sometimes, of thin hollow tubes of various cross-sections fixedly arranged in a design upon a plate carried by a reciprocating plunger. A complete design is perforated in the work upon each stroke of the die-carrying plunger. Dies of this character are very fragile and easily broken, consequently great care must be exercised in the adjustment of the machine in order to secure clean perforations without injury to the tubes. At the same time, the large expense involved in the making of the dies and the fact that the breaking of a single tube necessitates repairing before the die can be used again make it essential that every precaution be taken to prevent breakages.

Heretofore, it has been customary in such cases to employ a buffer strip of paper or other suitable material interposed between the work to be perforated and the work-support, said strip receiving the thin cutting edges of the tube dies after they have passed through the work. The buffer strip not only prevents injury to the cutting edges of the dies but also reduces the wear on said edges since it is fed forward from time to time to present new surfaces which have been neither cut nor defaced. The provision of a buffer strip involves an additional expense in the operation of the machine, an expense which is material in view of the high cost of paper and it is, therefore, very essential that the amount of the buffer strip used on each operation of the machine be reduced to the minimum compatible with attaining the desired results. The methods heretofore in use in this respect are open to the objections that a large amount of buffer strip has been wasted and that the operator has been at a disadvantage in adjusting the dies because the buffer strip has been fed in a direction away from the operator.

The principal object of my invention is the provision, in a perforating machine of the character hereinbefore described, of automatic means for feeding a buffer strip preferably toward the operator.

Another object of the invention is the provision of feeding means capable of easy and expeditious adjustment for varying the length of feed of the buffer strip on each operation of the machine.

A further object of the invention is the provision of feeding means so constructed that it may be operated by hand whenever desired without interfering with the automatic means.

Other objects of the invention will be more specifically set forth and described hereinafter.

In the accompanying drawings illustrating one embodiment of the invention, Figure 1 is a side elevation of a perforating machine of the type shown and described in the Letters Patent hereinbefore referred to having applied thereto an automatic paper feed constructed and operated in accordance with my invention; Fig. 2 is a vertical sectional view of the same on line 2—2 in Fig. 1, looking from right to left with the perforating and brake mechanisms omitted; Fig. 3 is a sectional view of the pawl mechanism and Fig. 4 is a side elevation of the brake mechanism.

Referring to the drawings, the frame of the machine comprises a base 20, two sides 21 strengthened by ribs 24, a curved back 22 and a front plate 23. A work-support 30 is carried by a bed-plate 32 having lugs 34 whereby it is pivotally mounted on a shaft 36 mounted in the sides of the frame. A plate 46 of soft metal such as brass may be secured to the top surface of the work-support 30 to prevent injury to the cutting edges of the tubes. A plunger head 50, fixed on two arms 51 pivotally mounted at their rear ends upon a shaft 53 in bearings 54 in the sides of the frame, carries a die-plate 60 provided with a plurality of tube dies 61 of ordinary construction. The die-plate is held in place between brackets 63 fastened to the plunger head by butterfly headed screws 64 threaded therein. The toggle joints for raising and lowering the plunger head 50 each comprise a lower arm 68 and an upper arm 69 pivotally connected together by a shaft 70. A main shaft 80 is

mounted in suitable bearings 84 formed on the inner faces of the two sides 21 of the frame and carries two eccentrics 82 upon which are mounted the pitmen for operating the toggle joints and an intermediate eccentric 88 to receive the pitman for lowering the toggle joints at the end of their downward movement to impart the final perforating pressure.

The foregoing construction, with the exception of the mounting of the bed-plate and the means for holding the die-plate upon the plunger-head which are slightly modified, is the same as shown and described in the Letters Patent No. 1,434,060, hereinbefore referred to. For convenience the parts of that machine herein shown have been given the same reference numerals and for a more explicit and detailed description of said machine and its mode of operation, reference may be made to said Letters Patent.

The novel features of the present case reside in the means provided for feeding a buffer strip which means are normally automatic but capable of hand operation when desired without interfering with the automatic control. It is to be understood, however, that the particular means shown for accomplishing this end constitutes merely one embodiment of the invention and that its application to my patented machine is for purposes of illustration only since it is capable of broad application generally to perforating machines either with or without modifications apparent to one skilled in the art.

The feeding means comprise two co-operating feed-rolls, 200 and 202, arranged within the frame of the machine in position to deliver a buffer strip to the work-support. The upper feed-roll 200, is fixed on the rotatable shaft 53 between the plunger carrying arms 51 and the lower feed-roll is secured to a shaft 204 rotatably mounted in two V-shaped brackets 206 at the points thereof. Each of said brackets 206 is pivotally mounted at the end of its upper arm upon a shaft 208 supported by the sides 21 of the frame of the machine. The ends of the lower arms of the two brackets are connected together by a rod 210 and midway between the brackets 206, a block 212 is loosely mounted on the rod 210 and is provided with a pin 214 adapted to project into the bore of a hollow screw stud 216 threaded through the back 22 of the frame. A helical spring 218 mounted on the pin 214 abuts at one end the end of the stud 216 and at the other end the block 212. By these means the lower feed-roll 202 is held in frictional engagement with the upper feed-roll 200 yet may yield against the pressure of the spring 218 to suit various thicknesses of buffer strip. At the same time the pressure between the two feed-rolls may be increased or diminished by turning the stud 216 inwardly or outwardly. To increase the accuracy of the feeding the surface of one of the rolls, preferably the lower roll, may be provided with longitudinal corrugations.

Any suitable means may be provided for operating said feed-rolls automatically and one such means is shown in the drawings comprising the following. The shafts 53 and 204 are extended through one side 21 of the frame and intermeshing gears 220 and 222 are respectively mounted on the two shafts and keyed thereto by keys 224. The gears are of the same effective diameter as their respective rolls so that the feeding surfaces of the two feed rolls travel at the same speed. Upon the end of the shaft 204 is mounted a ratchet wheel 226 which is fastened to the gear 222 by screws 228 and therefore turns with it. A segmental pawl housing 230 carrying two pawls 232, each pivotally mounted on a pin 234 and held in engagement with the ratchet wheel 226 by a spring 236, is loosely mounted on the end of the shaft 204 and suitable means are provided for operating the pawl housing from the main shaft to turn the ratchet wheel 226 and thereby the two feed-rolls. Although one pawl only may be used, I have found it of advantage to employ two as shown in Figure 3, the pawls being supplementary to each other so that the movement of the ratchet wheel may be adjusted to a distance equal to half a tooth.

For operating the pawl housing from the main shaft a crank arm disk 240 may be secured on the end of the main shaft by a key 242 and may be provided with a slightly curved crank arm radial slot 244, T-shaped in cross section to hold a screw pin 246 having a square T-shaped head fitting the slot loosely. The crank-arm disk 240 and the pawl housing 230 are connected together by a compound lever made up of two arms or levers 248 and 250 pivotally connected together by a pin 252, the upper end of the arm or lever 250 being in the form of a yoke to receive the arm or lever 248 between the arms of the yoke. The lower end of the lever 248 is extended below the pivot pin 252 and is curved inwardly toward the lever 250. A spring 254, attached at one end to a screw pin 256 set in the lower end of the lever 248 and at its other end to a screw pin 258 set in the lever 250 serves normally to hold said two levers in a position approximating alignment yet permitting of angular relation whenever the operation of the machine requires it. A screw stop 260 is threaded through the lower end of the lever 248 in position to bear against the lever 250 and to limit the movement of the two levers to prevent actual alignment so that the compound lever will break easily at the pin 252. A set nut 262 may be threaded on the stop 260 to hold it in adjusted position. At its upper end the lever 248 is mounted on the screw pin 246, a collar 264 being interposed be-

tween it and the crank arm disk 240 and a butterfly nut 266 is threaded on the end of the pin 246 for the purpose of drawing out the said pin so that its head will bind against the inner walls of the slot 244 and prevent movement thereof longitudinally the slot after the proper adjustment has been made. The lower end of the lever 250 is mounted upon a pivot pin 268 threaded into the pawl housing. To prevent the pawl housing being retracted beyond the center, it is provided with an arm extension 270 adapted to engage the extended end of the shaft 53 and to act as a stop which arm can also be used by the operator of the machine for feeding by hand when necessary through the handle 27i.

In order to bring the machine to a stop gradually and without shock or vibration, I provide a brake which is automatically applied with a gradually increasing but resilient brake pressure. Preferably, the brake is applied to the crank arm disk 240 and in the form shown in the drawings comprises a brake arm 272 pivotally mounted on a screw stud 274 set in the side 21 of the frame and carrying a brake shoe 276 having a brake lining 278. The brake is automatically operated by means of an eccentric 280 secured to the main shaft 80 and a strap 282 formed on one end of an arm 284 which at its other end is pivotally connected by a pin 285 to an operating arm 286 pivotally mounted on the stud 274. The operating arm 286 is provided with two lateral extensions or bosses 288 and 290 which overlap the brake arm 272. The boss 288 on the upper edge of the operating arm 286 carries a screw 292 threaded there through, which is adapted to engage the upper edge of the brake arm 272 to act as a stop therefor to limit its movement toward the crank arm disk. A set nut 294 holds the screw in adjusted position. The boss 290 is provided with a threaded bore to receive and hold a helical spring 296 which bears at one end against the brake shoe 276 and at its other end against an adjusting screw 298 in the bore whereby the pressure of the spring is regulated. By the foregoing means the pressure exerted by the brake may be regulated to a very fine degree and a uniform and automatic action secured to stop the machine at an exact point.

In the operation of the machine a buffer strip 300 of paper of suitable weight and hardness is threaded through the machine from a roll mounted in the rear of the machine. The buffer strip passes between the two feed-rolls and over the work-support toward the operator, its free end hanging down in front of the machine. The feeding of the buffer strip is necessarily performed between the perforating operation and the stopping of the machine with the die-carrying plunger in a raised position. In the machine of the type shown, the feeding mechanism is operated to feed during a period equal to approximately a quarter turn of the main shaft, it being necessary to allow the perforating tubes to be withdrawn from the work on the beginning of the upward stroke and the work to be withdrawn from the machine before the buffer strip is fed forward toward the operator. In Figure 1, the die-carrying plunger is shown on its upward stroke with the tubes withdrawn from the work, leaving the buffer strip free to be fed and the feeding mechanism is shown in its initial position ready to start feeding on the further upward movement of the die-carrying plunger. At this point the main shaft has been turned about three-quarters of the revolution necessary for a complete operation of the machine and the crank arm slot 244 is approximately horizontal, the feeding movement being accomplished during the last quarter revolution, at the end of which the crank arm slot reaches an approximately vertical position. The amount of paper fed on each operation of the feeding mechanism is regulated by moving the connection between the lever 248 and the crank arm slot in said slot to or from the centre of the crank arm disk and to accomplish this purpose fully the crank arm disk should be of sufficient diameter so that when the connection is adjusted at the circumference of the crank arm disk, the amount of buffer strip fed will be equal to the greatest demand on the machine.

As the main shaft continues to revolve from the point shown in Figure 1, the two levers 248 and 250 are carried upwardly by the revolution of the crank arm disk, thereby operating the pawl housing and pawls to turn the ratchet wheel and feed roll 202 and thereby the upper feed roll 200 through the gears 222 and 220 to feed the paper forward. This feeding movement continues until the crank arm slot 244 has reached a vertical position when the machine stops at the conclusion of the perforating operation with the die-carrying plunger in a raised position. Upon the starting of the machine for another perforating operation, the crank arm disk continues its revolution and the levers 248 and 250 are dropped and the pawl housing is returned to the position shown in Figure 1, the pawls slipping over the teeth of the ratchet wheel 226. This movement is accomplished during the first quarter revolution of the main shaft at the conclusion of which the crank arm slot 244 is substantially horizontal but on the opposite side from that shown in Figure 1. The continued movement of the main shaft then causes the two levers 248 and 250 to break at their pivot point 252, since the pawl housing is fixed against further retracted movement and during the next quarter revolution the two levers gradually

assume a more angular relative position until the crank arm slot is substantially vertical from which point up to the point shown in Figure 1, the two levers are gradually returned to normal position by the spring 254.

When a die is first placed in the machine, it is necessary to adjust the connection between the toggle joints and the die-carrying plunger head in order to secure the proper perforating adjustment so that the tubes will cut a clean pattern in the work and yet not penetrate entirely through the buffer strip; the best results being secured by having the cutting edges of the tube penetrate the buffer strip just far enough to cut a clean pattern in the work. This requires a very fine adjustment which may be made generally by turning over the machine by hand before starting it in operation under power. In making these adjustments it is necessary that the buffer strip be fed forward independently of the operation of the machine and this can be done by operating the lever 270 which can be done at any time, irrespective of the position of the feeding means. The operator in turning the pawl housing to move the buffer strip forward will necessarily break the lever connection between the pawl housing and the crank arm disk at the point 252, but the spring 254 will return the lever to its normal position, whatever that may be, due to the position of the parts of the perforating machine. By repeating this operation, the operator may move the buffer strip forward to any extent independently of the operation of the perforating means.

The operation of the brake mechanism is simple. The eccentric 80 is so adjusted on the main shaft that the greatest pressure applied by the brake is approximately at the end of each operation of the machine so that the pressure is gradually increased to bring the machine to stop. By adjusting the spring 296 and the screw stud 292 the pressure of the brake may be regulated to a fine degree to stop the machine at the exact point desired.

It is to be observed that the feeding of the buffer strip forward towards the operator rather than rearwardly or downwardly as heretofore shown, has a number of distinct advantages. It facilitates the adjustment of the tube dies, since the operator may observe the impressions made on the buffer strip as it is fed forward and thereby ascertain immediately whether the tubes are cutting too deeply or too lightly in the buffer strip and thereupon make such necessary adjustments as will secure clean cut perforations. Again, the forward feed enables me to use a very thin paper as a buffer strip. With the rearward feed the use of a thin buffer strip frequently results in the severing of the strip where the design includes a pinking blade or a continuous line for shoe tips. Each time that the strip is severed on the rearward feed, the operator is obliged to rethread the strip through the rolls in the rear of the machine, thereby necessitating a waste of time and effort. It has been sought heretofore to obviate this difficulty by using a buffer strip of soft and thick paper, but this involves a large expense and does not give the best results, especially when the cutting edges of the tube dies are somewhat dull, since they sink into the soft paper and make jagged, irregular perforations, leaving the perforated edges of the material frayed and fibrous.

The forward feed has the further advantage of economizing in the amount of buffer strip used. This material is more or less expensive and where possible the impressions should overlap on the strip. The operator with the forward feed is enabled to observe at all times whether or not the paper is being fed the proper distance upon each operation of the machine and may adjust the feed from time to time to secure the best results, having in mind economy in the use of the paper. With a rearward feed the ordinary operator will not take the trouble to go to the back of the machine and examine the paper to ascertain whether or not it is being wasted and this naturally results in waste.

The provision of manually operating means for feeding the buffer strip forward independently of the automatic means and without affecting the same is of particular advantage in threading the paper through the machine so that the tube dies will perforate in a clean cut manner. For threading the buffer strip through the machine, all that is required is for the operator to place the end of the paper between the feed rolls and then operate the hand lever a sufficient number of times to feed the paper through. In adjusting the machine, the operator may observe the impressions made on the buffer strip by the tube dies by operating the hand lever to feed the paper forward into view and the convenience of this method will be apparent.

It is further to be noticed that the adjustment of the feeding machanism to feed different lengths on each operation of the machine is of extreme simplicity and requires the manipulation of a butterfly nut only and the moving of the right arm connection in its slot.

Although I have shown my invention as applied to a particular type of perforating machine, it is to be understood that it is capable of general application to various types of perforating machines, either with or without changes, which will be apparent to one skilled in the art. It is further to be understood that my invention may be embodied in other forms of construction than that herein shown and described, all within the purview of the following claims.

What I claim is:

1. In a perforating machine, the combina-

tion with intermittently acting perforating means, of a pair of cooperating feed rolls, automatic means for operating said rolls to feed a buffer strip between the perforating operations of the machine and means for operating said feed rolls manually while said perforating means remains at rest.

2. In a perforating machine, the combination with intermittently acting perforating means, of a pair of co-operating feed rolls, means for operating said rolls to feed a buffer strip between the perforating operations of the machine, said means being adjustable for regulating the amount of strip fed forward on each operation, and means for operating said feed rolls by hand while said perforating means remains at rest.

3. In a perforating machine, the combination with intermittently acting perforating means, of co-operating feed rolls, means for operating said rolls to feed a buffer strip between the perforating operations, said operating means being adjustable to regulate the length of said feeding movement, and means for operating said feed rolls by hand without interfering with said first mentioned operating means.

4. In a perforating machine, the combination with intermittently acting perforating means, of co-operating feed rolls, intermittently acting means for operating said rolls between the perforating operations to feed a buffer strip toward the operator and means for operating said feed rolls by hand without interfering with said first-mentioned operating means.

5. In a perforating machine, the combination with intermittently acting perforating means, of co-operating feed rolls, intermittently acting means for operating said rolls between the perforating operations to feed a buffer strip toward the operator, said means being adjustable to vary the length of feed, and means for operating said feed rolls by hand without interfering with said first-mentioned operating means.

6. In a perforating machine, the combination with intermittently acting perforating means, of a pair of cooperating feed-rolls, one fixed and the other movable in axial location, adjustable resilient means for pressing said movable roll against said fixed roll, means for operating said rolls to feed a buffer strip and means for operating said last mentioned means by hand.

7. In a perforating machine, the combination with intermittently acting perforating means, of a pair of cooperating feed rolls, one of said rolls being fixed in axial location and the other of said rolls being movable to and from said first roll, resilient means for holding said second roll in engagement with the said first roll, means for operating said rolls to feed a pre-determined length of buffer strip toward the operator after each perforating operation of the machine and means for operating said last mentioned means by hand while the machine is at rest.

8. In a perforating machine, the combination with intermittently acting perforating means, of a pair of cooperating feed rolls, one of said rolls being fixed in axial location and the other being adjustable, resilient means for holding said second roll in engagement with said first roll, said means being adjustable to regulate the pressure between said two rolls, means for operating said rolls intermittently to feed a buffer strip toward the operator on each perforating operation of the machine, said means being adjustable in order to regulate the amount of buffer strip fed and means for operating said last mentioned means by hand while the machine is at rest.

9. In a perforating machine, the combination with intermittently acting perforating means, of a pair of cooperating feed rolls, one being fixed and the other movable, resilient means for pressing said movable roll against said fixed roll, means for adjusting the pressure exerted by said resilient means, two gears, one mounted on each of said rolls and adapted to mesh with each other, a crank arm disk mounted on the main shaft of the machine provided with a radial slot, a ratchet wheel mounted on one of said gears, a pawl housing carrying one or more pawls adapted for engagement with said ratchet wheel to turn said rolls and connections, a broken compound lever connecting said crank arm disk with said pawl housing and means for operating said pawl housing by hand to turn said feed rolls while the machine is at rest.

10. In a perforating machine, the combination with a pivotally mounted plunger, and perforating means carried by said plunger, of a pair of co-operating feed-rolls, means for operating said feed-rolls to feed a buffer strip a predetermined length after each perforating operation and on the upward movement of said plunger and means for operating said last mentioned means by hand while the machine is at rest.

11. In a perforating machine, the combination with a plunger, perforating means carried by said plunger and means for reciprocating said plunger to perforate the work, of a pair of co-operating feed-rolls, means for operating said feed-rolls to feed a buffer strip a predetermined length after each perforating operation and on the upward movement of said plunger, said means being adjustable to regulate the length of said feeding movement and means for operating said feed rolls by hand while the machine is at rest.

12. In a perforating machine, the combination with a plunger, perforating means carried by said plunger and means for reciprocating said plunger to perforate the work, of a pair of co-operating feed-rolls, means for operating said feed-rolls to feed a buffer strip

a predetermined length after each perforating operation and on the upward movement of said plunger, said means being adjustable to regulate the length of said feeding movement, and means for operating said last mentioned means by hand.

13. In a perforating machine, the combination with a plunger, perforating means carried by said plunger and means for reciprocating said plunger to perforate the work; of a pair of co-operating feed-rolls and means for operating said feed-rolls to feed a buffer strip a pre-determined length after each perforating operation and on the upward movement of said plunger; said means comprising a broken lever and a pawl and ratchet connection between said lever and said feed-rolls and means for operating said feed-rolls manually at the will of the operator.

14. In a perforating machine, the combination with a plunger, perforating means carried by said plunger and means for reciprocating said plunger to perforate the work, of a pair of co-operating feed-rolls and means for operating said feed-rolls to feed a buffer strip a pre-determined length after each perforating operation and on the upward movement of said plunger; said means comprising a crank arm disk mounted on the main shaft of the machine, a pawl and ratchet mounted on said feed-rolls and a broken lever adjustably connected at one end to said crank arm disk and at the other end to said pawl.

15. In a perforating machine, the combination with a plunger, perforating means carried by said plunger and means for reciprocating said plunger to perforate the work, of a pair of co-operating feed-rolls and means for operating said feed-rolls to feed a buffer strip a pre-determined length after each perforating operation and on the upward movement of said plunger; said means comprising a crank arm disk mounted on the main shaft of the machine, a ratchet wheel mounted on one of said feed-rolls, a pawl for operating said ratchet wheel, a compound lever adjustably connected at one end to said crank arm disk and at the other end to said pawl, said lever being capable of being broken when necessary, a spring for holding said lever in a normally straight condition and a hand lever for operating said pawl and ratchet manually to feed said buffer strip at the will of the operator.

In witness whereof, I hereunto set my hand this eleventh day of October, 1923.

WILLIAM F. LAUTENSCHLAGER.