G. H. MALLAM.

ADJUSTABLE CAM WHEEL.

APPLICATION FILED SEPT. 20, 1906.

908,790. Patented Jan. 5, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

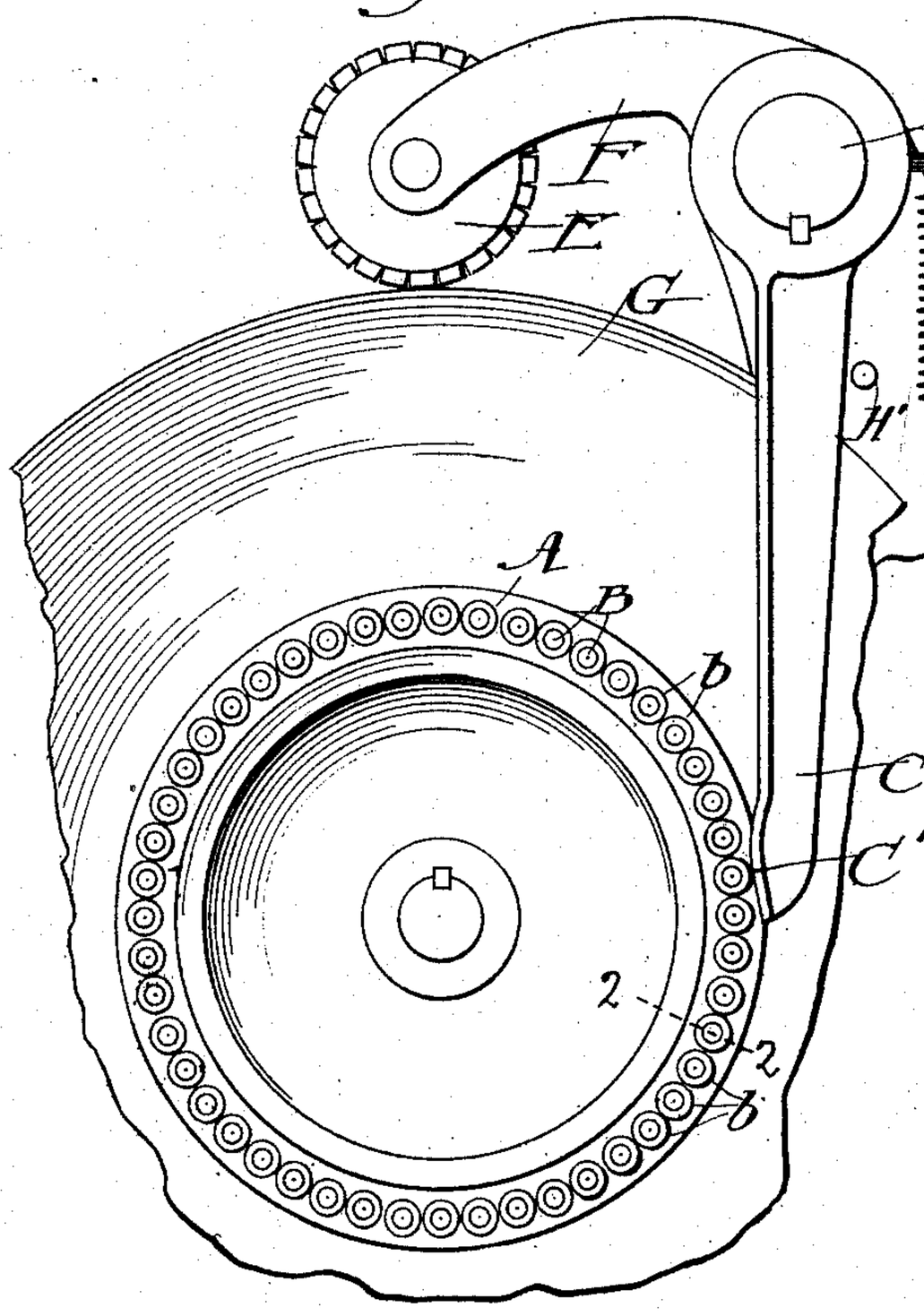
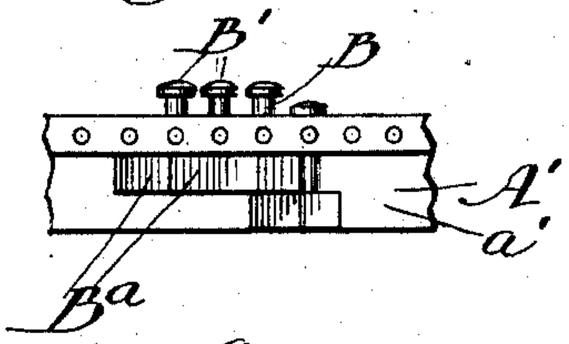


Fig. 3.

Fig. 5.



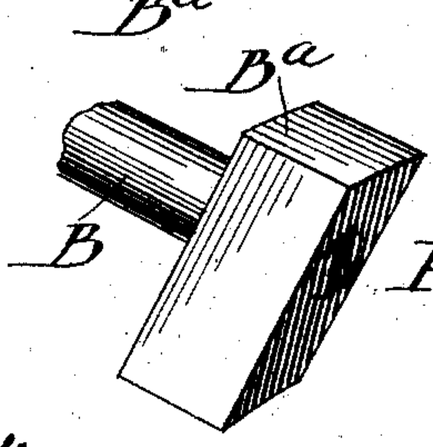


Fig. 6.

Fig. 2.

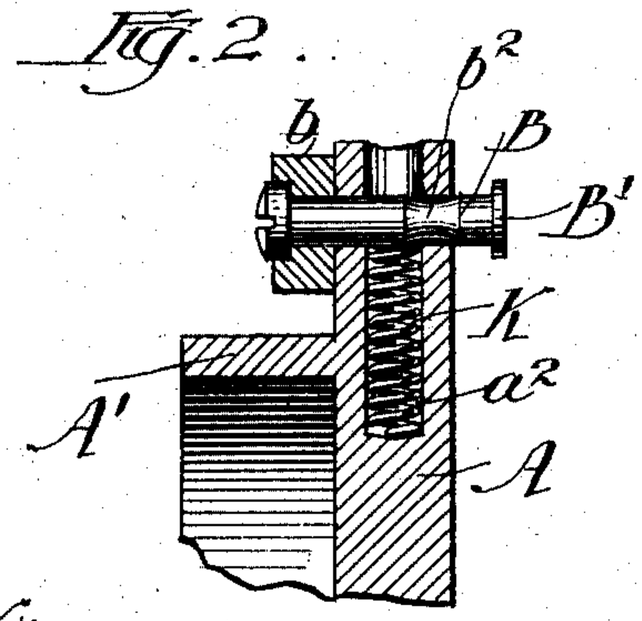
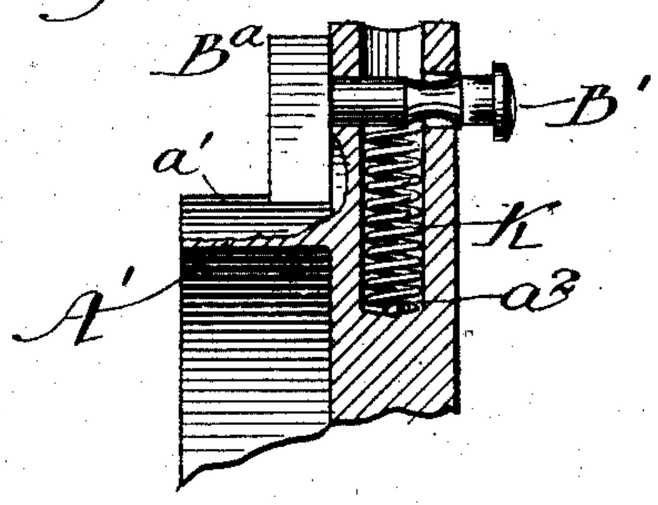


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 7.

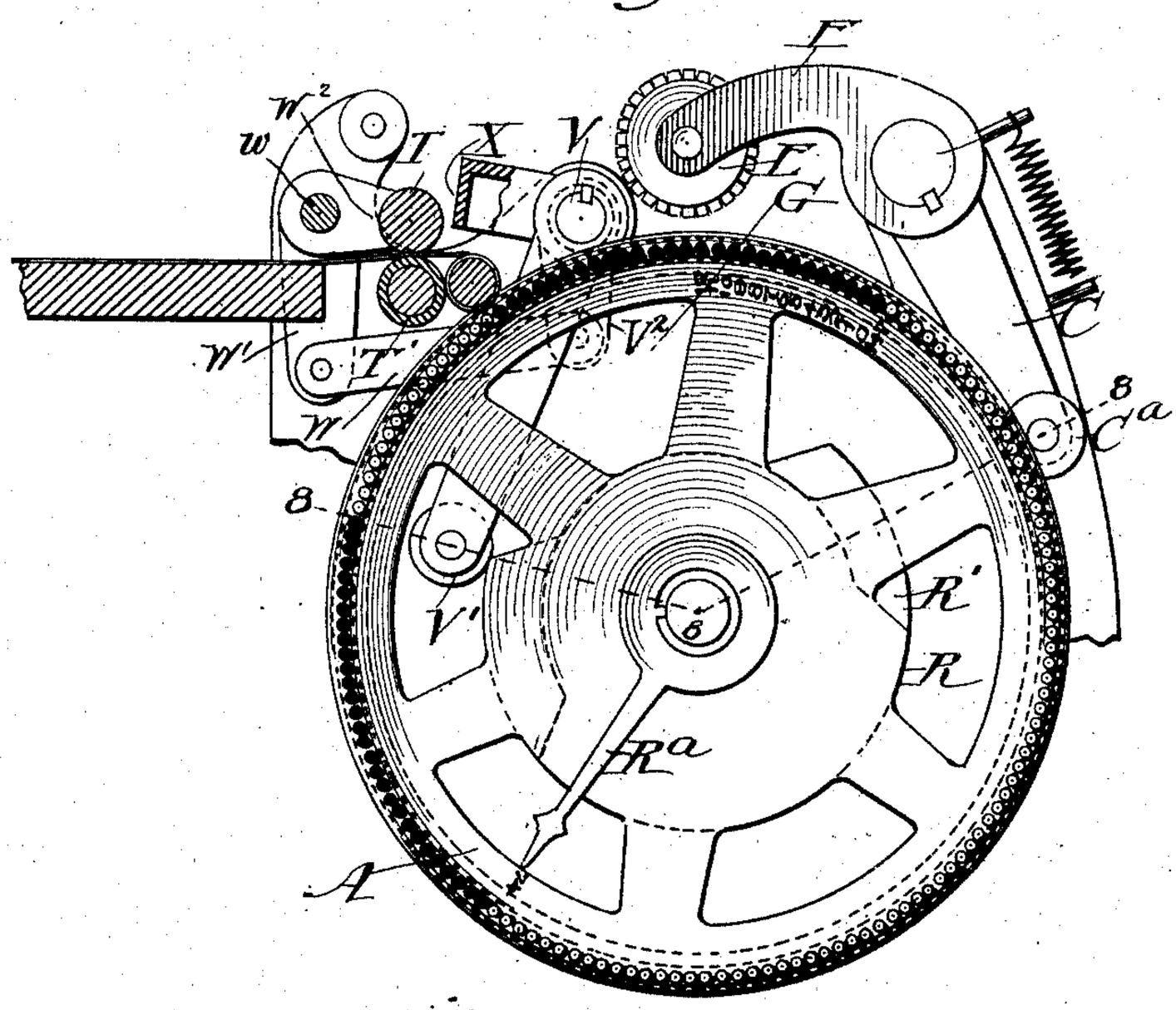
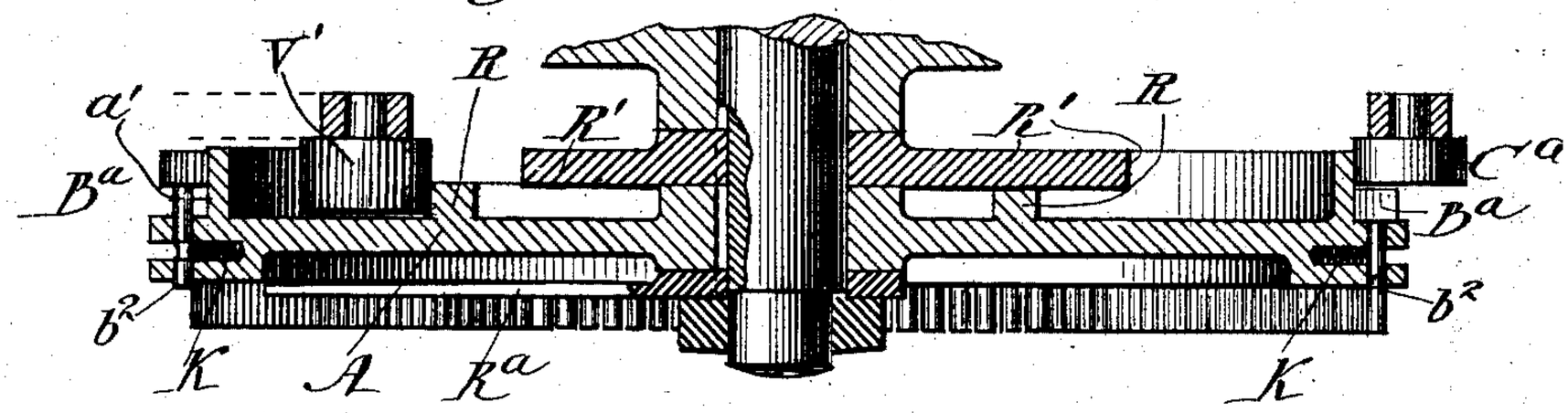


Fig. 8.



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UNITED STATES PATENT OFFICE.

GUY H. MALLAM, OF KANSAS CITY, MISSOURI, ASSIGNOR TO NATIONAL PERFORATING MACHINE COMPANY, OF KANSAS CITY, MISSOURI, A CORPORATION.

ADJUSTABLE CAM-WHEEL.

No. 908,790. Specification of Letters Patent. Patented Jan. 5, 1909.

Application filed September 20, 1906. Serial No. 335,373.

To all whom it may concern:

Be it known that I, GUY H. MALLAM, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented new and useful Improvements in Adjustable Cam-Wheels, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide a rotary cam or cam wheel for causing reciprocating or oscillating movement of a coöperating element—as a lever arm—which may be adjusted so as to vary the time in the rotation at which the movement is produced, and also to vary the length of circumferential extent of the cam upraise or portion of the cam which is protruded for crowding action upon the coöperating element.

It consists of the features of construction of such cam wheel and its combination with another adjustable cam as shown and described, and as set out in the claims.

In the drawings:—Figure 1 is a side elevation of a cam wheel and coöperating lever embodying this invention. Fig. 2 is a section at the line 2—2 on Fig. 1. Fig. 3 is a detail elevation of a portion of a cam wheel and coöperating lever showing a modification of the structure. Fig. 4 is a section similar to Fig. 2 presenting the modification shown in Fig. 3. Fig. 5 is an edge elevation of the cam wheel shown in Figs. 3 and 4. Fig. 6 is a perspective view of one of the plungers in the form shown in Figs. 3 and 4. Fig. 7 is a side elevation of portions of a paper-perforating machine embodying a cam device comprising a cam of the character shown in Fig. 6, and a second two-part adjustable cam for controlling the feed. Fig. 8 is a combination of sections at the lines 8—8, 8—8 on Fig. 7.

The wheel, A, is a circular disk having mounted in it a circularly disposed series of transverse plungers or studs, B, B, B, which are adapted, in respect to length and mode of mounting, each independently of the remainder, to protrude from one face of the disk, so as to have their path of rotation with the disk in the plane of the abutment, C^1, of the coöperating lever, C, which may be an arm of a rock shaft, D, parallel with the axis of the disk, A. In order, merely, to indicate a single instance of utility of such construction, the details of the drawings present the invention as applied to operating the perforating disk, E, of a paper-perforating machine, such disk being carried upon a lever arm, F, of the rock shaft, D, and forced into contact for perforating with the platen cylinder, G, of which a segment only is shown in the view. A spring, H, operates upon the rock shaft or either of its lever arms to draw and hold the arm, C, in toward the axis of the cam wheel, A, and to lift the disk, E, off the platen, a suitable stop, H^1, being provided at any point to limit the inward swing of the arm, C, and the upward lift of the perforating disk.

It will be obvious that if all of the plungers, D, are protruded so as to have their path of rotation in the plane of the abutment, C^1, that abutment will ride continuously upon said plungers and the lever arm, C, and the perforating disk, E, will not change position throughout the entire revolution of the cam wheel, A, and the perforating disk will be held on the platen continuously and produce an uninterrupted line of perforations; but if the plungers for any portion of the circular series are thrust back so that they do not revolve in a path causing them to encounter the abutment, C^1, the lever, C, will be swung inward toward the axis of the cam wheel throughout the portion of the circumference over which the plungers are thus thrust back out of operative path. In Fig. 7, the plungers which are designed to be indicated as thrust back out of operative position, are shown in solid black to distinguish them from those which are designed to be represented as thrust forward into operative position. The common expedient of providing anti-friction rollers on plungers may be employed when the work to be done is sufficiently severe to warrant so doing; and in Figs. 1 and 2 such anti-friction rollers, *b*, are shown. In order that when more than one of the studs, B, are protruded into operative position, the coöperating element may be held steadily at the position to which it is forced by the first stud to encounter it until the last protruded stud passes clear of it and without any tendency to drop back into the interval between consecutive studs the abutment or cam shoe, C^1, on said element, the lever, C, is made long enough to reach from one stud, B, to the

next, so that it cannot drop in between them in any case, or to any distance, however short.

In the form shown in Figs. 3, 4 5 and 6, the means for preventing the vibration or short oscillation of the lever, which is prevented in Figs. 1 and 2 by the expedient last described, consists in the form of the head or operating protruding portion, B^a, of the stud, B, such head being extended circumferentially with respect to the wheel, A, transversely to the stem of the stud by which it is mounted in the wheel, A, each head, B^a, being thus a segment of an annulus which is formed by all the studs so protruded into operative position, having their heads meeting and together occupying the complete circle. In this construction, preferably, the lever, C, has the abutment for coöperating with the studs in the form of a stud-and-roller, C^a, which will ride upon the smooth outer face of the head of the studs,—that is, upon the segment of the annulus formed by the protruding studs. In this construction it is desirable to provide a slope on which the stud and roller, C^a, may climb up onto the first encountered head, B^a, and the heads are therefore extended to form a sloped approach for the stud and roller at the advance side, and are correspondingly cut away on the rear side to accommodate the protruded slope of the next succeeding stud. In order to prevent the studs of the form having the heads, B^a, from turning on their stems in the wheel, A, said wheel is preferably formed with an annular flange, A^1, on the face producing a shoulder, a^1, facing outward radially, and on this shoulder the inner curved side of the heads, B^a, seat at all times. The range of movement of the studs in the wheel from inoperative to operative position is less than the width of the head and corresponding width of the shoulder, a^1, so that when protruded for operation the heads are still lodged against the shoulder and the studs are stopped thereby against turning on their bearings in the wheel.

In both forms of the device the studs are preferably provided with a stop shoulder, B^1, at the back side of the wheel to prevent them from being thrust entirely out and escaping from the wheel. Any convenient means may be employed to render the studs sufficiently secure at their different positions, whether operative or inoperative. Frictional means for this purpose are preferred, and I have shown springs, K, lodged in radial sockets, a^2, in the wheel, A, which cross the several transverse bearings of the stud, B, the outer ends of the springs being designed to press against the inner side of the studs to hold the latter frictionally in the seats to which they are thrust to either position. For increased security at operative position of the studs their stems may have an annular groove, b^2, at the proper point in the length of the stem to receive the end of the spring when the studs are protruded to operative position. This groove has its sides sloped rather than abrupt, so that a little pressure disengages the spring, permitting the stud to be pushed back into inoperative position.

I have employed this cam as above stated in a machine for perforating paper in which the same rotative element comprises not only the cam shown for the purpose of controlling the perforating disk, but another cam for controlling the feed to cause it to be intermitted at proper points and for proper intervals according to the length of the sheets fed in for perforation. This latter cam is also desirably adjustable to vary the extent or portion of each rotation of the platen wheel in which the paper is advanced onto it, so that when sheets whose length is less than the circumference of the platen cylinder are being operated upon the feed may be kept in operation for the length of the sheets and not materially more, so that successive sheets may all start in at the same point on the platen cylinder and so have their perforated lines all similarly placed and interrupted. This adjustable feed cam comprises for the purpose of rendering it adjustable, two identically shaped elements adapted to be rotated relatively to each other about the shaft for the purpose of adjustment to vary the duration of the feeding action or portion of the rotation occupied thereby. Each of these cam elements has a protruding and a retreating or back-set portion with slopes leading from one portion to the other, and when they are adjusted coincidently, their protruding portions both occupying the same degrees of the circle, the length of feed is minimum, being that determined by the circumferential extent of said protruding portion; and when they are adjusted relatively away from this position of coincidence, the abutment on the lever against which they operate being broad enough to lap or be in the path of rotation of the edges of both of them will be held out for a portion of the rotation as many degrees greater than the minimum as the two cams are relatively adjusted away from their position of coincidence.

I have shown in the drawings the feed cam above referred to having one of its two elements formed on, and integrally with, the wheel, A, the other element being on a separate piece having its own hub, but mounted on the same shaft. Either one of the two parts thus mounted on this shaft may be secured permanently rigid therewith, the other being adjustable for the purpose of varying the extent of feed; but for convenience in indicating clearly so as to be easily read at all times, the adjustment of the parts, both with respect to the extent of feed and with respect

to the extent of perforation and intermission of perforations, I mount the element, R^1, of the feed cam rigidly on the shaft, and mount the disk or wheel, A, having the other element, R, of the feed cam, for adjustment by rotation about the shaft.

The face of the wheel, A, is graduated to serve as a registering dial, one point of the dial being made for each of the studs, B, and numbered in the reverse of the direction of rotation from zero up to the full number of studs which the wheel carries, the zero point being placed at the stud whose encounter with the abutment, C^1, (or stud and roll, C^a, of the second form shown) will depress the perforating disk to cause it to commence perforating at the advance edge of the sheet. This stud may be ascertained experimentally or by measurement on construction drawings, by first noting the point or stud on the wheel, A, which stands in position for operating on the abutment, C^1 or C^a, when the cam element, R, at its advance end has operated the feed roller to cause it to commence feeding, and then counting off backwards on the wheel, A, the number of studs occupying the number of degrees corresponding to the distance through which the paper must be advanced from the time the feed rolls start its edge past the gage until that edge reaches the perforating disk. The adjustable cam element, R^1, may have an index finger, R^a, for conveniently reading on the dial the adjustment of said adjustable cam element. For certain convenience this index finger is preferably located so that when the two cam elements, R and R^1, are adjusted coincidently, the finger points on the dial to the number of inches which is the minimum length of feed which the cam will cause; and as the adjustable cam element is moved away from this position for increasing the feed, the index finger will at all times point on the dial to the number indicating the number of inches of feed.

For securing the adjustable wheel, A, having the cam element, R, it is clamped against the outer end of the hub of the cam element, R^1, by means of a nut screwed onto the end of the shaft, the index finger, R^a, having a hub which is interposed between the nut and the wheel, A, and which is feathered on the shaft, thus keeping the index finger fixed with respect to the cam element, R^1, (as to rotation) and also preventing the rotation of the nut in tightening from being transmitted to the wheel, A.

In order that the operation for adjustment of feed may be understood, I have shown in the drawings and will describe briefly the feed devices, which are, however, the same as those fully shown and described in the pending application of Cortland Carlton, Serial No. 301,753. An upper and lower feed roll, T and T^1, receive the paper between them, and when they are pressed toward each other so as to engage the paper, advance it onward toward the platen cylinder, G, on which the perforating disk, E, is pressed for perforating the paper when it reaches it. The upper feed roll is forced down onto the lower feed roll so as to commence the feeding of the paper by the operation of the cam, R, R^1, against the abutment, V^1, on the depending arm of the rock-shaft, V, which has another arm, V^2, connected by a link, W, to a lever arm, W^1, of a rock shaft, *w*, on whose horizontally extending arms, W^2, one of which is shown in the drawings, the upper feed roll is carried. When the feed rolls are separated, the operator advances the sheet between them to a stop-gage, X, and from that point when the feed rolls are forced together it is fed by said rolls, as already described, onto the platen between the same and the perforating disk; and the distance to be taken into account in locating the zero point on the dial, as above described, is from the stop gage to the point of tangency of the perforating disk with the platen cylinder.

I claim:—

1. An adjustable cam comprising a wheel or disk and a multiplicity of studs mounted in it for projecting parallel to the axis from one face, each adapted to be thrust out or withdrawn at will, in combination with a coöperating element mounted for movement toward and from the axis of the wheel or disk, having an abutment for encounter of the protruded studs.

2. An adjustable cam comprising a wheel or disk and a multiplicity of transverse plungers, each of which is adapted to be protruded from the face of the disk and retracted at will independently of the remainder, in combination with springs lodged in the wheel or disk for exerting frictional pressure laterally on the plungers respectively to restrain their movement for retraction or protrusion.

3. An adjustable cam device comprising a rotative wheel or disk and a multiplicity of transverse plungers mounted therein, each of which is adapted to be protruded from the face of the disk and retracted at will independently of the remainder, each plunger having a head at its operating end extending circumferentially of the disk the number of degrees intervening from plunger to plunger.

4. An adjustable cam device comprising a rotative wheel or disk and a multiplicity of transverse plungers, each of which is adapted to be protruded from the face of the disk and retracted at will independently of the remainder, each plunger having a head at its operating end extending circumferentially of the disk, the heads of consecutive plungers being interlapped to form a continuous bearing surface.

5. A double cam device consisting of an adjustable cam which comprises a disk and a multiplicity of transverse plungers, each adapted to be protruded from the face of the disk and to be retracted at will independently of the remainder; one element of a second two-part cam fixed with respect to said disk; a shaft on which said disk is mounted for adjustment by rotation thereabout; a second element of said two-part cam mounted for rotation with the same shaft, and means for clamping the disk rigid with said second cam element.

6. A double cam device consisting of an adjustable cam which comprises a disk and a circular group of transverse plungers, each adapted independently of the remainder to be protruded from the disk and to be retracted at will; a second two-part cam having one element fixed with respect to the disk; a shaft on which said disk is mounted for adjustment by rotation thereabout; a second element of said two-part cam mounted for rotation with the same shaft; a dial on the face of the disk of the first-mentioned cam; an index finger coöperating therewith, fixed with respect to the said second element of the two-part cam as to rotation about the shaft, and means for making said adjustable cam rigid with said second element.

In testimony whereof, I have hereunto set my hand at Chicago, Illinois, this 18th day of September, 1906.

GUY H. MALLAM.

Witnesses:
CHAS. S. BURTON,
J. S. ABBOTT.