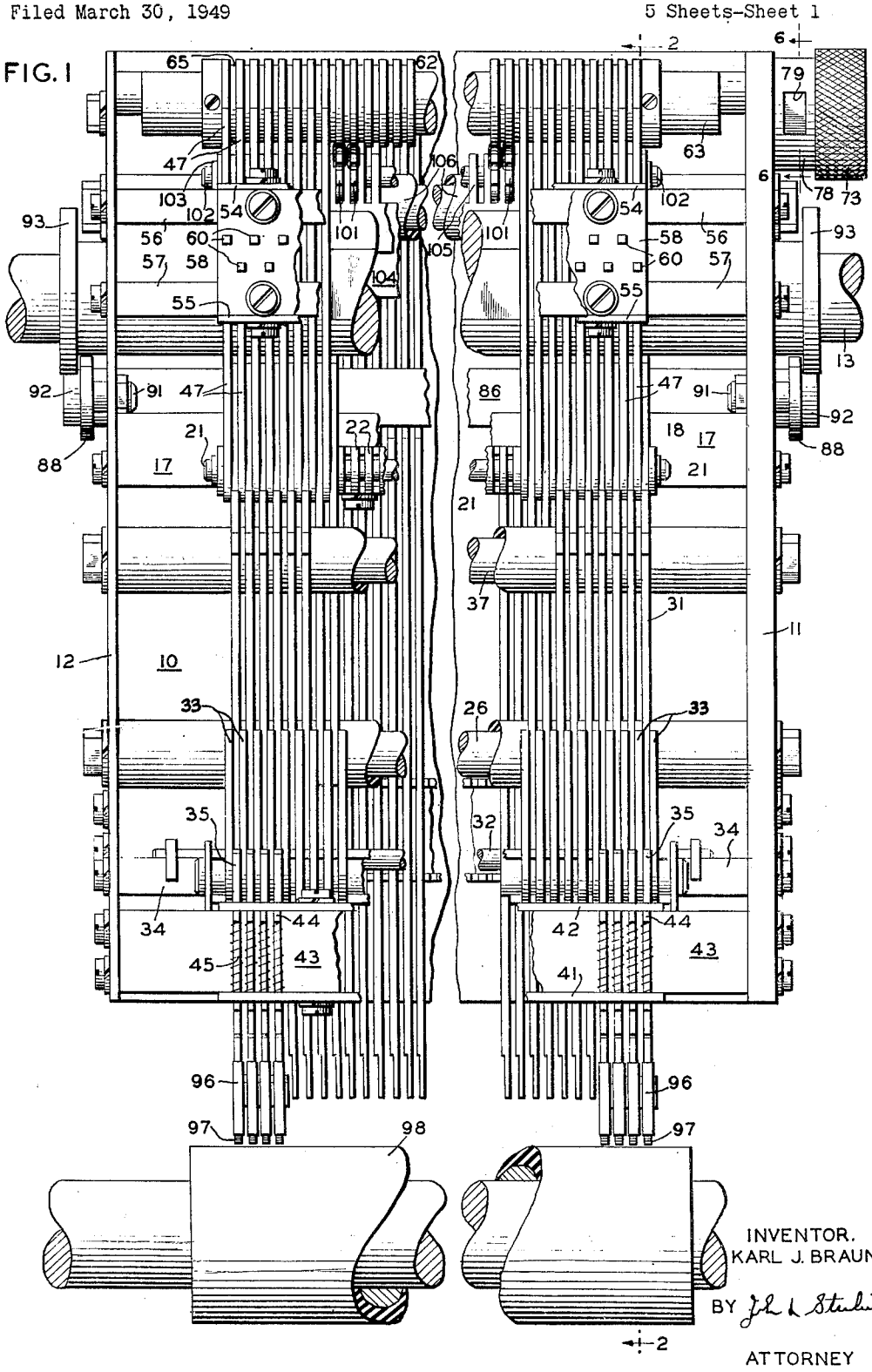
Nov. 10, 1953 K. J. BRAUN 2,658,447

POSITIVE CAM OPERATED PRINT MECHANISM

Filed March 30, 1949 5 Sheets-Sheet 1

FIG. 1



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Nov. 10, 1953 K. J. BRAUN 2,658,447

POSITIVE CAM OPERATED PRINT MECHANISM

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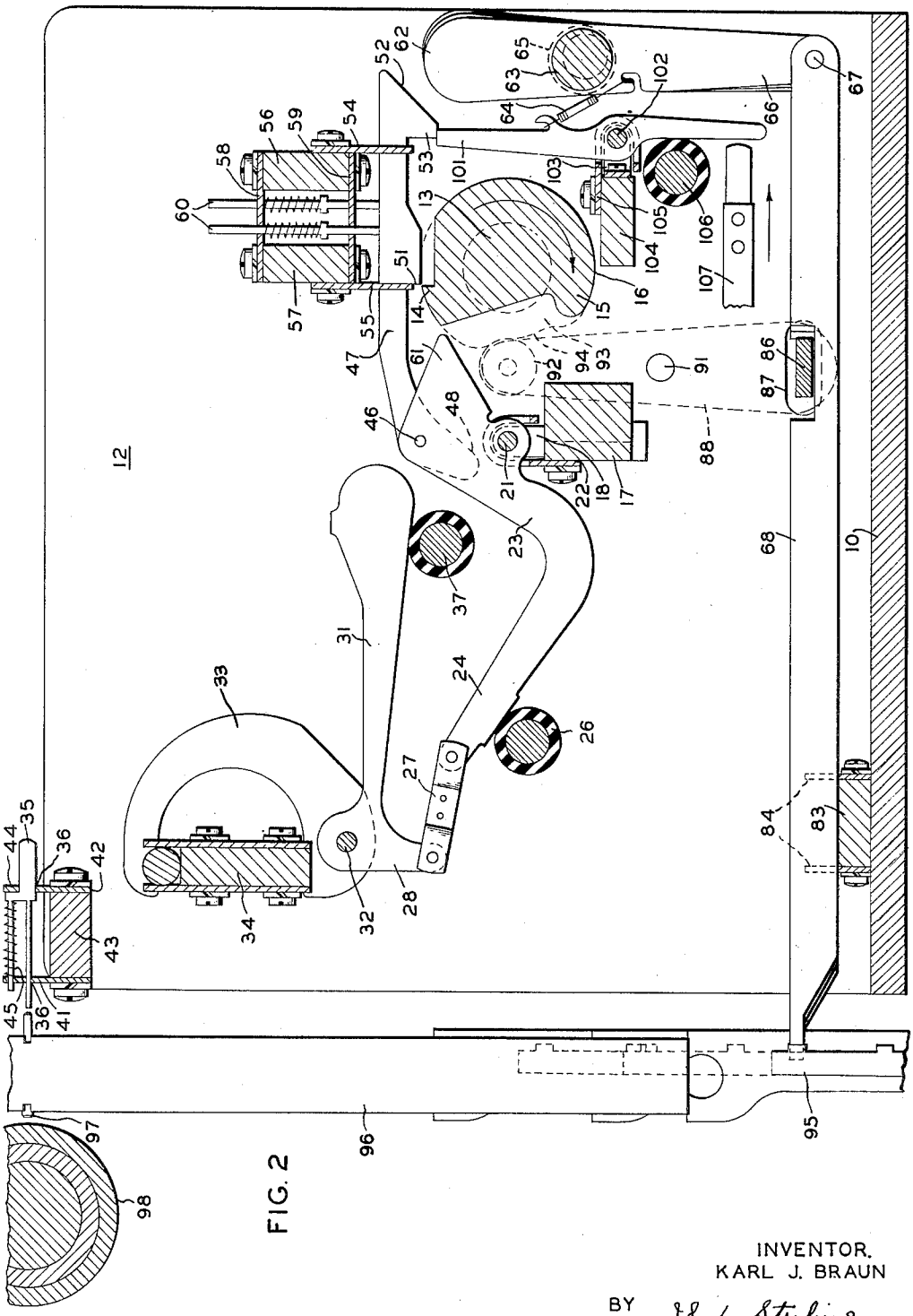


FIG. 2

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Nov. 10, 1953 K. J. BRAUN 2,658,447

POSITIVE CAM OPERATED PRINT MECHANISM

Filed March 30, 1949 5 Sheets-Sheet 3

FIG. 3

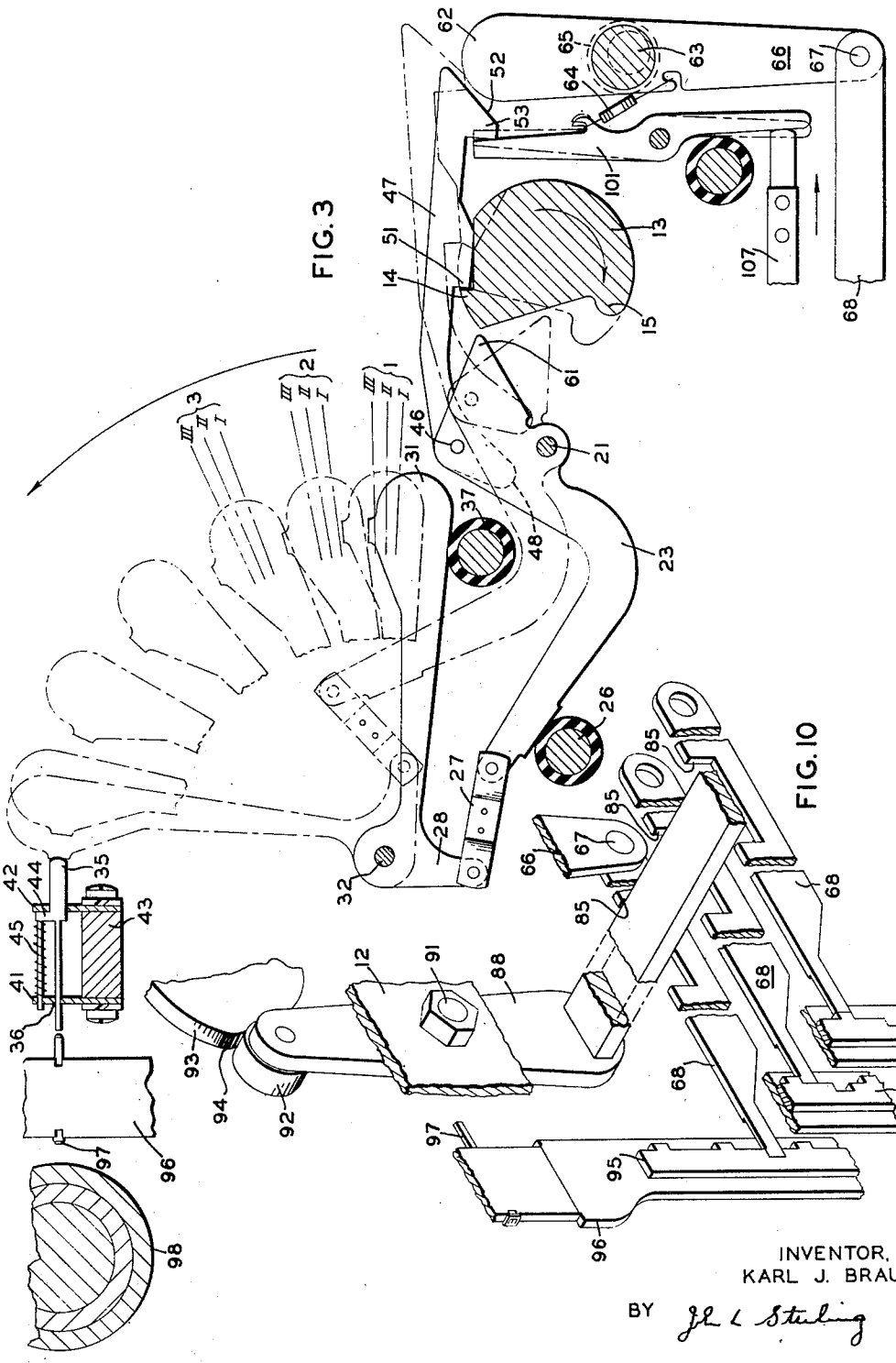


FIG. 10

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Nov. 10, 1953 K. J. BRAUN 2,658,447

POSITIVE CAM OPERATED PRINT MECHANISM

Filed March 30, 1949 5 Sheets-Sheet 4

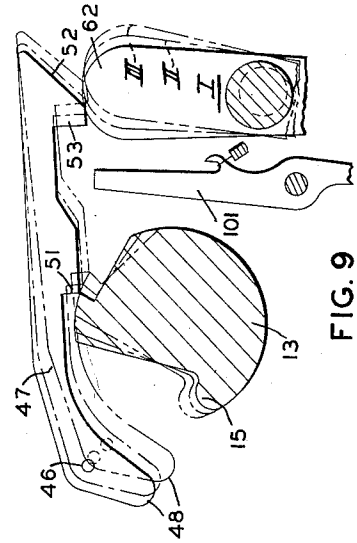


FIG. 9

FIG. 4

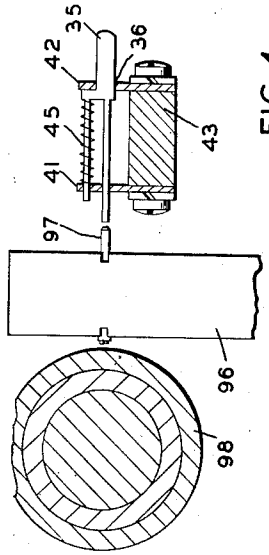
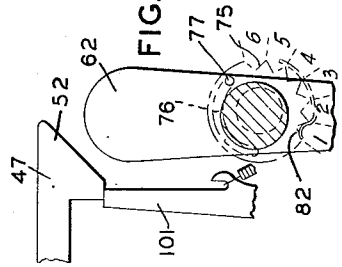


FIG. 8

FIG. 7



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POSITIVE CAM OPERATED PRINT MECHANISM

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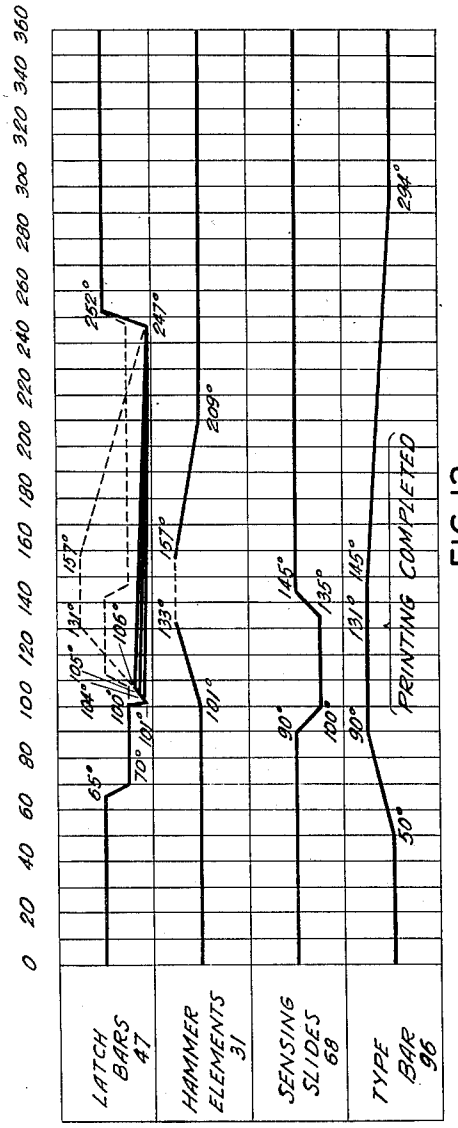


FIG. 12

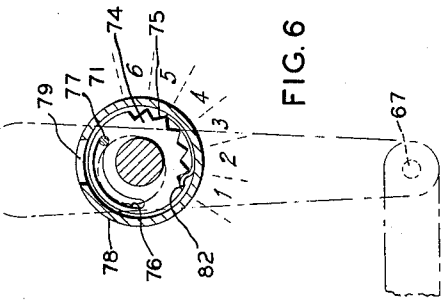


FIG. 6

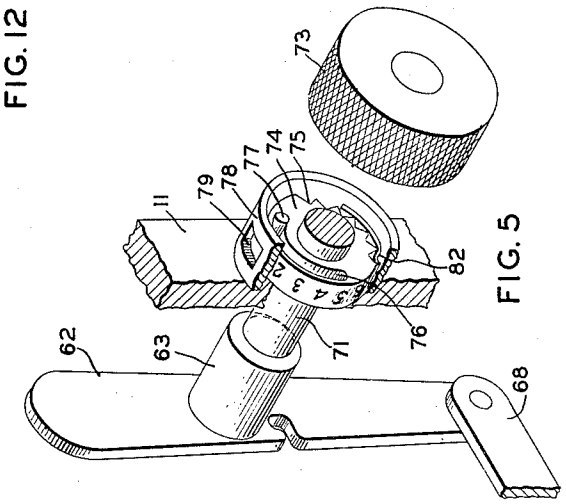


FIG. 5

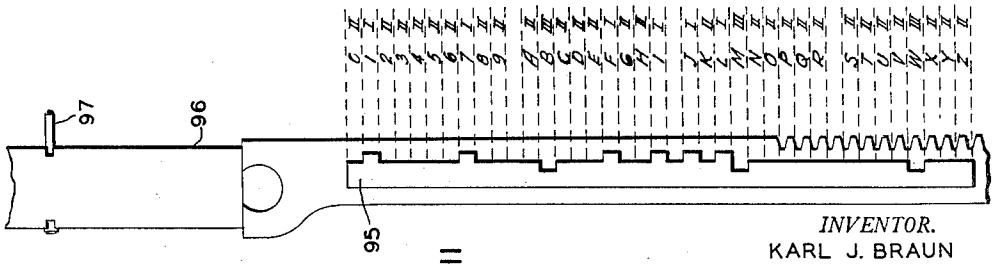


FIG. 11

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Patented Nov. 10, 1953 2,658,447

UNITED STATES PATENT OFFICE

2,658,447

POSITIVE CAM OPERATED PRINT MECHANISM

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Application March 30, 1949, Serial No. 84,465

21 Claims. (Cl. 101—93)

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This invention relates to printing mechanisms, and more particularly to the type employed in statistical machines and the like.

Heretofore, the hammer elements of such printing mechanisms were arranged to impel the type elements thereof and effect printing with a mean impingent force. That is, it was endeavored to actuate the hammer elements with a force sufficient for printing a plurality of carbon copies and still not too great for printing on a single sheet. In some instances this force proved insufficient for printing said plurality of carbon copies legibly. Conversely, in other instances these forces proved more than sufficient, and damaged the sheets being printed on by punching holes therethrough.

Also, heretofore the sharpness of the characters printed has not been uniform. This condition was due both to the fact that some characters require a relatively light, while others require a relatively heavy, impingent force for effecting legible printing, and to the fixed quality of the above mentioned mean force.

Employed also in the above mentioned printing mechanisms were resilient and impositive means for restoring the hammer elements after the actuation thereof, which proved undesirable in several respects. For instance, full advantage could not be had of the impetus afforded for actuating said hammer elements, since a certain amount thereof was expended in first overcoming the resilient restoring means, which restoring means also produced shocks and noises in said printing mechanisms when effective. Further, the impositiveness of said restoring means proved a limitation to the operating speeds of said printing mechanisms.

In view of the above, the principal object of the present invention is to provide a more versatile printing mechanism one capable of being manually and selectively pre-set for legibly printing one or a plurality of carbon copies in addition to an original, and of insuring automatically a more or less uniform sharpness to the printing effected.

Another object of the present invention is to provide a printing mechanism in which full advantage is taken of an impetus afforded hammer elements therein.

Another object of the present invention is to minimize shock and noises in a printing mechanism.

Another object of the present invention is to increase the operating speed of a printing mechanism.

And still another object of the present invention is to minimize time and material wastage due to the damaging of printing sheets.

Briefly, the present invention provides a plurality of hammer elements arranged to be acceleratedly power actuated, and further actuated by momentum for impelling corresponding type elements to thereby effect printing, manually and selectively presettable means for concurrently predetermining the effectiveness of said plurality of hammer elements, and automatic means for individually affecting the predetermined effectiveness of said hammer elements.

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Other objects and structural details of the invention will be apparent from the following description when read in connection with the accompanying drawing, wherein

Fig. 1 is a plan view broken away to illustrate the relative disposition of the several components of the apparatus;

Fig. 2 is a sectional view of the apparatus taken along the line 2—2 in Fig. 1;

Fig. 3 is a fragmentary sectional view similar to Fig. 2 illustrating several of the possible operational positions of the various components;

Fig. 4 is a fragmentary view similar to Fig. 3 illustrating the operation of the hammer restoring means;

Fig. 5 is a fragmentary and partially exploded isometric view showing the manual pre-setting means;

Fig. 6 is a sectional view of the manual presetting means taken along the line 6—6 in Fig. 1;

Fig. 7 is a fragmentary view illustrating a manually pre-set disengaging position of the cam levers;

Fig. 8 is a fragmentary view illustrating another manually pre-set disengaging position of the cam levers;

Fig. 9 is a fragmentary view illustrating the differentially positionable cam levers;

Fig. 10 is a fragmentary isometric view of the sensing mechanism for automatically affecting the predetermined disengaging positions of the cam levers;

Fig. 11 is a fragmentary view of a type bar indicating the relation between the printing characters and the differential steps on the stepped control bar; and

Fig. 12 is a single cycle operational time chart.

With reference to the drawings, and more particularly Figs. 1 and 2, it is seen that a base member 10 has secured thereto a left side plate 11 and a right side plate 12 between which is journaled a power shaft 13, which power shaft is adapted to be constantly rotated clockwise at a uniform velocity by suitable driving and transmitting means, neither being shown herein.

As best seen in Fig. 2, said power shaft 13 is formed to provide a longitudinal tooth or first cam portion 14, a longitudinal cam nose or second cam portion 15, and a peripheral camming surface 16. Also mounted between the side plates 11 and 12, but secured thereto, is a cross bar 17, which bar carries brackets 18 suitably disposed and fastened thereon for supporting a pivot rod 21.

Rotatably carried on the rod 21 and spaced thereon by the teeth of a U-shaped comb member 22 secured to the cross bar 17, is a plurality of bell-cranks 23 having rearwardly extending arms 24 formed thereoff. Said arms 24 normally rest on a rubber coated cross rod 26

mounted between the side plates 11 and 12, and provided for absorbing shock and minimizing noises in the apparatus. Connecting links 27 pivotally connect said arms 24 to pendent arms 28 of related hammer elements 31 loosely carried on a second pivot rod 32 passing through a plurality of guide elements 33. Said guide elements 33 are suitably secured to a second cross bar 34, also mounted between the side plates 11 and 12, and are adapted for properly spacing and guiding the aforementioned hammer elements 31.

Cooperable with the hammer elements 31, when they are actuated in a manner described hereinafter, is a plurality of related interponents 35. Said interponents 35 are slidably fitted for rearward and forward movement in aligned perforations 36 in vertical guide plates 41 and 42, which plates are fixedly attached to a cross bar 43 secured at its ends to the side plates 11 and 12 (Fig. 1). Shoulders 44 formed off said interponents 35 limit the forward movement thereof, and springs 45 fitted thereon are adapted for normally urging them to the limited or forwardmost position, as clearly seen in Fig. 2. A second rubber coated cross rod 37 mounted between the side plates 11 and 12 effectively stops and supports said hammer elements 31 following the restoration thereof, which will be described hereinafter. Like said first cross rod 26, the second cross rod 37 absorbs shocks and minimizes noises in the apparatus.

Pivotally connected to the aforesaid bell-cranks 23 as at 46 are latch bars 47 having tail portions 48 for serving as spacers between related and adjacent ones of said bell-cranks 23 (Figs. 1 and 2). Said latch bars 47 are further configured to provide hooks 51, camming edges 52, and latch noses 53, and are spaced from each other by the teeth of downwardly extending comb members 54 and 55 secured to parallel cross bars 56 and 57, respectively, fixedly mounted between the side plates 11 and 12. Also secured to said parallel bars 56 and 57 are identically perforated upper and lower plates 58 and 59, respectively, the perforations of which are aligned and serve to guide resiliently mounted pins 60. Said pins 60 constantly engage the upper surfaces of related latch bars 47 and in consequence of their resiliency, urge said related latch bars to rotate clockwise about the pivots 46. It will be evident that should the paths of rotation of the latch bars 47 be unobstructed, the hooks 51 thereof will effectively engage the tooth 14 formed on the aforementioned constantly rotating power shaft 13, and said latch bars 47 will be carried to the right, thereby rotating the bell-cranks 23 clockwise (Fig. 3).

As hereinabove mentioned, the power shaft 13 is adapted to rotate at a uniform velocity. Therefore, the bell-cranks 23 are also rotated at a uniform velocity, and the angular displacements under power thereof are increased uniformly. However, the arrangement of the bell-cranks 23, the hammer elements 31, and the connections therebetween is such that the uniformly increased angular power displacements clockwise of said bell-cranks 23 causes angular displacements counterclockwise of said hammer elements 31 which increase non-uniformly at an increasing rate. As a result the velocities of the hammer elements 31 constantly increase as long as power is applied thereto from the shaft 13 whereby said hammer elements 31 are actuated acceleratedly. It follows, therefore, that the

velocities of the hammer elements 31 are determinable by the amounts of angular power displacements of their related bell-cranks 23, which displacements are themselves determinable by the time or the number of degrees of rotation of the shaft 13 during which the related latch bars 47 are in engagement with the tooth 14. It also follows that since velocity is a prime factor in determining momentum, the momentums attained by the hammer elements 31 are also determinable by the time or the number of degrees of rotation of the shaft 13, during which said related latch bars 47 are in engagement with the tooth 14. In a manner hereinafter described, the disengagement of the latch bars 47 is controlled to thereby control the magnitudes of the impacts or the forces with which said hammer elements 31 impinge the interponents 35.

With reference to Fig. 4, it is seen that the clockwise displacement of the bell-cranks 23, as just described, positions cam portions 61 formed thereon in cooperative relation with the aforesaid cam nose 15 on the power shaft 13, which cam nose subsequently and effectively displaces said bell-cranks 23 counter-clockwise to positively return under power the hammer elements 31 to their restored position. In a manner converse to their accelerated actuation, the hammer elements 31 are restored deceleratedly to dampen the impact with which they strike the cross rod 37, thereby aiding in minimizing both noises and shock in the apparatus.

Cooperable with the latch bars 47 is a plurality of corresponding and coplanar cam levers 62 (Figs. 1 and 2), the upper portions of which are engageable with the camming edges 52 of said latch bars 47 for effectively disengaging the engaged hooks 51 thereof from the tooth 14. Said cam levers 62 are loosely carried on an eccentric shaft 63 and are constantly urged to rotate clockwise by springs 64. The aforementioned coplanar relation between the cam levers 62 and the latch bars 47 is maintained by spacers 65 interposed between said levers 62 and also carried on the shaft 63. Pivotally connected to pendent arms of the cam levers 62 as at 67 are horizontal sensing slides 68, the purpose of which will be described hereinafter. With regard to the eccentric shaft 63, it is best seen in Figs. 1, 5, and 6 that its left and right ends are formed concentric with the axis of eccentricity thereof and are journaled in the side plates 11 and 12, the left end 71 being adapted to protrude from said side plate 11 and have secured thereto a knurled knob 73. Intermediate of said knob 73 and the side plate 11, and also secured to the left end of the shaft 63 is a ratchet wheel 74 so configured as to provide six notches 75, and an arcuate slot 76 having positioned therein a stud 77 fixed in the side plate 11 for limiting the rotation of said eccentric shaft 63. Ordinals one through six are further provided which correspond to said notches 75 and are disposed diametrally therefrom on the periphery of said ratchet wheel 74. A sleeve 78 having a window 79, and secured to the side plate 11, covers the just described arrangement and supports a resilient detent 82 adapted to cooperate with said notches 75 for holding said shaft 63 in a manualaly selected one of several positions of rotation. The window 79 and the aforesaid ordinals one through six permit an operator to ascertain visually in which of said notches 75 the detent 82 is seated.

It will be seen that when the eccentric shaft 63 is manually rotated by means of the knob 73 and is stopped by the engagement of the stud 77 with the right end of the slot 76 in the ratchet wheel 74, the detent 82 is seated in the first of the notches 75, the ordinal one appears in the window 79, and the aforesaid plurality of cam levers 62 are caused to rock counter-clockwise on the pivots 67 to the closest pre-settable disengaging position thereof relative to the camming edges 52 of the latch bars 47, as indicated in Fig. 7. Rotating the shaft 63 to seat the detent in successive notches 75, causes the cam levers 62 to rock clockwise on the pivots 67 to predetermined successive disengaging positions thereof relatively farther from the camming edges 52. When the stud 77 engages the left end of the slot 76 the detent 82 is seated in the last of the notches 75, the ordinal six appears in the window 79, and the cam levers 62 are rocked clockwise to the farthest pre-settable disengaging position thereof relative to the camming edges 52, as indicated in Fig. 8. In this manner the plurality of cam levers 62 is selectively and concurrently pre-settable to any one of six disengaging positions relative to the camming edges 52, which disengaging positions determine the angular power displacements of the said plurality of bell-cranks 23 and thus the velocities of the related hammer elements 31.

It will be understood that any plurality of notches 75 may be effectively employed intermediate of the first and last, the present being six in number merely for purposes of illustration.

As shown in Fig. 2, the above mentioned sensing slides 68 are slidably carried on a cross member 83 and are properly spaced thereon by comb members 84. As also seen in Figs. 1, 2, and 10 said sensing slides 68 are provided with identical cut-outs 85 having positioned therein a bail 86, which bail extends through elongated apertures 87 in the side plates 11 and 12, and is secured between the lower arms of levers 88 pivoted as at 91 outside of said side plates 11 and 12. Mounted on the upper ends of said levers 88 are follower rolls 92 adapted to cooperate with identical cams 93 fast on the ends of the aforementioned power shaft 13 and having low dwells 94.

When the follower rolls 92, which follow the cams 93 in accordance with the urging of the springs 64, engage the low dwells 94, said levers 88 are rocked clockwise to thereby move the bail 86 rearwardly. Also in accordance with the urging of the springs 64 and the pivotal connections 67 between the cam levers 62 and the sensing slides 68, said sensing slides 68 tend to follow the bail 86 rearwardly to thereby rotate said pre-set cam levers clockwise on the shaft 63 and thus affect the pre-set disengaging position thereof.

Adapted to cooperate with said sensing slides 68 are corresponding stepped control bars 95 fixed to the lower sides of corresponding type bars 96 and comprising differential or high, mid, and low steps, hereinafter referred to as I, II, and III steps, respectively. Said type bars 96 carry in their upper ends a plurality of type elements 97 having formed thereon alphabetic, numeric, or other printing characters. Each of said characters has related thereto one of the mentioned differential steps. This relation is more clearly indicated in Fig. 11 in which it is seen that certain of said characters, i. e., I, L,

J, etc., comprise a few or less than an average number of lines and require a relatively light impingent force for printing. These characters have I steps related thereto. Other characters, i. e., Z, A, D, etc., comprise an average number of lines and require a medium impingent force for printing. These have II steps related thereto. Still others of said characters, i. e., B, M, and W comprise more than an average number of lines and require a relatively heavy impingent force to effect printing. These have III steps related thereto. Although the means for positioning said type bars 96 is not herein shown, it will be clear that when selected ones of said type elements 97 are thereby raised to a printing line or to be cooperable with the hammer impelled interponents 35 for printing selected characters against a platen 98, the aforesaid differential steps related thereto will be positioned at a sensing line or rendered cooperable with the corresponding sensing slides 68 (Figs. 2 and 5). Subsequent cooperation between the sensing slides 68 and the steps at the said sensing line causes the related cam levers 62 to be individually rotated clockwise in accordance with the differential steps sensed, to thereby affect the pre-set disengaging positions thereof. In this manner said cam levers 62 may be rendered differentially effective during a machine cycle for disengaging the hooks 51 to affect the determined angular power displacements of the bell-cranks 23 and the determined velocities afforded the related hammer elements 31. It is to be understood that but three differential steps are herein shown for the purpose of simplifying descriptions, and that any variance thereof may be employed, even to the extent of utilizing a particular step for each particular printing character.

Normally, the above mentioned clockwise rotation of the latch bars 47 is obstructed by the engagement of the latch noses 53 thereof with the upper ends of a plurality of corresponding and coplanar trip levers 101 (Figs. 1 and 2). Said trip levers 101 are loosely mounted on a pivot rod 102 supported by brackets 103 secured to a cross bar 104 fixedly mounted between the side plates 11 and 12, and are effectively spaced by a U-shaped comb member 105, also secured to said cross bar 104. The aforesaid springs 64 also serve to urge said trip levers 101 to rotate clockwise until limited by a rubber coated cross rod 106 mounted between the side plates 11 and 12. Tripping means 107, the form and workings of which may be varied and, therefore, not fully shown herein, are individually and selectively effective for rotating said trip levers 101 counter-clockwise against the urging of the springs 64, thus rendering them unobstructive with regard to the latch bars 47 and permitting the aforementioned resilient pins 69 to rotate said latch bars 47 into engagement with the tooth 14 on the power shaft 13, in the manner and for the purpose hereinabove described.

In operation the present apparatus may be manually pre-set for printing a desired number of carbon copies in addition to an original sheet, while the apparatus automatically insures a more or less uniform sharpness to the characters printed. For example, if it is desirous to print but one carbon copy the operator turns the knurled knob 73 until the number one appears in the window 79, thus seating the detent 82 in the first of said notches 75 and concurrently

positioning the upper portions of the cam levers 62 a predetermined distance from the camming edges 52 of the latch bars, or in the first disengaging position thereof.

In this setting and at 0° of a machine cycle the latch bars 47 are in contact with the peripheral camming surface 16 (Fig. 2) of the constantly rotating power shaft 13 and are thereby held up, compressing the resilient pins 60 and affording a clearance between the latch noses 53 and the coplanar trip levers 101 (dotted latch Fig. 4). At this time in the cycle the hammer elements 31 are in a restored position, the sensing bars 68 are ineffective, and the type bars 96 are in a lowered position (Fig. 12). At 50° of the cycle the type bars 96 of those columns in which printing is to be effected begin to ascend. At 65° all of the latch bars 47 ride off said peripheral camming surface 16 (Fig. 2) and the latch noses 53 thereof engage the trip levers 101. At 90°, the effective type bars 96 have fully raised the selected type elements 97 to the printing line or to the cooperable position with respect to the interponents 35, and have also raised the differential steps related thereto to the sensing line or the cooperable position with respect to the sensing slides 68, at which time the follower rollers 92 engage the dwells 94 of the cams 93 to thereby effect a rearward movement (to the left in Fig. 2) of the bail 86.

Due to the urging of the springs 64 the sensing bars 68 follow the said bail 86 and individually sense the said differential steps I, II, or III at said sensing line (Figs. 2 and 10) and in accordance with the steps sensed and in the manner hereinabove described the related cam levers 62 are rotated clockwise and may differentially affect the pre-set first disengaging position thereof.

At a time subsequent to 70° of the cycle and prior to 100°, the trip levers 101 related to the columns in which printing is to be effected are rotated counter-clockwise by the tripping means 107. Consequently, the actuated trip levers 101 disengage the latch noses 53 of the related latch bars 47 and said latch bars are permitted to rotate clockwise under the influence of the resilient pins 60 to engage the hooks 51 thereof with the tooth 14 on the constantly rotating power shaft 13 at approximately 101°. This engagement causes the latch bars 47 to be carried forward and the related bell-cranks 23 to be power rotated or angularly displaced clockwise by power until the camming edges 52 of said latch bars 47 cooperate with the coplanar cam levers 62 and the camming action therebetween disengages said hooks 51 from the said tooth 14.

It will be seen that in the columns in which I steps are sensed the hooks 51 thereof are disengaged at approximately 104° and the related hammer elements 31 are acceleratedly actuated to the 1–I position as indicated in Fig. 3, attaining a momentum after leaving that position sufficient for effecting, with a certain sharpness, the printing on an original sheet and one carbon copy of those characters requiring a relatively light impingent force. In the columns in which II steps are sensed the hooks 51 thereof are disengaged at approximately 105° and the related hammer elements 31 are acceleratedly actuated to the 1–II position of Fig. 3, attaining a momentum sufficient for effecting, with said certain sharpness, the printing on an original sheet and one carbon copy of those characters requiring a medium impingent force. And in the columns in which III steps are sensed the hooks 51 thereof are disengaged at approximately 106° and the related hammer elements 31 are acceleratedly actuated to the 1–III position of Fig. 3, attaining a momentum sufficient for effecting, with said certain sharpness also, the printing on an original sheet and one carbon copy of those characters requiring a relatively heavy impingent force. Thus all printing effected during each machine cycle is of a more or less uniform sharpness.

In consequence of the similarity between the just described operation and the operation of the apparatus when the eccentric shaft 63 is set to any of its other five positions for printing multiple carbon copies and the clarity of Figs. 3 and 12, said operation in said five other settings will be evident without further description herein. By 131° of the machine cycle the power actuation of the hammer elements 31 will have been fully effected, regardless of the manual setting of the eccentric shaft 63 and the positions of said hammer elements are thereafter determined only by the recoil actions of the individual resilient interponents 35 until 157° of said cycle. At this time, the mentioned cam portions 61 of the effective bell-cranks 23 are picked up by the cam nose 15 (Fig. 4) on the power shaft 13 for deceleratedly and positively restoring said hammer elements 31, which restoration is completed by 209° of the cycle. It is to be noted that at 135° of the cycle the follow rolls 92 began to rise out of the dwells 94 and commenced to ride on the outer peripheries of the cams 93 at 145°, and thereby restored the sensing bars 68 to their normally ineffective forward position. Also, at 145° the type bars began to descend and are fully lowered at 294°.

Until 247° of the cycle the trip levers 101 remain actuated, at which time all of the latch bars 47 are again engaged by the peripheral camming surface 16 of the power shaft 13 and are thereby raised, permitting the springs 64 to rotate said trip levers 101 to their normal most clockwise positions (Fig. 4). However, as indicated above, the latch noses 53 will not again engage the trip levers 101 until 65° of a successive cycle.

In those columns in which there is to be no printing, an idle movement of the related latch bars 47 is effected (Fig. 12), thus lowering the latch noses 53 thereof on to the trip levers 101 at at 70°, raising them therefrom at approximately 112°, lowering them again at approximately 147°, and finally raising them fully at 252°, and maintaining them in this raised position into a successive cycle.

While the invention has been described in detail and with respect to a present preferred form thereof, it is not to be limited to such details and forms since many changes and modifications may be made in the invention without departing from the spirit and scope of the invention in its broadest aspects. Hence it is desired to cover any and all forms and modifications of the invention which may come within the language or scope of any one or more of the appended claims.

What is claimed as new, and desired to be secured by Letters Patent, is

1. In a power operated printing mechanism, the combination of a type bar having a plurality of type elements, a stepped member integral with said type bar and having a plurality of differential steps, each being related to one of said type elements, means for selectively positioning said type elements at a printing line, a constantly rotating power means, a rotatable bell-crank mem-

ber, a hammer element related to said rotatable member and adapted for being acceleratedly actuated by the rotation thereof and further actuated by momentum to impel a type element at said printing line, a latch connected to said bell-crank and effectively engageable with said power means for thereby power rotating said bell-crank and acceleratedly actuating said hammer element, means normally preventing the engagement of said latch and said power means and trippable for permitting said engagement, a latch disengaging member cooperative with the engaged latch and selectively settable to one of a plurality of disengaging positions for predetermining the power rotation of said rotatable member, and a sensing element cooperative to sense the differential step related to said type element at said printing line and effective for altering the set disengaging position of said latch disengaging member to effect the predetermined power rotation of said bell-crank.

2. In a power operated printing mechanism, the combination of a type bar having therein a plurality of type elements, a stepped bar carried on said type bar and comprising a plurality of differential steps each being related to one of said type elements, means for selectively positioning one of said type elements at a printing line, a constantly rotating power shaft having a longitudinal tooth and a longitudinal cam nose, an angularly displaceable bell-crank, a type hammer related to said bell-crank and adapted to be acceleratedly actuated in accordance with the angular displacement thereof, and further actuated by momentum to impel the type element at said printing line, a latch member connected to said bell-crank and engageable with said tooth for thereby power displacing said bell-crank and acceleratedly actuating said type hammer, a tripping member normally preventing the engagement of said latch member and said tooth and permitting said engagement when tripped, a cam lever cooperative with the engaged latch member to effect the disengagement thereof, said cam lever being manually and selectively pre-settable to one of a plurality of disengaging positions for predetermining the angular power displacement of said bell-crank, a slidable member connected to said cam lever and effective to sense the differential step related to said type element at said printing line for thereby altering the pre-set disengaging position of said cam lever to affect the predetermined angular power displacement of said bell-crank, and said longitudinal cam nose being effective for engaging and counterdisplacing the displaced bell-crank to thereby positively restore said type hammer.

3. In a power operated printing mechanism, the combination of a type bar having a plurality of type elements, a stepped bar affixed to said type bar and formed to provide a plurality of differential steps each being related to one of said type elements, means for selectively positioning one of said type elements at a printing line, a constantly rotating power shaft formed to provide a longitudinal tooth and a peripheral camming surface, an angularly displaceable bell-crank, a type hammer related to said bell-crank and adapted to be actuated with increasing velocity in accordance with the angle displaced by said bell-crank and further actuated by momentum to impel the type element at said printing line, a hook connected to said bell-crank and engageable with said tooth for thereby power displacing said bell-crank and actuating said type hammer with increasing velocity, a tripping member normally obstructing the engagement of said hook and said tooth and trippable for permitting said engagement, a cam lever cooperative with the engaged hook to effect the disengagement thereof, said cam lever being manually and selectively pre-settable to one of a plurality of disengaging positions for predetermining the angle displaced by said bell-crank, a slidable member connected to said cam lever and effective to sense the differential step related to said type element at said printing line for accordingly altering the pre-set disengaging position of said cam lever to affect the predetermined angle displaced by said bell-crank, and said peripheral camming surface being effective to engage said hook and position the same to permit the return of said tripping member to the normal position.

4. In a power operated printing mechanism, the combination of a platen, a type bar having therein a plurality of type elements, a stepped bar affixed to said type bar and configured to provide a plurality of differential steps each being related to one of said type elements, means for selectively positioning one of said type elements at a printing line, a constantly rotating power shaft having a longitudinal tooth, a longitudinal cam nose, and a peripheral camming surface, an angularly displaceable bell-crank having a camming portion, a type hammer related to said bell-crank and adapted to be actuated with increasing velocity in accordance with the angle displaced by said bell-crank and further actuated by momentum to impel the type element at said printing line against said platen, a hook connected to said bell-crank and engageable with said tooth to thereby power displace said bell-crank and actuate said type hammer, a tripping lever normally positioned to prevent the engagement of said hook and said tooth and trippable to permit said engagement, a cam lever cooperative with the engaged hook to effect the disengagement thereof, said cam lever being manually and selectively pre-settable to one of a plurality of disengaging positions for predetermining the angle displaced by said bell-crank, a sensing slide connected to said cam lever and resiliently urged to cooperate with the differential step related to the type element at said printing line for thereby accordingly altering the pre-set disengaging position of said cam lever to thereby affect the predetermined angle displaced by said bell-crank, a reciprocating bail normally engaged with said slide and preventing the cooperation between same and said steps and permitting said cooperation when a type element is selectively positioned at said printing line, said peripheral camming surface being effective to engage said hook and position the same to permit the return to normal of said tripping lever, and said cam nose being effective to engage the bell-crank camming portion for counter-displacing the displaced bell-crank to thereby positively restore the actuated hammer element.

5. In an apparatus of the class described, a constantly rotating power shaft having a longitudinal tooth, and a longitudinal cam nose formed thereon, a plurality of angularly displaceable bell-cranks each having a camming portion, a plurality of pivotally mounted hammer elements each connected to one of said bell-cranks and arranged to be acceleratedly actuated in accordance with the angles displaced by said bell-cranks, a plurality of latch members each pivotally connected to one of said bell-

cranks and all being engageable with said tooth for thereby power displacing said bell-cranks and acceleratedly actuating said hammer elements, a plurality of tripping levers normally obstructing the engagement of said latch members and said tooth and selectively trippable for effecting the engagement of certain of said latch members and said tooth, an eccentric shaft, a plurality of cam levers carried on said eccentric shaft each being related to one of said latch members and cooperative with and effective for disengaging the engaged ones thereof, said shaft being rotatable and pre-settable for selectively and concurrently positioning said plurality of cam levers in one of a plurality of disengaging positions to predetermine the power displacement of said plurality of bell-cranks, said cam levers being differentially positionable for varying the pre-set disengaging position thereof to thereby alter the predetermined power displacement of said bell-cranks, and said cam nose being effective to engage the camming portion of, and thereby counter-displacing, all the displaced bell-cranks to power restore deceleratedly the actuated hammer elements.

6. In an apparatus of the class described, a platen, a plurality of columnar type bars each having a plurality of type elements therein, stepped bars affixed to said type bars each configured to provide a plurality of differential steps, and each of said steps being related to one of said type elements, means for selectively positioning said type elements at a printing line, a constantly rotating power shaft having a longitudinal tooth, a longitudinal cam nose, and a peripheral camming surface, a plurality of columnar and angularly displaceable bell-cranks, a plurality of type hammers each connected to one of said bell-cranks and arranged to be acceleratedly actuated in accordance with the angles displaced by said bell-cranks and further actuated by momentum to impel the type elements at said printing line against the said platen, a plurality of hooks each pivotally connected to one of said bell-cranks and all being engageable with said tooth for thereby power displacing said bell-cranks and acceleratedly actuating said type hammers, tripping levers each cooperatively related to one of said hooks and positioned normally to prevent the engagement of said hooks and said tooth and selectively trippable for effecting the engagement of certain of said hooks and said tooth, an eccentric shaft, a plurality of cam levers loosely carried on said shaft each being related to one of said hooks and cooperative with and effective for disengaging the engaged ones thereof, said shaft being rotatable and pre-settable for selectively and concurrently positioning said plurality of cam levers in one of a plurality of disengaging positions to pre-determine the power displacement of said bell-cranks, a plurality of sensing slides each pivoted to one of said cam levers and each cooperable with one of said stepped bars for sensing the said differential steps related to the type elements at said printing line, said cam levers being differentially positionable in accordance with the steps sensed for varying the pre-set disengaging position thereof to thereby effect the pre-determined power displacement of said bell-cranks, said cam nose being cooperative with and effective for counter-displacing the displaced bell-cranks to thereby positively and deceleratedly restore the actuated type hammers, and said peripheral camming surface being cooperative with all of said hooks to thereby permit the restoration to normal of the tripped ones of said tripping levers.

7. In a power operated printing mechanism, the combination of a constantly rotating power means, a rotatable member, a hammer element adapted to be actuated upon rotation of said rotatable member, a latch bar connected to said rotatable member and positionable as to effect engagement of a hook formed thereon with said power means for thereby angularly displacing under power said rotatable member, trip lever means normally set to prevent engagement of the said hook with the power means, tripping means for releasing the trip lever means from its normal position to allow engagement of the hook with the power means hook disengaging means, and said power means being effective to engage the latch bar elsewhere than at the hook for thereby raising the latch bar to a position where its hook is unengageable by the power means, and spring means operable when the hook is in said latter position to reset the trip lever to its normal position.

8. In a power operated printing mechanism, the combination of a constantly rotating power means, a rotatable member, a hammer element adapted to be actuated upon rotation of said rotatable member, a latch bar connected to said rotatable member and positionable as to effect engagement of a hook formed thereon with said power means for thereby angularly displacing under power said rotatable member, tripping means set normally to maintain said hook unengageable and operable for rendering same engageable, hook disengaging means, and said power means being effective to engage the latch bar elsewhere than at the hook for thereby positioning said latch bar as to render said hook unengageable and permit a resetting of said tripping means, and spring means operable upon positioning of the latch bar to its latter position, to reset the tripping means to its normal position for maintaining said hook unengageable with said shaft tooth.

9. In a power operated printing mechanism, the combination of a constantly rotating power shaft including a tooth and a peripheral camming surface, a rotatable bell-crank, a hammer element adapted to be actuated upon rotation of said bell-crank, a latch bar connected to said bell-crank and positionable as to effect engagement of a hook formed thereon with said shaft tooth for thereby power rotating said bell-crank, trip lever means normally set to prevent engagement of the said hook with the power means hook disengaging means, and said shaft camming surface being effective to engage the latch bar elsewhere than at the hook for thereby raising the latch bar to a position where its hook is unengageable by the power means, and spring means operable when the hook is in said latter position to reset the trip lever to its normal position.

10. In a power operated printing mechanism, the combination of a constantly rotating power shaft including a tooth and a peripheral camming surface, a rotatable bell-crank, a hammer element adapted to be actuated upon rotation of such bell-crank, a latch bar connected to said bell-crank and positionable as to effect engagement of a hook formed thereon with said shaft tooth for thereby rotating said bell-crank and actuating said hammer element, tripping means set normally to maintain said hook unengageable and operable for rendering same engageable, hook disengaging means, and said camming sur-

face being engageable with the latch bar elsewhere than at the hook to thereby position said latch bar as to render said hook unengageable and permit a resetting of said tripping means, and spring means operable upon positioning of the latch bar to its latter position, to reset the tripping means to its normal position for maintaining said hook unengageable with said shaft tooth.

11. In a power operated printing mechanism, the combination of a constantly rotating power means, a rotatable member, a hammer element adapted to be actuated upon rotation of said rotatable member, a latch member connected to said rotatable member and positionable to engage effectively said power means whereby said rotatable member is rotated under power and a portion thereof is positioned to be engaged by said power means, and said power means being thereafter effective to engage said portion and counter-rotate said rotatable member.

12. In a power operated printing mechanism, the combination of a constantly rotating power means, a rotatable member, a hammer element adapted to be actuated upon rotation of said rotatable member, a latch bar connected to said rotatable member and positionable to effect engagement of a hook formed thereon with said power means whereby said rotatable member is rotated under power and a portion thereof is positioned to be engaged also by said power means, trip lever means normally set to prevent engagement of the said hook with the power means, tripping means for releasing the trip lever means from its normal position to allow engagement of the hook with the power means hook disengaging means, and said power means being effective to engage said portion and counter-rotate said rotatable member and to engage the latch bar elsewhere than at the hook for thereby raising the latch bar to a position where its hook is unengageable by the power means, and spring means operable when the hook is in said latter position to reset the trip lever to its normal position.

13. In a power operated printing mechanism, the combination of a constantly rotating power means, a rotatable member, a hammer element adapted to be actuated upon rotation of said rotatable member, a latch bar connected to said rotatable member and positionable to effect engagement of a hook formed thereon with said power means for thereby rotating under power said rotatable member and positioning a portion thereof to be engaged by said power means, tripping means set normally to maintain said hook unengageable and operable for rendering same engageable, hook disengaging means, and said power means being effective to engage said portion and counter-rotate said rotatable member and to engage the latch bar elsewhere than at the hook for thereby positioning said latch bar as to render the said hook unengageable and permit a resetting of said tripping means, and spring means operable upon positioning of the latch bar to its latter position, to reset the tripping means to its normal position for maintaining said hook unengageable with said shaft tooth.

14. In a power operated printing mechanism, the combination of a constantly rotating power shaft including a tooth, and a cam nose; a rotatable member including a camming portion; a hammer element adapted to be actuated upon rotation of said rotatable member; a latch bar connected to said rotatable member and positionable to effect engagement of a hook formed thereon with said shaft tooth whereby said rotatable member is rotated under power and the camming portion thereof is disposed as to be engageable by said cam nose, hook disengaging means selectively settable for predetermining the power rotation of said rotatable member, and said cam nose being effective following disengagement of said hook and tooth to engage said camming portion and thereby counter-rotate said rotatable member.

15. In a power operated printing mechanism, the combination of a constantly rotating power shaft including a tooth, a cam nose, and a peripheral camming surface; a rotatable member including a camming portion; a hammer element adapted to be actuated upon rotation of said rotatable member; a latch bar connected to said rotatable member and positionable to effect engagement of a hook formed thereon with said shaft tooth for thereby rotating under power said rotatable member and positioning the camming portion thereof as to be engageable by said cam nose; tripping means set normally to maintain said hook unengageable and operable for rendering same engageable; hook disengaging means selectively settable for predetermining the power rotation of said rotatable member, said cam nose being effective, following disengagement of said hook and tooth, to engage said camming portion and thereby counter-rotate said rotatable member; and said peripheral camming surface being effective to engage the latch bar elsewhere than at the hook for thereby positioning said latch bar as to render said hook unengageable and permit a resetting of said tripping means, and spring means operable upon positioning of the latch bar to its latter position, to reset the tripping means to its normal position for maintaining said hook unengageable with said shaft tooth.

16. In a power operated printing mechanism; the combination of a constantly rotating power shaft having a longitudinal tooth and a longitudinal cam nose; an angularly displaceable bell-crank including a camming portion; a hammer element arranged to be actuated acceleratedly in accordance with the displacement of said bell-crank; a latch bar connected to said bell-crank and positionable as to effect engagement of a hook formed thereon with said shaft tooth for thereby power displacing said bell-crank to actuate acceleratedly said hammer element and to dispose said camming portion as to be engageable by said cam nose; a tripping member set normally to maintain said hook unengageable and trippable for rendering same engageable; a cam member cooperative with said latch bar to effect the disengagement of said hook, said cam member being selectively settable to a plurality of disengaging positions for predetermining the power displacement of said bell-crank and differentially positionable for varying such displacement; and said shaft cam nose being effective to engage the bell-crank camming portion for counter-displacing the displaced bell-crank and thereby restoring positively and deceleratedly the actuated hammer element.

17. In a power operated printing mechanism; the combination of a constantly rotating power shaft having a longitudinal tooth, a longitudinal cam nose, and a peripheral camming surface; an angularly displaceable bell-crank including a camming portion; a hammer element arranged to be actuated acceleratedly in accordance with the displacement of said bell-crank; a latch bar connected to said bell-crank and positionable as

to effect engagement of a hook formed thereon with said shaft tooth for thereby power displacing said bell-crank to actuate acceleratedly said hammer element and to dispose said camming portion as to be engageable by said cam nose; a tripping member set normally to maintain said hook unengageable and trippable for rendering same engageable; a cam member cooperative with said latch bar to effect the disengagement of said hook, said cam member being selectively settable to a plurality of disengaging positions for predetermining the power displacement of said bell-crank and differentially positionable for varying such displacement; said shaft cam nose being effective to engage the bell-crank camming portion for counter-displacing the displaced bell-crank and thereby restoring positively and deceleratedly the actuated hammer element; and said shaft peripheral camming surface being effective to engage the latch bar and thereby position same as to render the hook thereon unengageable and to permit resetting of the said tripping means, and spring means operable upon positioning of the latch bar to its latter position, to reset the tripping means to its normal position for maintaining said hook unengageable with said shaft tooth.

18. In a power operated printing mechanism; the combination with a type bar including a plurality of type elements, means for operating said type bar and selectively positioning said type elements at a printing line, a constantly rotating power means, a rotatable member, a hammer element related to said rotatable member and adapted for being acceleratedly actuated upon rotation thereof to impel a type element at said printing line, a latch connected to said rotatable member and effectively engageable with said power means for thereby power rotating said member and acceleratedly actuating said hammer element, and a cam member engageable by the engaged latch member for disengaging same; of a control bar carried by said type bar and having a plurality of differential steps, each being related to one of said type elements and proportional to the impelling force required by same to print according to a certain uniformity; a sensing element connected to the cam member and operative to sense the differential step related to a type element at said printing line and thereby position said cam member as to determine the impelling force delivered by said hammer element in accordance with the requirement of the particular type element at said printing line.

19. In a power operated printing mechanism, the combination with a type bar including a plurality of type elements, means for operating said type bar and selectively positioning said type elements at a printing line, a constantly rotating power means, a rotatable member, a hammer element related to said rotatable member and adapted for being acceleratedly actuated upon rotation thereof to impel a type element at said printing line, a latch connected to said rotatable member and effectively engageable with said power means for thereby power rotating said member and acceleratedly actuating said hammer element; of an eccentric shaft; a cam lever carried loosely on said shaft and being engageable by the engaged latch member for disengaging same, said shaft being rotatable and settable for positioning said lever as to be differentially effective and for thereby predetermining the impelling force delivered by said hammer element; a control bar carried by said type bar and having a plurality of differential steps, each being related to one of said type elements and proportional to an alteration required thereby in said predetermined impelling force to print according to a certain uniformity; a sensing element connected to the cam lever and operative to sense the differential step related to a type element at said printing line and thereby position said cam lever as to alter the predetermined impelling force in accordance with the requirement of the particular type element of said printing line.

20. In a power operated printing mechanism, the combination with a plurality of columnar type bars each having a plurality of type elements therein, means for operating said type bars and selectively positioning said type elements at a printing line, a constantly rotating power means, a plurality of rotatable members, a plurality of hammer elements each connected to one of said rotatable members and arranged to be actuated acceleratedly upon rotation thereof to impel the type elements at said printing line, a plurality of latch members each connected to one of said rotatable members and all being effectively engageable with said power means for thereby power rotating said rotatable members and acceleratedly actuating said hammer elements; of an eccentric shaft; a plurality of cam levers carried loosely on said shaft and being engageable by engaged ones of said latch members for disengaging same, said shaft being rotatable and settable for selectively and concurrently positioning said plurality of cam levers in one of a plurality of disengaging positions for thereby predetermining the impelling force delivered by said hammer elements; a plurality of control bars each carried by one of said type bars and having a plurality of differential steps each of which is related to one of said type elements and is proportional to an alteration required thereby in said predetermined impelling force to print according to a certain uniformity; a plurality of sensing slides each connected to one of said cam levers and resiliently urged to sense said differential steps and accordingly effect the set position of its related cam lever as to alter the predetermined impelling force delivered by its related hammer element; a ball engaging the plurality of sensing slides normally to restrain same and operative to permit said slides to sense said differential steps when said type elements are effectively positioned at said printing line.

21. In a printing mechanism, a linkage including a member movable toward and away from a printing position, a hook lever and a member intermediate the hook lever and the movable member, and a rotary drive means for engaging the hook lever to advance the movable member toward the printing position and to engage said intermediate member to retract said movable member.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,120,679	Bright	Dec. 15, 1914
1,579,151	Schluns	Mar. 30, 1926
1,818,200	Dorsey	Aug. 11, 1931
2,019,901	Furman	Nov. 5, 1935
2,039,791	Furman	May 5, 1936
2,066,784	Lake et al.	Jan. 5, 1937
2,095,068	Koca	Oct. 5, 1937
2,178,749	Fuller	Nov. 7, 1939