H. DREWELL.

BAND PERFORATING APPARATUS.

APPLICATION FILED SEPT. 23, 1913.

1,106,638. **Patented Aug. 11, 1914.**

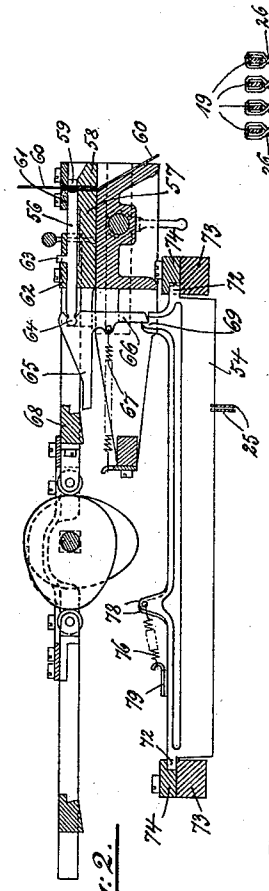


Fig: 2.

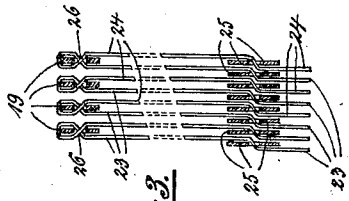


Fig: 3.

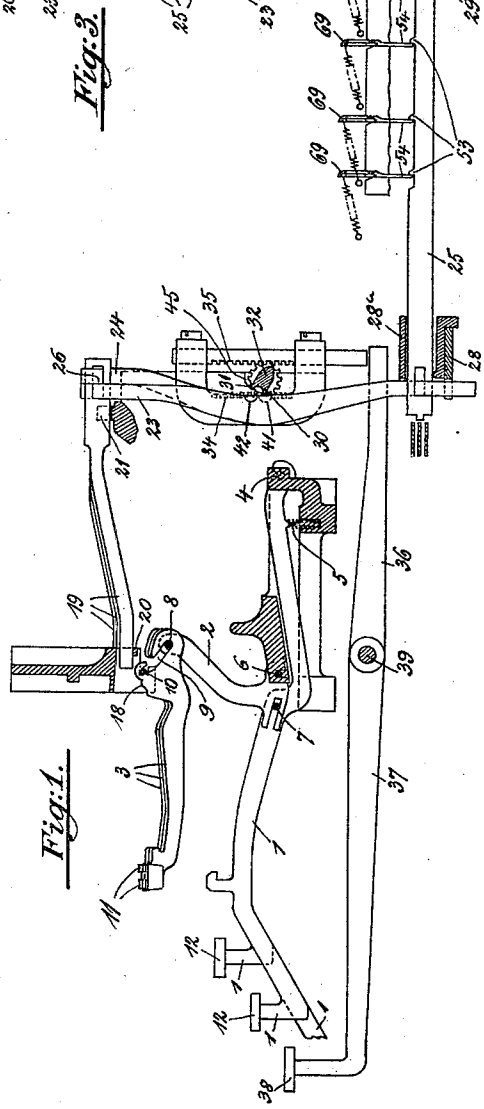


Fig: 1.

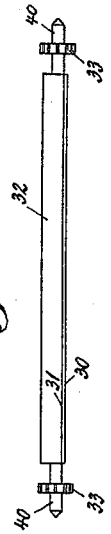


Fig: 4.

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BAND-PERFORATING APPARATUS.

1,106,638. Specification of Letters Patent. Patented Aug. 11, 1914.

Application filed September 23, 1913. Serial No. 791,270.

To all whom it may concern:

Be it known that I, HEINRICH DREWELL, a subject of the German Emperor, residing at Charlottenburg, Germany, have invented new and useful Improvements in Band-Perforating Apparatus, of which the following is a specification.

My invention relates to apparatus for making perforated bands for operating automatic type-setting machines, automatic matrix-setting and line-casting machines and the like.

A primary object of my invention is to provide that the perforations shall agree exactly with the text written by the typewriter connected with the perforating device. Such agreement is of considerable importance because without it the text would not fulfil its purpose, *i. e.* that of serving as an aid in making corrections. The agreement is, however, rendered difficult owing to certain occurrences which are unavoidable in the case of rapid working, *e. g.* the simultaneous partial depression of several keys, and the like. In order to render such mistakes non-injurious I make the selection of the punches used for perforating the band dependent on that type-bar of the typewriter which carries the type corresponding to the perforated symbol, by causing the type-bar to select the punch only when in proximity to its printing position. In addition, a very elastic and light stroke of the key is obtained in this manner. The certainty of operation is based, on the one hand, on all the type-bars having to be brought into an exactly predetermined end position in order to bring about both the printing of the types and also the selection and action of the punches and, on the other hand, on a type-bar which does not arrive into this end position causing neither the one nor the other function to be performed. Consequently, a key can be depressed through three-quarters of its stroke, for example, without its becoming operative, whereas both printing and perforation take place without fail when the key is struck in the ordinary manner with sufficient force. The certainty of action is increased owing to the type-bar acquiring a certain velocity when it is struck in the ordinary manner, and owing to its being able by means of the impetus thereby acquired to bring about both the printing of the type and also the production of the perforated symbol even should the finger which strikes the key leave the latter too soon. Thus the proper action of the blow on the key depends not only on the extent of the movement which the finger directly imparts to the key, but also on the energy of this movement. Consequently, keys which are depressed owing to their being unintentionally struck when an adjacent key is struck produce neither a print nor a perforated symbol, because in by far the majority of cases such keys are struck only lightly and the key or the type-bar does not move at any high speed. On the other hand, the two type-bars which operate simultaneously must necessarily strike together at the same point, so that defective operation is recognized without fail in this manner by the operator and can be rendered non-injurious.

The invention can be employed in combination with typewriters and perforating devices of very various construction. Both typewriters without shift-keys and also those comprising the same may be used. In the following description it is assumed that a typewriter comprising a shift-key is used, and a mode of changing over to capital letters of a particularly advantageous kind in such cases is described.

To these ends the invention consists in the construction, arrangement and combination of parts described hereinafter and pointed out in the claims.

One embodiment of the invention is represented by way of example in the accompanying drawings, wherein:—

Figure 1 is a sectional side elevation showing the typewriting mechanism and the combination members operated thereby for actuating the perforating apparatus, Fig. 2 is a cross-section showing the perforating apparatus, and Figs. 3 and 4 show details.

Referring to the drawing, the typewriting mechanism is of the known construction of the Underwood system and comprises key-levers 1, angle levers 2 and type-bars 3. The key-levers are rotatable about a common axle 4 and are held by springs 5 in their upper or normal position. The intermediate levers 2 are rotatable about an axle 6 and are driven by pins 7, mounted on the key-levers 1, entering into slots in the levers 2. Driving pins 8 on the levers 2 enter into slots 9 in the type-bars 3 and impart to these the motion of the key-levers. The type-bars rotate about the curved

axle 10 known in the Underwood mechanism. They carry at their free ends a number of types 11, in this case two. When a key 12 fastened to the extreme outermost end of the key-lever 1 is struck the type-bar is thrown out of its horizontal into a vertical position and strikes against the platen where it produces an impression. The mode of operation of the typewriting mechanism is the same as that of the well-known Underwood typewriting machine.

In order to produce a perforation in the register band simultaneously with the printing of the types the motion of the type-bars is imparted to a device for selecting punches. For this purpose, the type-bar 3 has a shoulder 18 near its fulcrum. When a key 12 is depressed and the type-bar 3 is consequently moved into its vertical position, this shoulder abuts against a rod 19 and shifts it backward a small distance. Each of the type-bars 3 influences a separate rod 19, the two ends of which slide in guides 20 and 21. Each of the rods 19 is connected with a number of levers, in the present case two, 23 and 24, in such manner that the upper ends of the latter must participate in the motion of the rods 19. A band 25 is attached to the lower end of each of these levers. The connection of the levers 23 and 24 with the rods 19 and bands 29 is established by both the rods and the bands being provided with oval or longitudinal holes, through which the levers are inserted. The levers are bent in the holes so that they can be placed as close together as possible (Fig. 3). The rod 19 drives the rear lever 24 by means of the intermediate lever 23. In order that the levers 23 and 24 forming a pair cannot be pushed one beside another they are arranged crosswise in a suitable hole or recess of the rod, 19, as is shown at 26 in Figs. 1 and 3. The lower ends of the levers 23 and 24 are guided laterally in a comb-like guide 28, and a similar guide 29 guides the bands 25 laterally. These bands are themselves under the influence of springs 50 tending to pull them rearwardly, the springs being fastened in suitable manner to a cross-bar 51. The bands 25 are provided with teeth or lugs 53, with which they coact with cross-bars 54 and thereby bring about the selection of the punches in the manner described hereinafter.

Each of the rods 19 acts on two or more levers 23 and 24, the number thereof depending on the number of types provided at the end of each type-lever. In a machine comprising single shift-key mechanism one type-bar carries two types and, accordingly, each rod 19 drives two levers. When a key is depressed, however, only one of the levers should operate, the other remaining inoperative. For this purpose, opposite the middle of the levers 23 and 24 is a shaft 32 provided with two knife-edge like ribs 30 and 31 (Figs. 1 and 4). The shaft carries at its two ends gears 33 which mesh with toothed racks 34 and 35. Of these racks the former is rigidly connected with the frame of the machine, while the latter can be shifted longitudinally. This rack 35 bears on the end of the lever 36, 37 of the shift key 38 rotatable about the axle 39. The shaft 32 is so guided by round pins 40 in slots 45 in the frame of the machine that it can shift in these slots only vertically and not from front to rear. In the normal position the pins 40 are located in the lower parts of the slots. When the shift-key 38 is depressed the rack 35 is lifted, the shaft 32 is consequently rotated and its gears 33 roll on the fixedly mounted rack 34. The shaft 32 is consequently simultaneously lifted. In the normal position the knife-edge 30 of the shaft constitutes a support and fulcrum for the levers 23. In this position only the levers 23 operate, because the levers 24 are provided with recesses 41 and consequently remain inoperative when the said key is depressed. Instead of rocking about the edge 30 they rock about the front edge of a bar 28^a at the lower end of the lever, so that they move only a small distance toward the front at the point of attachment to the band 25, and this displacement does not suffice for operating any mechanism. The lever 23, on the contrary, is compelled to rock about the edge 30, so that its lower end is swung a greater distance toward the front and the band 25 attached to it is pulled. When the position of the shaft 32 is changed owing to the depression of the key 38, the edge 31 forms the fulcrum of the levers, it being located in a position higher than that previously occupied by the edge 30 opposite the levers. In this position the edge 31 is opposite a recess 42 in the lever 23, while the lever 24 has no recess at this place. Consequently, when a key is depressed the lever 23 now remains inoperative, but the lever 24 is rocked about the edge 31 and pulls with it the band 25 connected to it. When the key 38 is released the shaft 32 is returned into its normal position by gravity or by a spring attached in suitable manner to it or to the rack 35. The key 38 simultaneously constitutes the shift key of the typewriter, by means of which capital letters and certain characters are written.

The perforating device comprises sixteen punches 56 located one beside another, which number may of course be increased or diminished as desired, the punches being longitudinally displaceably mounted in a guide 57 (Fig. 2). In front of the one end of this guide is the matrix 58 having a number of holes 59 corresponding to the punches. Between the guide 57 and the matrix 58 is a

small gap through which the band 60 to be perforated is drawn. The grooves of the guide 57 in which the punches 56 slide are covered over by covers 61 and 62. Between the two covers is a gap in which lugs 63 of the punches move. These lugs are for returning the punches after use into their normal position. Each punch is provided at one end with a round, spherical or cylindrical head 64 engaged by an angle lever 65, 66. The arm 66 of this lever is under the influence of a spring 67 which tends to rock it so that the arm 65 is located in the path of a bar 68. This is prevented in the normal position of the apparatus by a projection 69 on a bar 54. These bars 54 are mounted with two knife-edge like pivot pins or fulcrums 72 in recesses in bearings 73 and are rotatable about the lower edges of the fulcrums 72. The covers 74 prevent the fulcrums 72 being lifted out of the bearings 73. The bars 54 are under the influence of springs 76 having one end attached to lugs 78 on the bars. The other ends of these springs are attached to a cross-bar 79 attached in suitable manner to the frame of the machine.

The apparatus as described above operates as follows:—When a key 12 is depressed and the type-bar 3 is thrown against the platen, the lug 18 drives the corresponding rod 19 rearwardly, the two levers 23 and 24 connected with the rod being driven. One of these levers rocks about its lower end, *i. e.*, about the point of support against the bar 28^a, while the other lever rocks about the edge 30 of the change-over shaft 32 or, in event of the shift-key having been operated, the other lever rocks about the edge 31 of the same shaft. That lever which rocks about the lower point of support of the bar 28^a exercises no action on the selection of punches or on other parts of the apparatus. The other lever rocking about one of the edges of the shaft 32 causes one of the combination bands 25 to be pulled forward. The teeth 53 of this band act on cross-bars 54 which are thereby rocked about the lower edges of the fulcrum 72. Each projection 69 of the cross-bars in question is shifted so much that it releases the arms 66 of the angle levers 65, 66 in operative relation therewith. These angle levers are rocked so far that the free ends of the arms 65 arrive in front of the bar 68. This bar forms a part of a striking frame which whenever a key is struck is moved forward and backward by means of cams, whereby the selected levers 65, 66 together with the punches 56 pivotally connected to them are driven forward and perforate the paper band 60. The mechanism for driving the cams is described in detail in my American Patents No. 988984 dated the 11th day of April, 1911 and No. 1001825 dated the 29th day of August, 1911 and therefore need not be described here.

In the above described arrangement for selecting the punches the rod 19 which brings about the selection can be driven by the momentum of the type-bar associated therewith when the key in question receives a short, but sufficiently powerful blow. This is of material importance for the production of a correct perforated symbol which corresponds to the struck key. In perforating devices known heretofore which were connected with a typewriter, the unintentional partial depression of a key could produce an incorrect perforated symbol because there was so much lost motion between the key and the type-bar, on the one hand, and the key and the member for selecting the punch, on the other hand, that the type-bar and the member for selecting the punch could operate independently one of the other when a key was depressed only a little. This is impossible in my arrangement because the member for selecting the punch cannot be driven otherwise than by the type-bar and is driven thereby only during the last part of its movement. In consequence of the latter circumstance, when a key is insufficiently depressed and the type-bar is not moved sufficiently neither a perforated symbol is produced nor is a type printed. On the other hand, it is not necessary to depress each key specially carefully into its lowest position because the swing or impetus of the rapidly moved type-bar suffices for both printing the type and also for driving the punch-selecting member 19. Accordingly, it is not so much the extent of the movement of the key as the energy of the stroke which is important for the correct action of the latter. In this way, one of the most important conditions for rapid, but nevertheless certain and correct working of the machine is fulfilled.

I claim:—

1. In means for making operating bands for operating automatic type-setting machines or automatic matrix-setting and line-casting machines, the combination with a typewriter comprising a plurality of type-bars adapted to be brought into a printing position, of a plurality of punches, punch-selecting means for selecting one or more of said punches, means operatively connected to said punch-selecting means and adapted to be actuated by one of said type-bars when coming into printing position and means for actuating said punches when selected by said punch-selecting means.

2. In means for making operating bands for operating automatic type-setting machines or automatic matrix-setting and line-casting machines, the combination of a plurality of type-bars, each adapted to be thrown into printing position, a plurality of

pushing rods each adapted to be driven by one of said type-bars when coming into its printing position, punch-selecting means adapted to be actuated by said rods, a plurality of punch-driving members adapted to be selected by said punch-selecting means, and punch-operating means adapted to actuate said punch-driving members when selected by said selecting means.

3. In means for making register bands of the character described, the combination with a plurality of key-levers, a plurality of type-bars operatively connected therewith, a plurality of driving members each adapted to be driven by one of said type-bars when moving into its printing position, and punch-selecting means comprising a plurality of selecting members, of a plurality of groups of intermediate members, each of said groups being connected to one of said driving members and each of said intermediate members being adapted to actuate one of said selecting members, and means for rendering said intermediate members alternately operative and inoperative.

4. In means for making the operating bands of automatic composing machines, the combination of a plurality of key-levers, a plurality of type-bars, means operatively connecting said type-bars and said key-levers, a plurality of groups of intermediate members, a plurality of driving members each adapted to be driven by one of said type-bars and to actuate one of said groups of intermediate members, a plurality of punches, a plurality of punch-driving members each connected to one of said punches and adapted to actuate the same, punch-driving means adapted to drive said punch-driving members, a plurality of selecting members each adapted to be actuated by one of said intermediate members and to bring one or more of said punch-driving members into operative relation with said punch-driving means, and means for rendering the members of said groups of intermediate members alternately operative and inoperative.

5. In means for making register bands of the character described, the combination with a plurality of key-levers, a plurality of type-bars operatively connected therewith, a plurality of driving members each adapted to be driven by one of said type-bars when moving into its printing position, and punch-selecting means comprising a plurality of selecting members, of a plurality of groups of intermediate members, each of said groups being connected to one of said driving members and each of said intermediate members being adapted to actuate one of said selecting members, a shift key, and means controlled by the shift key for rendering said intermediate members alternately operative and inoperative.

6. In means for making the operating bands of automatic composing machines, the combination of a plurality of key-levers, a plurality of type-bars, means operatively connecting said type-bars and said key-levers, a plurality of groups of intermediate members, a plurality of driving members each adapted to be driven by one of said type-bars and to actuate one of said groups of intermediate members, a plurality of punches, a plurality of punch-driving members each connected to one of said punches and adapted to actuate the same, punch-driving means adapted to drive said punch-driving members, a plurality of selecting members each adapted to be actuated by one of said intermediate members and to bring one or more of said punch-driving members into operative relation with said punch-driving means, and means for rendering the members of said groups of intermediate members alternately operative and inoperative, the latter means comprising a shaft adapted to roll along said intermediate members and to constitute the fulcrum of the members of all said groups of intermediate members in turn.

7. In means for making register bands of the character described, the combination with a plurality of key-levers, a plurality of type-bars operatively connected therewith, a plurality of driving members each adapted to be driven by one of said type-bars when moving into its printing position, and punch-selecting means comprising a plurality of selecting members, of a plurality of groups of substantially vertical intermediate members each having a recess, the intermediate members in each group having one end connected to one of said driving members and each intermediate member being operatively connected at the other end to one of said selecting members, the recesses in the intermediate members of one group being located at various elevations, a vertically movable, horizontally non-displaceable shaft having fulcrum edges equal in number to the number of intermediate members in a group and so arranged that when one edge acts as the fulcrum of an intermediate member in one group, the same edge is opposite a recess in each of the remaining intermediate members in the same group, and means for vertically shifting said shaft.

8. In means for making the operating bands of automatic composing machines, the combination of a plurality of key-levers, a plurality of type-bars, means operatively connecting said type-bars and said key-levers, a plurality of groups of intermediate members, a plurality of driving members each adapted to be driven by one of said type-bars and to actuate one of said groups of intermediate members, a plurality of

punches, a plurality of punch-driving members each connected to one of said punches and adapted to actuate the same, punch-driving means adapted to drive said punch-driving members, a plurality of selecting members each adapted to be actuated by one of said intermediate members and to bring one or more of said punch-driving members into operative relation with said punch-driving means, and means for rendering the members of said groups of intermediate members alternately operative and inoperative, the latter means comprising a shaft adapted to roll along said intermediate members and to constitute the fulcrum of the members of all said groups of intermediate members in turn, a gear fast on said shaft, a shift key, and a toothed rack operatively connected with the shift key and meshing with said gear.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HEINRICH DREWELL

Witnesses:
WOLDEMAR HAUPT,
HENRY HASPER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."