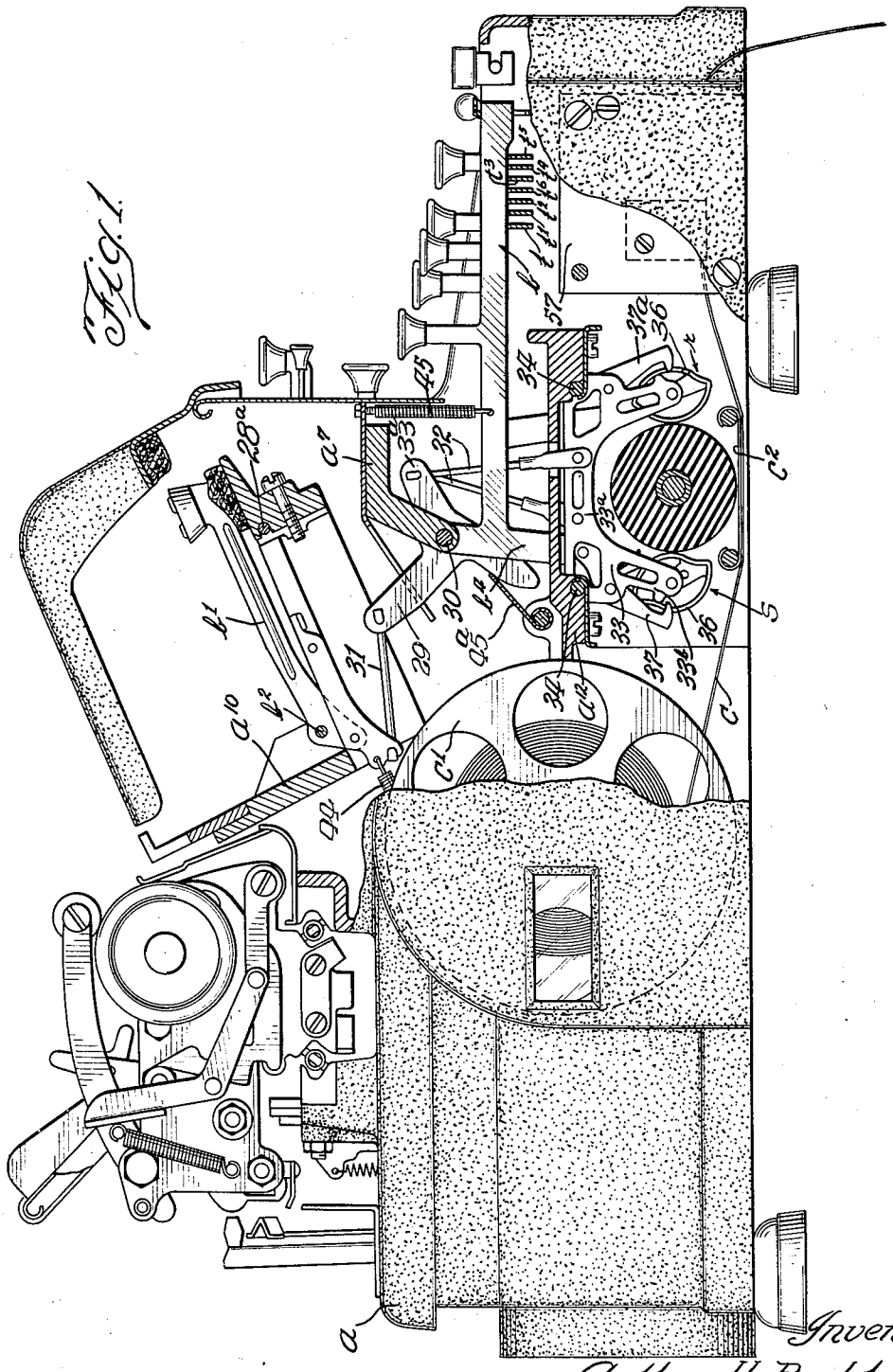
June 23, 1942. A. H. BUCKLEY 2,287,291

KEYBOARD TAPE-PERFORATOR

Filed April 6, 1939 3 Sheets-Sheet 1

Fig. 1.



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KEYBOARD TAPE-PERFORATOR

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Fig. 2.

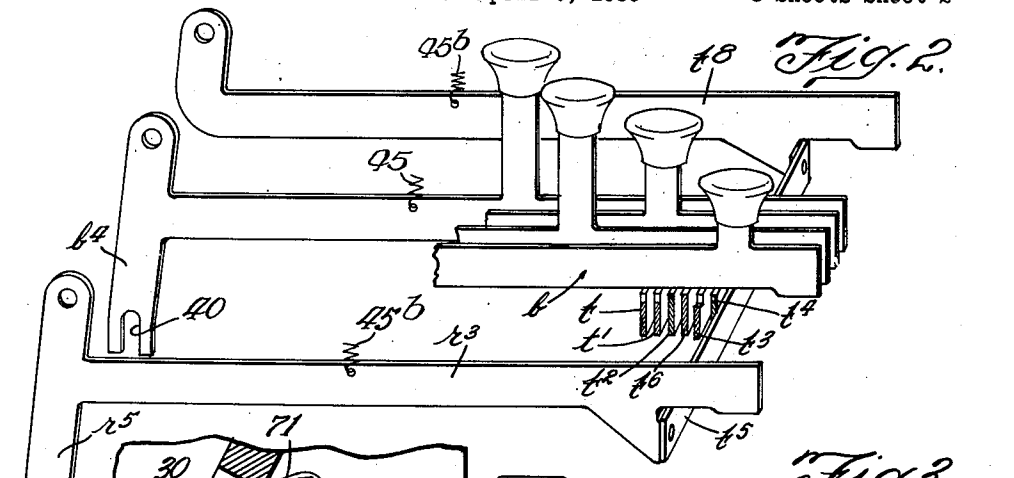


Fig. 3.

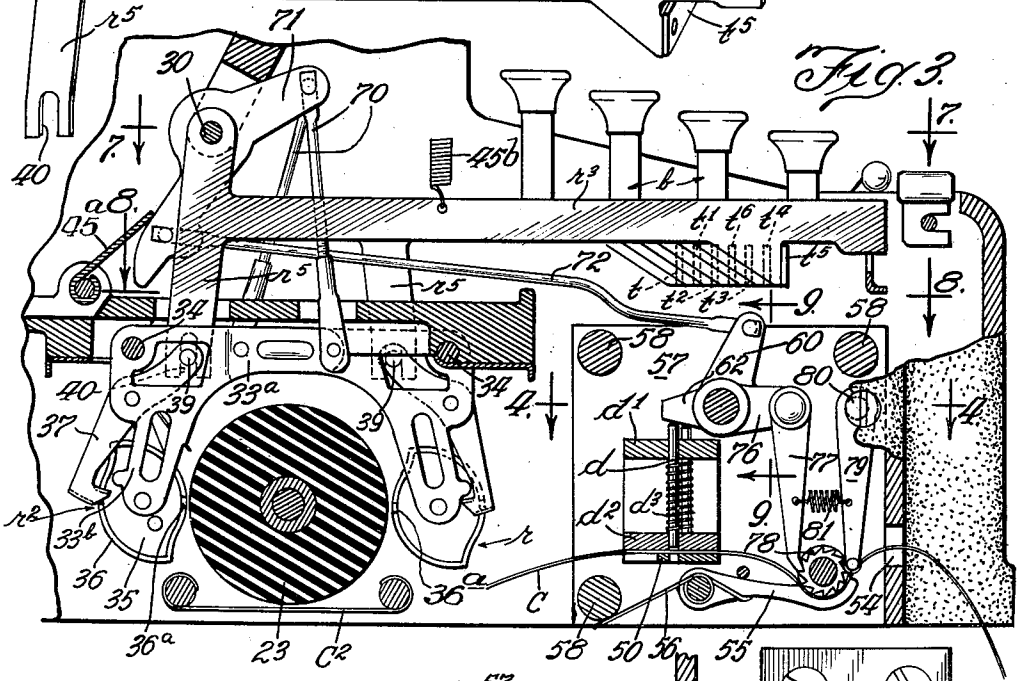


Fig. 4.

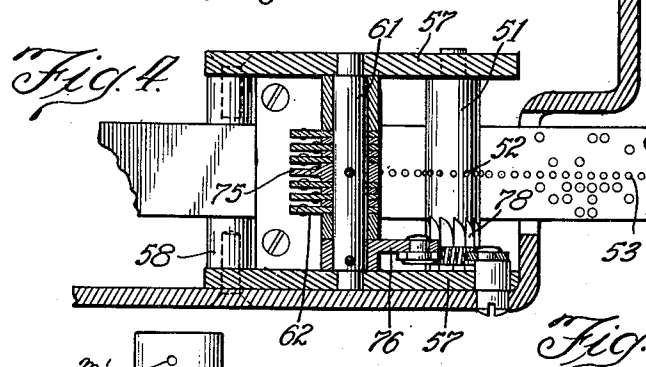


Fig. 5.

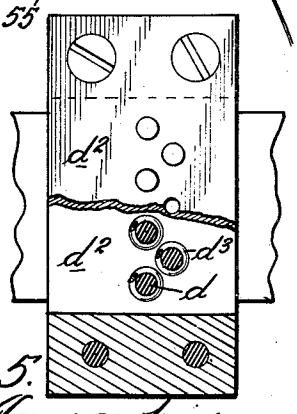
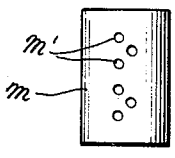


Fig. 6.



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Fig. 7.

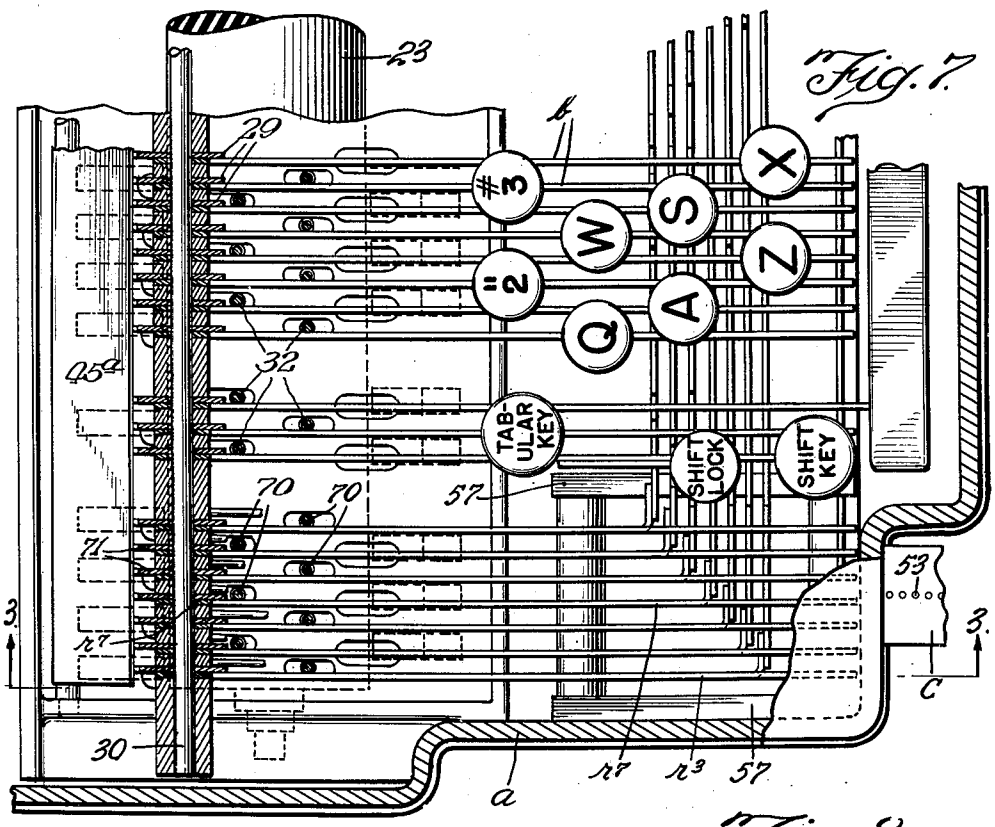
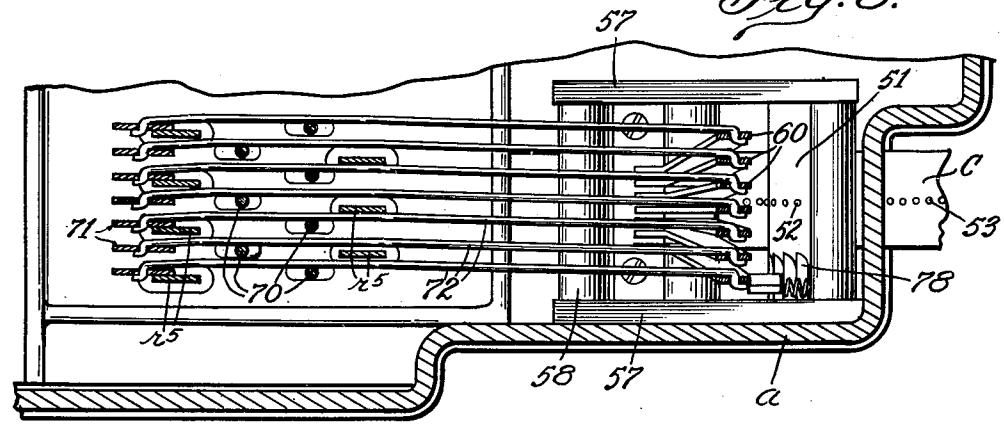


Fig. 8.



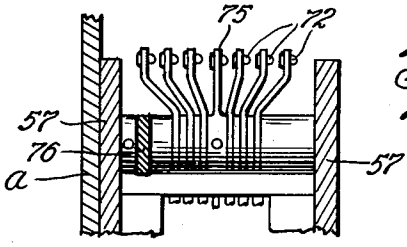


Fig. 9.

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Patented June 23, 1942 2,287,291

UNITED STATES PATENT OFFICE

2,287,291

KEYBOARD TAPE PERFORATOR

Arthur H. Buckley, Chicago, Ill.

Application April 6, 1939, Serial No. 266,260

10 Claims. (Cl. 164—112)

The invention relates to key-board mechanism for perforating tape for use in motorized typewriters.

Heretofore, perforating mechanism for tape has been associated with a typewriter so that when a key was depressed a type-bar was operated for printing and electrical mechanism was controlled by the key to operate perforating mechanism corresponding to a code symbol for the type printed. In practice, it has been found that the key-controlled electrically operated tape perforating mechanism was not reliable or satisfactory.

One object of the invention is to provide an improved combined typewriter and tape perforating mechanism in which the key-controlled perforating mechanism is mechanically operated by the same source of power which is used to operate the motorized typewriter.

A still further object of the invention is to provide improved tape perforating mechanism in which the punches are selectively operable by power devices similar to those used for operating the type-bars and from the power-driven roll used for imparting strokes to the type-bars.

A still further object of the invention is to provide improved tape-feeding mechanism in which the punches are arranged in staggered relation so that the spring-retracted plungers can be associated together in close relation so that a relatively narrow tape can be used.

Other objects of the invention will appear from the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings: Fig. 1 is a side elevation, parts being shown in section, of a machine embodying the invention. Fig. 2 is a diagrammatic perspective illustrating some of the typewriter keys and one of the levers for controlling one of the devices for operating one of the punches. Fig. 3 is a vertical section taken on line 3—3 of Fig. 7. Fig. 4 is a horizontal section taken on line 4—4 of Fig. 3. Fig. 5 is a plan, parts being shown in section, of the punch-devices and guide-plates therefor. Fig. 6 is a plan of a tracker-bar for which the perforated tape is adapted. Fig. 7 is a horizontal section taken on line 7—7 of Fig. 3. Fig. 8 is a horizontal section taken on line 8—8 of Fig. 3. Fig. 9 is a vertical section taken on line 9—9 of Fig. 3.

The invention is exemplified as applied to a motorized typewriting machine which comprises a frame a; a key-board comprising a full set of key-levers b for the usual number of type-bars and associated actions such as the space-bar, shift-lock, tabulator, back-spacer, case-shift, and carriage-return; type-bars b^1 controlled by certain of the key-levers b; a driving roll 23 which is continuously driven by a motor, as well understood in the art, and a set of shifting devices s, each adapted to be engaged with and automatically uncoupled from roll 23 to shift, by power, a connection for operating one of the type-bars b or the associated actions. Devices s are alternately arranged at the front and in the rear of the roll 23 for compactness. These devices s are alike in construction and may be of any suitable construction, such as used for operating the type-bars from a driving roll in motorized typewriters. The construction illustrated is described in detail in an application filed by me February 23, 1939, Serial No. 257,775, to which reference may be had for the details thereof. Roll 23 extends laterally across the machine to drive the entire set of devices s, is suitably journaled in the frame a and continuously driven by an electric motor, as well understood in the art.

Key-levers b are fulcrumed on a rod 30 which is supported in a member a^7 of the frame of the machine. Each key-lever b is held normally raised by a spring 45 and is provided with a leg b^4 (Fig. 1) having a slot 40 for a stud 39 on the upper end of the controller-dog 37 for one of the shifting devices s. Depression of the key-levers controls, through the dogs 37, the individual operation of the devices s.

All of the type-bars b^1 are fulcrumed on a rod b^2 which is supported in a shiftable frame a^{10} for upper and lower case printing, as well understood in the art. Each type-bar is operable by an angular lever 33 of one of the shifting devices s by a connection comprising a toggle-lever 28, the front member of which is pivoted at 28^a in frame a^{10} and to the type-bar, a link 31 pivoted to the rear member of toggle 28, a bellcrank lever 29, which is fulcrumed on rod 30 concentrically with key-levers b and has one of its arms connected to link 31, and a link 32 between an arm of lever 29 and the arm 33^a of a lever 33. A spring 44 is applied to each toggle 28 for retracting the type-bar connected thereto. A spring 45^a is applied to all levers b for retracting said levers, links 32 and the levers 33.

Bellcrank levers 33 of devices s are fulcrumed on rod 34 which is supported in a frame-member a^{12}. Each lever 33, when swung on its fulcrum 34, is adapted to shift a type-bar or one of its

associated sections through its horizontally extending arm 33ª which is connected to link 32. Each lever 33 comprises a vertically extending arm 33ᵇ which carries, at its lower end, a rotatable element 35 which is provided with cam-faces 36 for rocking lever 33 on its fulcrum to shift arm 33ª. Cam-faces 36 are normally disengaged from roll 23. Upon a slight initial rotation of element 33 on its own axis in arm 33ᵇ, one of its cam-faces 36 will engage roll 23 so the element will be rotated a cycle of one-half revolution to rock lever 33 and shift its arm 33ª for the operation by power of the type-bar or device connected to said lever and at the end of said cycle to disengage the element 35 from the roll. A lever or dog 37 pivoted in lever 33 engages stop-lugs 36ª at the end of each cycle to arrest against further rotation and automatically stop the element 35 at the end of each cycle. These devices *s* exemplify power-operable devices engageable with the drive-roll 23 for imparting strokes to the type-bars and associated actions which are manually controlled by the key-levers *b*. The details of these devices *s* may be of usual construction used for the same purpose as exemplified in my aforesaid application Serial No. 257,775. When a key-lever is depressed by the operator, the rotatable element 35 will be brought into contact with the continuously rotating roll 23 to impart a predetermined power-stroke to one of the levers 29 and automatically stopped at the end of each stroke.

The improved tape perforating mechanism is disposed within and at one side of the frame *a*. The tape *c* to be perforated is wound on a reel c^1 which is supported adjacent one side of the typewriter-frame. From the reel the tape passes under a guide c^2 and over the punch-block 50 of the punching-mechanism. From block 50 the tape passes under a feed-roll 51 which is provided with sprocket-teeth 52 engaging a central row of perforations 53 in the tape to feed the tape over the punch-block. From the feed-rolls 51 the tape passes through an opening 54 to a suitable take-up spool (not shown). A presser-bar 55 with an arcuate face, engaged by a spring 56, presses the portion of the tape against the lower portion of roll 51. A series of punches *d* are mounted to slide vertically in upper and lower plates d^1 and d^2 and are each held normally raised by a coil-spring d^3. The punch-block 50 is provided with openings for the punches. Plates d^1, d^2 are fixedly secured in a frame which comprises a pair of sides 57 and three cross-posts 58 rigidly secured together. One of the plates 57 is fixedly secured to the inner side of the frame *a* to support the punching-mechanism. Each punch is operated by a bellcrank-lever 60 which is fulcrumed on a shaft 61 which is journaled in side plates 67. Levers 60 are held against endwise movement on shaft 61 by suitable spacers. Each lever 60 comprises an arm 62 which is adapted to engage the upper end of one of the punches *d* to cause the lower end of the punch to cut a perforation in the tape and force the punching through block 50.

A series of power-operable devices *r* is provided for operating the punch-operating levers 60 respectively to punch the tape in code corresponding to the type-bar or action operated responsively to one of the keys *b*. Each of these devices *r* is similar in construction to the devices *s* for imparting power-strokes to the type-bars and, therefore, the detailed description of the devices *s* is applicable to the devices *r*. It will be understood that each device *r* includes a lever 33ª, rotatable element 35 with cam-surfaces 36, and a dog 37, which are like the corresponding parts of devices *s*. The punch-mechanism is provided with a set of six punches and a device *r* is provided for operating the punches so that the punches may be operated selectively and singly or permutably by power from roll 23. Driven roll 23 is extended laterally to provide power for the operation of the rotatable element 35 of the devices *r* so that this roll serves to provide power for simultaneously and synchronously operating one of the key-controlled devices *s* and one or more of the devices *r* for operating the punches. Three of the devices *r* are disposed at the rear of said roll. The operating connection between each of the levers 33 of the devices *r* and the punch-lever 60 comprises (Fig. 3) a link 70, pivoted to the outer end of lever 33 of one of the devices *r*, a double-armed lever 71 fulcrumed on rod 30 and to which the upper end of link 70 is connected, and a link 72 pivotally connected to the lower arm of lever 71 and to the upper end of one of the punch-operating levers 60. When one of the rotatable cam-members 35 of devices *r* is rotated a half revolution, it will swing its lever 33 to rock arm 33ª of said lever downwardly so it will shift link 70 and rock lever 71 to operate the link 72 and impart a power-stroke to one of the levers 60 and one of the punches *d*. Spring 45ª is applied to all of the levers 71 to retract said levers, links 32 and the levers 33 to which they are connected, at the end of each operative cycle of member 35.

The punches are adapted to perforate the tape in code to correspond to the key *b* which is operated and the type-bar or other actions controlled thereby. By single or different permutations of the perforations across the tape during each automatic operation, the successive perforations on the tape will be in a code for controlling the automatic operation of all of the actions of an automatic motorized typewriter, such as is exemplified in my aforesaid application Serial No. 257,775.

The punches *d* are relatively staggered, as illustrated in Fig. 5, so that the punches may simultaneously perforate the tape on two transverse lines. This makes it possible to utilize a narrow tape for a code including a series of six perforations because, if the punches were placed in line, they would have to be spaced apart sufficiently to leave stock between the perforations of a line and to permit the application of retraction springs d^3 to the punches. The punched tape is adapted for use over a tracker-bar *m* in which the air inlet ducts m^1 are in staggered relation correspondingly to the arrangement of the punches *d* so that a staggered series of perforations will simultaneously control the ducts m^1 to the pneumatic actions for controlling the operation of the motorized typewriter.

A shifting device r^2, similar in construction to the devices *r*, is provided for operating a link 70, lever 71 and link 72 to operate a lever 75 for operating the tape-feed mechanism. Lever 75 is disposed centrally of the punch-operating levers 60 and is keyed to shaft 61 so that upon each operation of any of the entire set of keys *b* of the typewriter, devices *r* will be operated to operate arm 75 and advance the tape a distance equal to the spacing between successive zones for successive perforations. An arm 76 is fixed to one end of shaft 61, is adapted to reciprocate a pawl 77

which is pivotally connected to the outer end of said arm, and has its lower end adapted to engage ratchet teeth 78 formed on the tape-feed roll 51. A detent 79 pivoted at 80 and pawl 76 are frictionally held in engagement with the ratchet by a spring 81 between said dog and pawl.

The mechanism for controlling, by the keys *b*, the operation of the shifting-devices *r* for operating the punches *d* and the tape-feed lever 75, comprises a set of six controller-bars *t*, t^1, t^2, t^3, t^4, t^5, each extending transversely under and each adapted to be depressed upon depression of the key-levers *b*. These bars are provided with notches differently arranged for the single or permutative shift or depression by the key-levers *b* to control the operation of the punches *d* to produce the perforation in code, responsively to each of the key-levers. The bars *t*, t^1, t^2, t^3, t^4, t^5 are respectively secured to levers r^3 which are fulcrumed on rod 30 and are each provided with a leg r^5 having a slotted lower end for the stud 39 on the dog 37 of one of the shifting devices *r*, so that when one of said levers is operated it will release one of the rotary elements 35^a of one of the shifting devices *r* to engage said element with roll 23. The right-hand end of each of the bars *t*, t^1, t^2, t^3, t^4, t^5 is supported by a member t^8 which is parallel to levers r^3 and fulcrumed on rod 30. The mechanism for controlling the operation of the lever 75 for operating the tape-feed mechanism comprises a bar t^6 underlying and operable by all of the keys *b*. This bar t^6 is secured to a lever r^7 which is fulcrumed on the rod 30 and is connected to control the dog 37 of the shifting device r^2 which is engageable with the driving-roll 23.

In operation, when a key *b* is depressed by the operator it will, through its depending arm b^4 control the shifting-device *s* to which it is connected to engage it with driving-roll 23 to operate through the lever 33 of said device and impart a power-stroke to the type-bar or other action controlled by the key. The depression of the key will depress one or more of the controller-bars *t*, t^1, t^2, t^3, t^4, t^5 to perforate the tape in code for the operation of an automatic motorized typewriter, each key being adapted to singly or permutatively control the depression of the controller-bars according to the code perforations for a corresponding operation of the type or other action in the motorized typewriter. Each controller lever that is depressed by a key *b* will operate the lever r^3 to which it is secured, to connect the driving-roll 23 with shifting device *r* controlled through link 70, lever 71, link 72 and punch operating lever 60, the corresponding punch *d*. One or more of the punches will be operated according to the number of controller-bars depressed by the keys, respectively.

The invention exemplifies a key-lever controlled motorized typewriter for printing a sheet in the paper-carriage and simultaneously controlling power-operated shifting-devices for operating the punches to perforate the tape according to the keys depressed. It also exemplifies tape-perforating mechanism which is operable by power from the power-driven roll for operating the motorized typewriter. It also exemplifies a combined typewriter and tape-perforator in which similar shifting devices are utilized to impart the power strokes to the type-bars and actions of the typewriting machine and to the punches for perforating the tape and simultaneously printing a sheet and perforating the tape for reproducing the operations on a motorized typewriter.

While the invention is illustrated for perforating a flexible tape, the flexible tape illustrated and described exemplifies a perforated record. It will be understood that the record may consist of a card strip as well as a flexible tape.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination of a set of punches for perforating a tape, a set of keys, a power-driven continuously rotatable roll having a friction driving face, shifting devices individually operable by the friction face of said roll for operatively imparting strokes to the punches, comprising levers for engaging the punches, means selectively controlled by the keys for engaging said devices and said roll for operating the punches singly or permutably by the power from the roll, tape-feeding mechanism, and a device engageable with said roll for operating said mechanism by power directly from the roll and means for rendering said device for operating the tape-feed mechanism operative by the set of keys, and comprising a lever concentrically movable with the punch-engaging levers.

2. The combination of a set of punches for perforating a record, a set of keys, a power-driven continuously-rotatable roll, shifting devices each comprising an element engageable with said roll, connections for imparting operative strokes to the punches from said elements, and means singly and permutably controlled by the keys for engaging, permutably and singly, the shifting-devices with the roll to operate the punches, comprising levers concentrically pivoted with the keys.

3. The combination of a set of punches for perforating a record, a set of keys, a power-driven continuously-rotatable roll, shifting devices each comprising an element engageable with said roll, connections for operating the punches from said elements, bars singly and permutably controlled by the keys for engaging the shifting-devices with the roll to operate the punches, and arms to which the bars are secured, concentrically pivoted with the keys.

4. The combination of a set of punches for perforating a record, a set of keys, a power-driven continuously-rotatable roll, shifting-devices engageable with said roll, for operating the punches, respectively, means permutably and singly controlled by the keys, for selectively engaging the devices with said roll to operate the punches, said punches being disposed forwardly of the roll and below and closely adjacent to the front ends of the keys.

5. In a combined motorized typewriter and perforating machine, the combination of a set of keys and type-bars, a series of punches for perforating a tape, a power-operated continuously driven roll having a friction driving face, rotatable elements individually controlled by the keys for engaging the face of said roll, connections between said elements and the type bars for imparting strokes to the type-bars by power directly from the roll, code-bars permutably shiftable by the keys, similar elements individually controlled by the code-bars for engaging the roll, and connections between the elements which are controlled by the code-bars and the punches for

imparting operative strokes to the punches by power directly from the roll.

6. In a combined motorized typewriter and perforating machine, the combination of a set of keys and type-bars, a series of punches for perforating a tape, a power-operated continuously driven roll having a friction driving face, rotatable elements individually controlled by the keys for engaging the face of said roll, connections between said elements and the type-bars for imparting strokes to the type-bars by power directly from the roll, code-bars permutably shiftable by the keys, similar elements controlled by the code-bars for engaging the roll, and connections comprising pivotally connected levers and links between the elements which are controlled by the code-bars and the punches for imparting operative strokes to the punches by power directly from the roll.

7. In a combined motorized typewriter and perforating machine, the combination of a set of keys and type-bars, a series of punches for perforating a tape, a power-operated continuously driven roll having a friction driving face, rotatable elements individually controlled by the keys for engaging the face of said roll, connections between said devices and the type-bars for imparting strokes to the type-bars by power directly from the roll, code-bars permutably shiftable by the keys, similar elements individually controlled by the code-bars for engaging the face of said roll, connections between the elements controlled by the code-bars and the punches for imparting operative strokes to the punches by power directly from the roll, tape-feed mechanism, a bar associated with the code-bars and shiftable by the set of keys, a similar element controlled by said bar, engageable with the roll, and a connection between said last named element and the tape-feed mechanism for operating said mechanism by power directly from the roll.

8. In a perforating machine, the combination of a set of keys and a series of punches for perforating a tape, a power-operated continuously driven roll having a friction driving face, code-bars permutably shiftable by the keys, rotatable elements individually controlled by the code-bars for engaging the face of the roll, and individual connections between said elements and the punches for imparting operative strokes to the punches by power directly from the roll.

9. In a perforating machine, the combination of a set of keys and a series of punches for perforating a tape, a power-operated continuously driven roll having a friction driving face, code-bars permutably shiftable by the keys, rotatable elements individually controlled by the code-bars for engaging the face of said roll, and individual connections consisting of pivotally connected links and levers between said elements and the punches for imparting operative strokes to the punches by power directly from the roll.

10. In a perforating machine, the combination of a set of keys, a series of punches for perforating a tape, a power-operated continuously driven roll having a friction driving face, code-bars permutably shiftable by the keys, rotatable elements individually controlled by the code-bars for engaging the face of said roll, individual connections between said elements and the punches for imparting operative strokes to the punches by power directly from the roll, a bar shiftable by the set of keys, a similar element controlled by said last named bar, tape-feeding mechanism, and a connection between the last named element and said mechanism for operating said mechanism by power directly from the roll.

ARTHUR H. BUCKLEY.