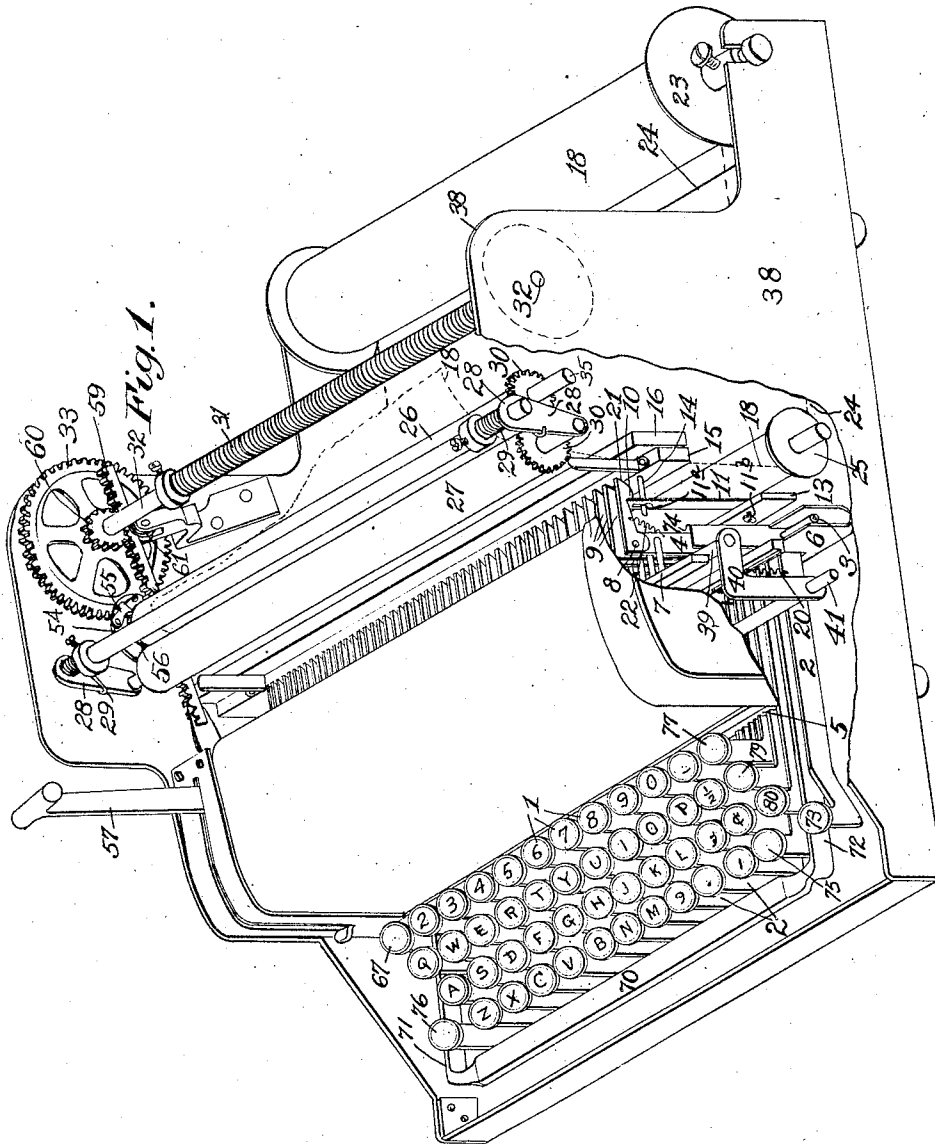


L. R. ROBERTS & C. L. DAVIS.
MACHINE FOR PERFORATING MASTER SHEETS FOR TYPE WRITER OPERATORS.
APPLICATION FILED JAN. 26, 1909.

953,180.

Patented Mar. 29, 1910.

4 SHEETS—SHEET 1.



Witnesses:

P. H. Pittman
John C. Seifert

Inventors:

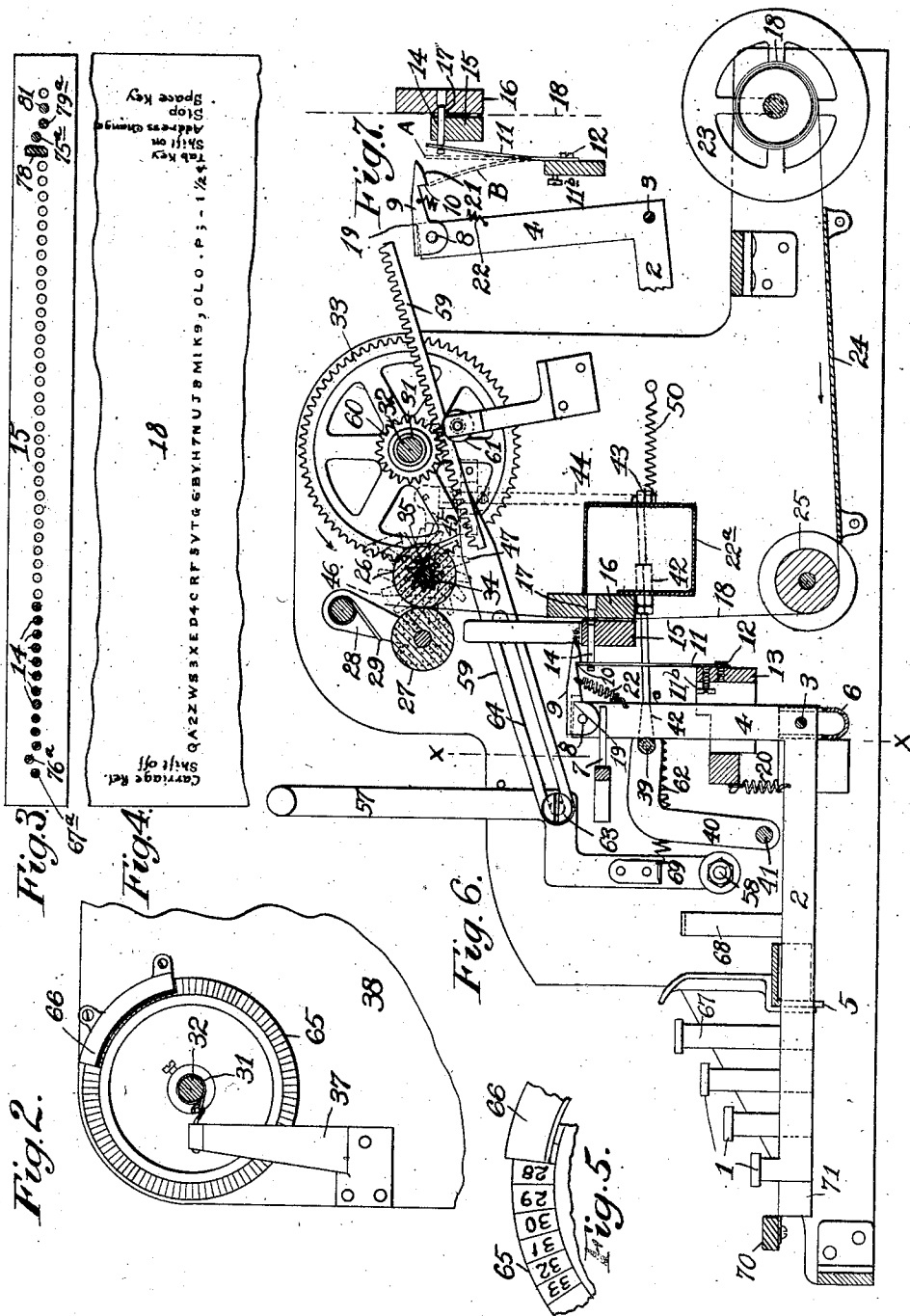
Lymon R. Roberts and Charles L. Davis,
By their Attorney,
C. C. Thompson

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4 SHEETS—SHEET 2.



Witnesses:
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4 SHEETS—SHEET 3.

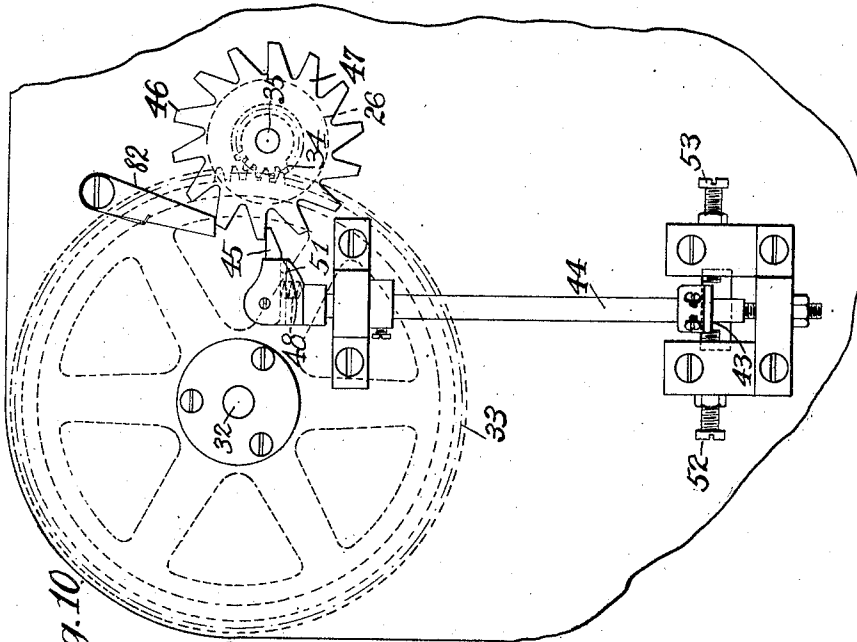


Fig. 10.

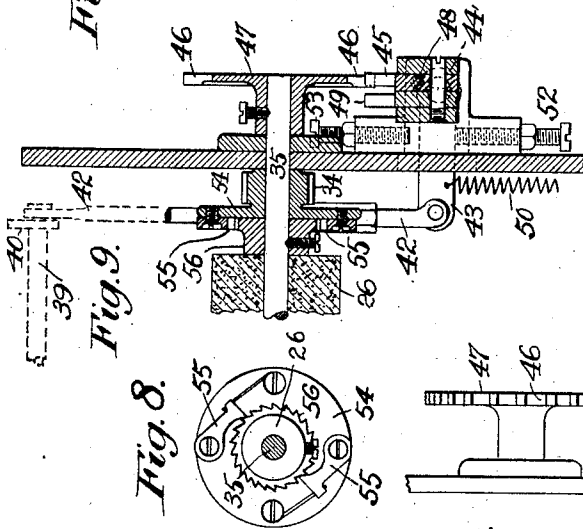


Fig. 9.

Fig. 8.

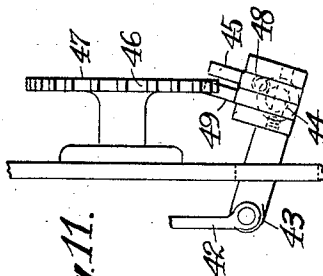
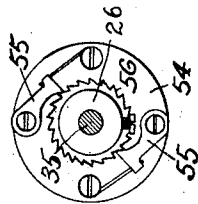
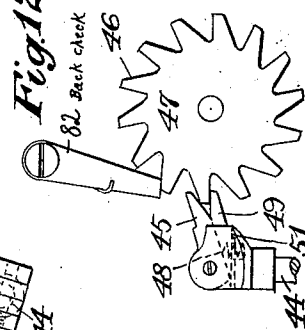


Fig. 11.

Fig. 12.



Witnesses;
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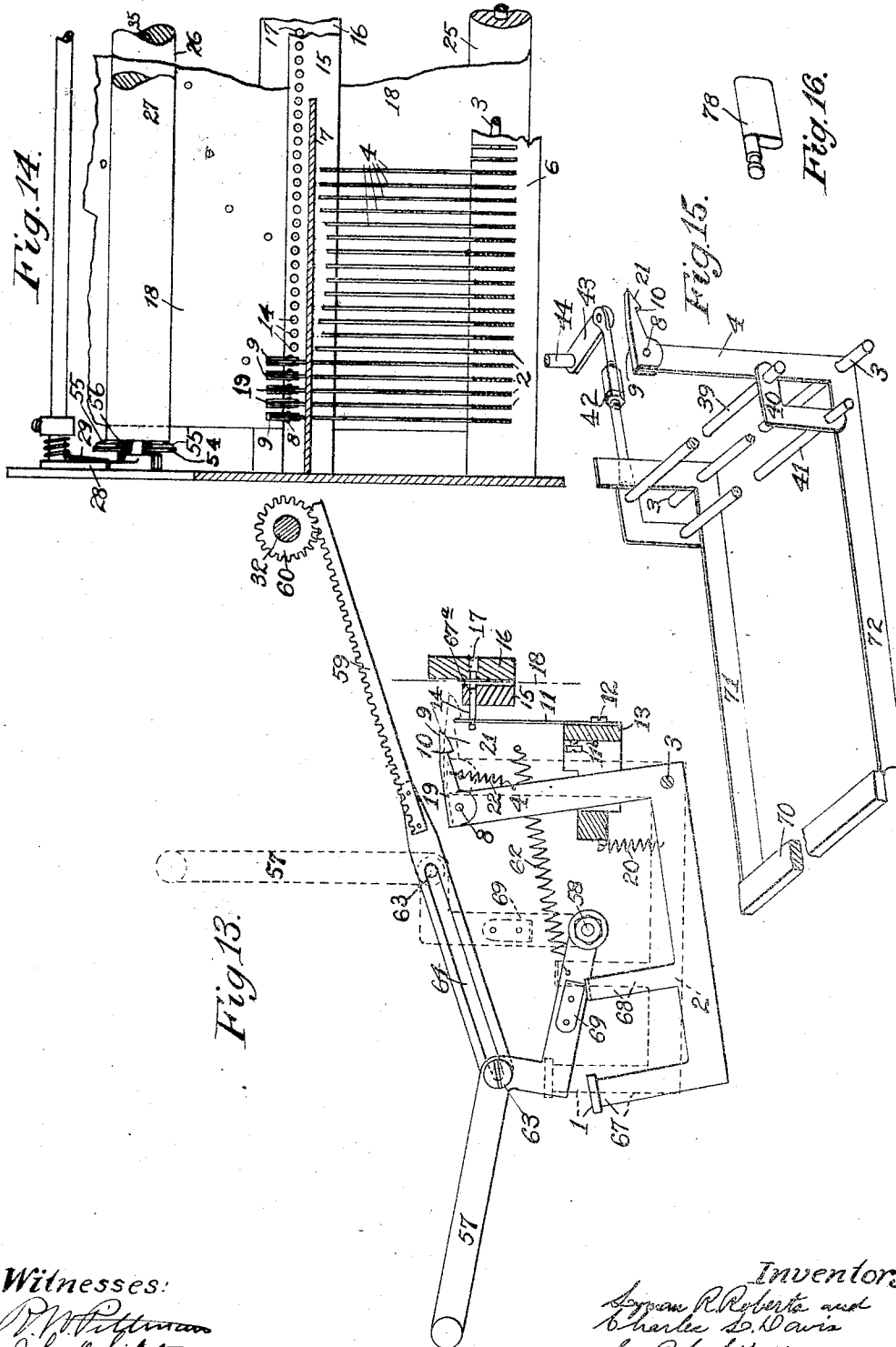
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4 SHEETS—SHEET 4.

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Witnesses:

W. H. Pittman
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UNITED STATES PATENT OFFICE.

LYMAN R. ROBERTS AND CHARLES L. DAVIS, OF DETROIT, MICHIGAN, ASSIGNORS TO UNDERWOOD TYPEWRITER COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

MACHINE FOR PERFORATING MASTER-SHEETS FOR TYPE-WRITER OPERATORS.

953,180.

Specification of Letters Patent.

Patented Mar. 29, 1910.

Application filed January 26, 1909. Serial No. 474,279.

To all whom it may concern:

Be it known that we, LYMAN R. ROBERTS and CHARLES L. DAVIS, both citizens of the United States of America, and both residing in Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Machines for Perforating Master-Sheets for Type-Writer Operators, &c., of which the following is a specification.

This invention relates to key-operating machines for perforating the master sheets, by the agency of which other machines, especially typewriting machines, are operated.

One of the main objects of the invention is to produce a simple, inexpensive, easily operated and effective machine for perforating master sheets, particularly those which are to be used in typewriter operators.

The web of paper is fed past a row of punches, which are operated by keys corresponding generally to the keyboard of a typewriting machine; the keyboard being preferably a counterpart of that on which the machine is to be operated through the agency of the perforated web.

One of the objects of the invention is to render the keys easy to operate, so that the tough web may be rapidly perforated without tiring the operator, and without undue liability of false key strokes being made, that is, strokes which depress the keys without perforating the web. In the preferred form of the invention, the keys are caused to first tension the punch-operating springs, and then release the springs, the recoil of which drives or snaps the punches through the paper.

Another object of the invention is to render it convenient for the user to read the perforations as the work progresses; and to this end, the web is advanced automatically after each punching operation, so as to bring the perforation into full view of the operator, and any suitable means are provided for enabling the user to read every perforation. In the present instance, the web is marked repeatedly with scales at short intervals for this purpose.

Another object of the invention is to minimize the labor thrown upon the keys of

effecting the step-by-step feed of the web as the perforations are made; and to this end, the web is fed by means of a spring, and the keys merely actuate an escapement mechanism which permits the spring to feed the web at each key stroke. Provision is made for rewinding the spring from time to time as the web progresses. Preferably a scale is provided to correspond with the usual letter-spacing scale of the typewriting machine, by consulting which the operator is enabled to determine the point at which he has made enough perforations in the web to complete the writing of a line on the typewriter. By pulling the handle he may then rewind the spring (without affecting the web) and simultaneously make a carriage return perforation in the web, that is, a perforation which causes the carriage of the typewriter to return to begin a new line.

The set of key-operated punches preferably includes separate punches for setting and restoring the case-shift mechanism of the typewriting machine; also a punch for causing the active web of the typewriter operating machine to become idle and the inactive web to become active where such operating machine is designed for the use of two webs.

One of the punches has a dimension as great as the extent of the normal longitudinal feed of the web, so that by operating this punch repeatedly, an elongated or continuous slot may be made in the web, controlling the length of time during which the tabulator key of the typewriting machine shall be held depressed. In addition to keys for the aforesaid purposes, there is provided a key to feed the web without perforating the same, which is useful for various purposes.

Other objects and advantages will hereinafter appear.

In the accompanying drawings, Figure 1 is a perspective view partly broken away of a perforating machine embodying the present improvements. Fig. 2 is a sectional elevation to show an annular revolving scale to indicate the progress of the perforating web. Fig. 3 is a front elevation of a punch-guide and a series of punches therein, some

of the punches shown in section. Fig. 4 is a fragment of a web showing printed thereon a scale comprising a set of letters and characters and extra keys, the order of the scale being the same as that of the key levers in the perforating machine and corresponding generally to the order of the key levers of the typewriter that is to be operated by the agency of the web. This scale is repeated at short intervals along the web for the convenience of the user. Fig. 5 is a notched fragment of a rotary annular scale and a stationary shield thereon, the end of which serves as an index. Fig. 6 is a sectional elevation from front to rear, omitting certain parts, of the perforating machine, showing the parts in normal positions. Fig. 7 is a view to illustrate the tensioning and release of one of the spring punches. Fig. 8 is a view of a clutch or pawl and ratchet device, which permits the re-tensioning of the web-feeding spring while the web remains motionless. Fig. 9 is a sectional elevation of the escapement mechanism which controls the web-feeding roll, the parts shown in normal positions. Fig. 10 is an elevation of the escapement mechanism, etc. Fig. 11 is a plan corresponding to Fig. 9, but showing the dog rocker swung to permit the advance of the spacing dog, as seen at Fig. 12. Fig. 12 is an elevation of the escapement wheel, back check pawl therefor, and dogs for controlling the same; the dogs being shown in the positions they occupy while a key is depressed. Fig. 13 is an elevation illustrating the movement of the handle which sets back or re-tensions the web-driving spring; and showing the manner in which this handle operates the punch to make a perforation in the web to cause the typewriter carriage to be returned to begin a new line. Fig. 14 is a sectional front elevation to illustrate the manner in which each perforation is brought into the view of the operator upon the return to normal position of the operating key; said view showing certain of the punches, trips, levers, etc., by which perforations are made; the section being taken up about on the line X—X of Fig. 6. Fig. 15 is a perspective view of the key or bar which makes a spacing perforation in the web; showing also the universal bar, and a connection to the actuating arm of the escapement devices. Fig. 16 is a perspective view of a special punch for making short and long slots in the web or master sheet to control the operation of a tabulating key in a typewriting machine.

Depressible keys 1, similar to typewriter keys and arranged in four banks as usual in typewriting machines, are mounted upon the forward ends of arms 2 of a set of elbow levers, which are pivoted upon a horizontal rod 3 and comprise upstanding arms 4;

the arms 2 extending forwardly from the pivots. The key levers are guided in combs 5, 6, 7. To the upper ends of the key levers are pivoted at 8 punch-operating trips 9, which extend rearwardly from their pivots and at their rear ends are hooked at 10 to catch upon the tops of upstanding spring fingers 11, which are attached at their lower ends by screws 12 to a fixed horizontal bar 13 and at their upper ends are attached to horizontal rearwardly extending punches 14 forming a horizontal row extending across the machine. The punches are mounted in perforations in a transverse fixed bar 15; and a fixed die-plate 16 is provided with corresponding perforations 17. Upon depressing any key, the arm 2 swings downwardly and the arm 4 forwardly to the Fig. 7 position; and the trip swings the spring finger (together with the punch) forward from the normal dotted line position A, Fig. 7, to the dotted line position B, and then releases the same. The released spring snaps backwardly to the full-line position, together with the punch, the latter being caused to perforate the web or sheet 18, which extends up vertically between the row of punches and the die or guide plate 16. The point of the tooth or hook 10 of the trip is caused to swing approximately in an arc about the pivot 3 of the trip-bearing lever, the arm 4 thereof having at its top a shoulder 19, which forms a rest for the trip during the described swinging movement thereof; the trip consisting of a suitably formed piece of metal folded over the top of the lever arm, Fig. 14, and the shoulder 19 on said arm bearing up within the fold of the trip as seen best at Fig. 7. Upon the release of the key it is returned to normal position by a spring 20; and a beveled nose 21 on the trip rides back over the top of the spring-finger 11, and finally a spring 22, Fig. 6, snaps the trip down to catch again over the top of the finger ready for another operation.

It will be seen from the foregoing description that there is no shock to the finger of the operator arising by reason of the punch encountering the tough, resisting paper, but that power is accumulated or stored up in the spring 11 during the key stroke, and then employed to cause the punch to perforate the paper. In consequence, the touch of the keys is easy and agreeable to the operator, and facility is gained in the execution of the work. It will be noted that the movements of the punches are independent of the movements of the keys after the punches are released from the trips.

The spring finger 11 may have a key-hole slot 11^a to engage in a groove cut in the forward end of the punch; and an individual screw 11^b may be provided for each of the

springs to regulate its striking force independently of the others, or to set the spring backwardly into the notch of the trip.

A receptacle 22^a, Fig. 6, is provided back of the die-plate 16 to receive the punchings.

The web 18 is wound upon the core of a spool 23 mounted at the back of the machine, and runs thence forwardly upon a table 24 to a pulley 25 (extending across the machine back of the key actions), and thence up past the row of punches. The table 24 prevents sagging of the paper between the spool and the pulley 25, and sufficient friction is generated between the paper and the table to hold the paper taut as it runs up past the punches.

Above the punches is a web feeding roll 26 extending horizontally across the upper part of the machine; and cooperating therewith is a roll 27 hung in arms 28 and pressed by springs 29 against the roll 26 to bite the paper; the rolls being preferably connected by gears 30 to render them more effective. The forward or upper roll 27 may be swung forwardly on the arms 28 to facilitate insertion or manipulation of the web; while the rear or lower roll 26 acts as a driver. By means presently to be explained, the web is fed up at each key stroke sufficiently to bring the last perforation into full view of the operator; and it will be seen that the rolls 26, 27 are placed well above the row of punches to bring a considerable expanse of the perforated web into view, to enable the operator to observe the perforations in the paper promptly as the work progresses. So long as the rolls 26, 27 are placed on the delivery side of the machine, it is not essential that the expanse of the web between said rolls and the punches shall extend in vertical direction. The web-feeding rolls are driven by a spring 31 coiled about a shaft 32, the latter carrying a gear 33 in mesh with a pinion 34 on the axle 35 of the feed-roll 26; said feed-roll being fixed to the axle. One end of the spring is caught on an arm 37 fixed upon a side wall 38 of the machine frame opposite to the gear wheel 33. The movements of the spring-driven roll 26 are controlled by the keys through the medium of a universal bar 39 fixed upon a pair of rock arms 40, the latter rising from a rock shaft 41 journaled in the side frames of the machine. The bar 39 extends across in front of all of the upstanding key-operated arms 4, so that when any key is depressed as aforesaid, the universal bar rocks forwardly and by means of an adjustable link 42 pulls forwardly an arm 43 of an escapement mechanism associated with the feeding roll 26. Said arm 43 is fixed upon the lower end of a vertical rocker or rock-shaft 44, which carries at its upper end a dog 45, normally engaging a

tooth 46 of an escapement wheel 47 fixed upon the roll axle 35 outside of the machine frame. When a key is operated, the universal bar 39 is swung forwardly, and the dog 45 is rocked about the vertical shaft 44 out of engagement with the tooth 46 of the escapement wheel, as seen at Fig. 11, and immediately snaps past said tooth, Fig. 12, this movement being effected by a spring 48. At the same time a second dog or detent 49 fixed upon said shaft 44 and normally in line with the dog 45, is swung into engagement with the tooth 46 from which the dog 45 escapes, and holds the escapement wheel stationary while the parts are in a position seen at Figs. 11 and 12. Upon the release of the key from pressure, the universal bar is returned by a spring 50, Fig. 6, together with the dog rocker 44; the detent 49 escaping from the tooth, the active dog 45 entering the notch between said tooth and the succeeding one and being pressed by the latter to normal Fig. 10 position, whereby the wheel (which acts under the influence of the spring 31) is arrested; the dog 45 being stopped by a shoulder 51 on the rocker 44. As often as a key is depressed, the escapement wheel turns a distance of one notch or tooth, and the web 18 is fed up accordingly; each perforation being brought into view of the operator immediately upon the return of the key to normal position. The dog rocker arm 43 plays between adjustable stop screws 52, 53 which limit the movements of the dog rocker as well as the universal bar 39.

In order to permit the web-feeding spring 31 to be re-tensioned from time to time, the pinion 34 connected thereto is made loose on the feed-roll 35, and is formed with a disk 54 on which are pivoted pawls 55 to engage a ratchet wheel 56 fastened to the roll 26. This clutch device permits the gear 33 to run backwardly while the roll 26 remains stationary, so that the spring 31 may be rewound to feed the web again. This rewinding may be done by a handle or lever 57 pivoted upon a stud 58 at the left hand side of the machine to swing forwardly and downwardly from the Fig. 6 to the Fig. 13 position; said handle being attached to a rack bar 59 in mesh with a pinion 60 fixed upon the spring shaft 32. The rack may be held by a guide-roll 61 supported upon the machine frame. When the handle 57 is pulled forwardly, the rack 59 turns the pinion and the shaft 32 backwardly to re-tension the spring, and then the handle 57 is independently returned to normal position by a spring 62; said handle being loosely connected to the rack by a headed pin 63 and slot 64 to permit such independent return movement. Thus the spring may be rewound as often as necessary without disturb-

ing the position of the web relatively to the punches.

There is preferably fixed upon the shaft 32 a scale disk 65; and an index is fixed upon the side wall 38 of the framing to cooperate with said scale to show the extent to which the spring 31 has been unwound, or to show the progress of the web 18 through the machine; said index being preferably in the form of a shield 66 overlying part of the scale, which is read by means of the upper edge of the shield. The divisions on the scale preferably correspond to the letter-feeding movements of the typewriting machine, which is finally to be operated through the agency of the perforated sheet, and there are as many divisions as there are letters in the line written on the typewriter. These divisions may be numbered as at Fig. 5 to indicate the number of letters written on the typewriter as the line fills up. As soon as the operator observes that the line of writing is full, he pulls the handle 57 forwardly to re-tension the spring 31, and by that act may operate a punch to make in the sheet a perforation which shall cause the carriage of the typewriting machine to be returned to begin a new line; this motion of the handle 57 being therefore analogous to the operation of returning the typewriter carriage, so that the operation of the present machine corresponds very nearly to that of the usual operation of a typewriter. The carriage return punch 67^a is similar to the others, and is operated in the same manner by an extra key 67, Fig. 1. Upon the lever of this key and punch is fixed an upstanding arm 68, Figs. 6 and 13, to be engaged by a lug 69 on the handle 57, whereby the lever is depressed, and the corresponding punch 14 accordingly operated, Fig. 13. It will be understood that a carriage-return perforation may be made at any time by depressing the key 67 without operating the handle 57.

A space-bar 70 extending along the front of the keyboard and occupying a position corresponding to that of the ordinary space key of a typewriter, is supported at its ends upon a pair of levers 71, 72, Figs. 1 and 15. Both levers hang upon the fulcrum rod 3, and the lever 72 carries an upstanding arm 4 with its trip for operating the extreme right hand punch in the row; the perforation made by these punches being intended to cause the operation of the space key of the typewriting machine. The arm 4 of the space key operates the universal bar 39 to feed the web.

When it is desired to feed the web without making any perforation, a supernumerary key 73 is employed, this key being at the extreme right hand end of the keyboard, and mounted on an elbow lever whose horizontal arm corresponds to the other key-

bearing arms in the machine, but whose arm 74 is not connected with any punch, but is made long enough to operate the universal bar 39. When the key 73 is depressed, therefore, the escapement mechanism is operated and the web is fed up but not perforated.

The right hand key in the front bank, numbered 75, is connected to a punch 75^a which makes a perforation in the sheet in position to cause the operation in the typewriting machine of the case-shift key which sets and locks the typewriting machine to position for writing capital letters; the position of such key in the typewriter corresponding to the position of said key 75. In using the present machine for writing a capital letter, the key 75 is first depressed, and then one of the alphabet keys, and then a key 76 at the left hand end of the front bank. The key 76 causes a perforation to be made in the sheet for effecting the operation of the key in the writing machine, which releases the case-shifting mechanism thereof from its locked condition, and permits it to return to normal position; this release key occupying in a typewriting machine the same position as the key 76. It will be understood that all perforations made after the operation of 75 and before the operation of 76 cause the writing of capital letters in the typewriting machine. It will be seen at Fig. 3 that the punches 75^a and 76^a which are operated by these two shifting keys are out of line with the main portion of the row of punches and a little in advance thereof, so that the typewriter operating machine, which is intended to operate at high speed; is given a trifle additional time in which to effect the operation of the case-shifting mechanism, which is relatively bulky and heavy. Moreover, in the case of the case-releasing ("shift-off") key, the release is promptly effected, and the case-shift mechanism is given time to return to normal position promptly enough to receive the succeeding type-bar impact. In other words, two operations of the typewriting machine are necessary between the writing of the capital letter and the writing of the succeeding lower case letter; one of said operations consisting in the depression of the "shift-off" key, and the second consisting in the return of the case-shift mechanism to normal position; and it is an advantage to allow extra time for this two-part operation.

The extreme right hand key 77 of the back row is connected to a punch 78, Fig. 16; the vertical dimension of this punch being as great as the extent of the web-feeding movement caused by the operation of the key, so that repeated operations of said punch may form a single long slot in the web. This slot may therefore be made

of any desired length, for the purpose of controlling the duration of the depression of the tabulator key of the typewriting machine; the position of which corresponds to that of key 77.

The key 79 at the right hand end of the second bank operates a punch 79^a for making a perforation in the web, which is of use where the typewriter operating machine is adapted to be controlled in alternation by two webs or master sheets. This perforation is intended to silence the active web and to call the inactive web into action. One web may be used for the body of a letter or other document, and the other web may be employed for writing addresses, so that successive similar letters may be written bearing different addresses for the purpose of circularizing, etc.

It will be understood that in preparing a master sheet to contain a list of addresses, the key 79 may be operated at the completion of every address, so that the address master sheet may be silenced and the other master sheet may be called into action; while upon completing a master sheet for the body of a letter, said key 79 may be operated, for calling into action the master sheet which contains the addresses and silencing the master sheet which contains the body of the letter.

The extreme right hand key 80 in the third bank of keys is connected to a punch 81 for making a perforation to cause the stoppage of the typewriter operating machine.

At Fig. 4 is shown a fragment of the master sheet, which is previously prepared with a scale printed at short intervals, the letters on the scale corresponding with those on the keys of the present machine, and having the same order as the elbow levers 2, 4, or as the punches 14. This scale is always in view at some point in the expanse of the perforated web sheet, between the punch guide 15, and the web feeding roll 26; and by consulting the scale, the user is enabled to read each perforation, and hence to read the words that he has punched, as will readily be understood. The invention is not however limited to this particular means for reading the perforations.

Variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others.

Having thus described our invention, we claim:

1. A perforating machine comprising a keyboard, a set of punches, and yielding devices to be tensioned by the keys and caused to operate the punches in recovering from their tensioned condition.

2. In a perforating machine, the combination with punches, of key-bearing levers,

and yielding devices to transmit movements between the levers and the punches, to enable the latter to be actuated by power derived from the keys.

3. In a perforating machine, the combination with keys and punches, of movement-transmitting means, including trips, between the keys and the punches.

4. In a perforating machine, the combination with punches and keys, of spring devices to operate the punches, and trips to enable the keys to first tension and then release the spring devices, to enable the latter to operate the punches.

5. In a perforating machine, the combination with keys and spring-operated punches, of trips connected to the keys to enable them to withdraw and release the punches; means being provided to enable the trips to reconnect with the punches upon the restoration of the keys to normal positions.

6. In a perforating machine, the combination with spring-pressed punches, of key-operated levers, trips between the levers and the punches to enable the keys to withdraw and release the punches, and springs to connect the trips and the punches.

7. In a perforating machine, the combination with a series of punches and a series of springs to operate the same, of key-operated means for setting and releasing the punches.

8. In a perforating machine, the combination with a row of punches, of a row of springs connected to said punches, a row of key-operated levers or members having trips to connect them to said punches, and springs to return the trips and levers to normal positions; the trips constructed to tension and release the springs at the depression of the keys and to reconnect with the springs at the return of the keys to normal positions.

9. In a perforating machine, the combination with a row of punches, of a row of spring fingers to engage said punches, a row of key-operated levers, and trips extending from said levers to said spring fingers to enable the keys to first tension and then release the spring fingers, to cause them to operate the punches.

10. In a perforating machine, the combination with a row of punches, of a row of spring fingers to engage said punches, a row of key-operated levers, trips extending from said levers to said spring fingers to enable the keys to first tension and then release the spring fingers, to cause them to operate the punches, said trips pivoted upon said levers and having hooks to catch over the spring fingers, and springs being provided to re-engage said trips with the spring fingers upon the return of the key levers to normal positions.

11. A perforating machine comprising a

set of punches, a set of keys, and power-accumulating devices connecting the keys to the punches to enable power applied to the keys to be accumulated during the key strokes and then employed to cause the punches to perforate the paper.

12. A perforating machine comprising a set of movable punches, a set of movable keys, and means controlled by the keys to snap the punches through the paper at the completion of the key strokes, the movements of the punches being independent of the movements of the keys.

13. A perforating machine comprising a framework, a web-carrying roll or spool supported upon the rear of the framework, a pulley forward of said roll over which the web turns to run upwardly, a set of punches above said pulley, key actions forward of said pulley to operate said punches, paper-feeding rolls above the punches and controlled by the key actions, and a brake or retarding device for the web being provided on the introductory side of the machine.

14. A perforating machine comprising a framework, a web-carrying roll or spool supported upon the rear of the framework, a pulley forward of said roll over which the web turns to run upwardly, a set of punches above said pulley, key actions forward of said pulley to operate said punches, paper-feeding rolls above the punches and controlled by the key actions, and a brake or retarding device for the web being provided on the introductory side of the machine in the form of a table upon which the web lies in running from said web-carrying roll to said pulley.

15. A perforating machine comprising a set of keys, punches operated thereby, a paper-feeding mechanism driven by a spring and controlled by the keys to advance the paper intermittently after every punching operation, and a handle connected to the spring to enable the operator to re-tension the same from time to time.

16. A perforating machine comprising a set of keys, punches operated thereby, paper-feeding means driven by a spring and controlled by an escapement mechanism which is controlled by said keys to advance the paper after every punching operation, and a handle connected to the spring for re-tensioning the same; a clutch being provided between the paper-feeding means and the escapement devices, to permit re-tensioning of the spring independently of the escapement devices.

17. A perforating machine comprising a set of keys, punches operated thereby, a paper-feeding roll, a driving spring, a clutch device between the driving spring and the paper-feeding roll to permit the spring to be re-tensioned independently of

the roll, and means controlled by the keys to permit the roll to be driven step by step by said spring to feed the paper intermittently after every punching operation.

18. A perforating machine comprising a set of keys, punches operated thereby, a driving spring, a paper-feeding roll provided with escapement devices, a clutch device connecting said spring to said roll and said escapement devices, to permit the spring to be independently set back or re-tensioned, and connections from the keys to the escapement devices.

19. A perforating machine comprising a set of keys, punches operated thereby, a paper-feeding roll, a driving spring connected by movement-multiplying gearing to said roll, and escapement mechanism controlling said roll and connected to the keys.

20. A perforating machine comprising a set of keys and punches connected thereto, a paper-feeding roll, an escapement wheel connected to said roll, key-operated feeding mechanism to control said escapement wheel, and a driving spring connected by movement-multiplying gearing to said roll and escapement wheel.

21. A perforating machine comprising a set of keys and punches connected thereto, a paper-feeding roll, an escapement wheel connected to said roll, key-operated feeding mechanism to control said escapement wheel, a driving spring connected by movement-multiplying gearing to said roll and escapement wheel, and a clutch being provided between the spring and the roll to permit independent setting back or re-tensioning of the spring.

22. A perforating machine comprising a set of punches, keys to operate them, a spring-driven paper-feeding roll, an escapement wheel for said roll, and escapement mechanism operated by said keys to control said wheel.

23. A perforating machine comprising a set of punches, keys to operate them, a spring-driven paper-feeding roll, an escapement wheel for said roll, and escapement mechanism operated by said keys to control said wheel; said escapement mechanism including a universal bar actuated by all the keys.

24. A perforating machine comprising a set of punches, keys to operate them, a paper-feeding roll, a spring to drive said roll, an escapement wheel for said roll, escapement mechanism operated by said keys to control said wheel, and means for re-tensioning the spring from time to time, as the work progresses.

25. A perforating machine comprising a set of punches, keys to operate them, a paper-feeding roll, a spring to drive said roll, an escapement wheel for said roll, es-

capement mechanism operated by said keys to control said wheel, and means for re-tensioning the spring from time to time as the work progresses; said re-tensioning means independent of said roll, so that the latter may lie idle while the spring is being re-tensioned.

26. A perforating machine comprising a set of keys, punches operated thereby, a paper-feeding roll, a driving spring for said roll, and an escapement mechanism controlling said roll and connected to the keys, a train of movement multiplying gearing connecting said spring to an escapement wheel forming part of said escapement mechanism.

27. A perforating machine comprising a set of keys, punches operated thereby, a paper-feeding roll, a driving spring for said roll, an escapement mechanism controlling said roll and connected to the keys, a train of movement multiplying gearing connecting said spring to an escapement wheel forming part of said escapement mechanism, and means being provided for re-tensioning said spring from time to time independently of said paper-feeding roll.

28. A perforating machine comprising a set of punches, keys to operate them, a paper-feeding roll having an axle, a pinion on the roll axle and connected by a clutch device to the roll, a gear meshing with said pinion, a spring driving said gear, means to re-tension said spring, an escapement wheel on said axle, escapement devices controlling said escapement wheel and actuated by the keys, and a second roll cooperating with said roll to feed the paper.

29. A perforating machine comprising a set of punches, keys to operate them, a paper-feeding roll having an axle, a pinion on the roll axle and connected by a clutch device to the roll, a gear meshing with said pinion, a spring driving said gear, means to re-tension said spring, an escapement wheel on said axle, escapement devices controlling said escapement wheel and actuated by the keys, a second roll cooperating with said roll to feed the paper, said re-tensioning means including a pinion connected to the spring, a rack meshing with the pinion, and a lever or handle connected to the rack.

30. A perforating machine comprising a set of punches, keys to operate them, a paper-feeding roll having an axle, a pinion on the roll axle and connected by a clutch device to the roll, a gear meshing with said pinion, a spring driving said gear, means to re-tension said spring, an escapement wheel on said axle, escapement devices controlling said escapement wheel and actuated by the keys, a second roll cooperating with said roll to feed the paper, said re-tensioning means including a pinion connected to the spring, a rack meshing with the pinion, and a lever

or handle connected to the rack; a lost-motion construction being provided between the rack and the lever, to enable the lever to return to initial position in advance of the rack.

31. A perforating machine comprising a set of keys, punches operated thereby, a paper feeding mechanism driven by a spring and controlled by the keys to advance the paper intermittently after every punching operation, a handle connected to the spring to re-tension the same from time to time, and a scale connected to said spring to indicate its unwinding movements.

32. A perforating machine comprising a set of keys, punches operated thereby, a paper feeding mechanism driven by a spring and controlled by the keys to advance the paper intermittently after every punching operation, a handle connected to the spring to re-tension the same from time to time, and a scale connected to said spring to indicate its unwinding movements; said scale having divisions corresponding to the letter-spacing movements of the typewriting machine in the operation of which the perforated sheet is to be employed.

33. A perforating machine comprising a set of keys, punches operated thereby, a paper-feeding mechanism controlled by the keys to advance the sheet or web after every punching operation, and means to indicate the progress of the sheet; said indicating means including a scale divided to correspond with the letter-feeding movements in a line of writing of the typewriting machine to be operated through the agency of the perforated sheet.

34. A perforating machine comprising a set of keys, punches operated thereby, including a punch to make a perforation to cause the return of the carriage of the typewriter which is to be operated through the agency of the punched sheet, a paper-feeding mechanism controlled by the keys to advance the sheet or web after every punching operation, and a scale to indicate the progress of the sheet; said scale divided to correspond with the letter-feeding movements of the typewriting machine, whereby upon consulting the scale the operator is informed when to operate the carriage-return punch.

35. A perforating machine comprising a set of punches, keys to operate them, a spring having means to advance a web of paper past the punches, and means to enable the keys to control the operations of said spring.

36. A perforating machine comprising a set of punches, keys to operate them, a spring having means to advance a web of paper past the punches, means to enable the keys to control the operations of said spring, and means to re-tension the spring from

time to time independently of the web of paper.

37. A perforating machine comprising a set of punches, keys to operate them, a spring having means to advance a web of paper past the punches, means to enable the keys to control the operations of said spring, means to re-tension the spring from time to time independently of the web of paper, and a scale to indicate when the spring should be re-wound.

38. A perforating machine comprising a set of punches, a spring having means to feed a web of paper, punch-operating keys having means to control the movements of the paper effected by said spring, and means, including a handle, for re-tensioning said spring from time to time independently of the web of paper.

39. A perforating machine comprising a set of punches, a spring having means to feed a web of paper, punch-operating keys having means to control the movements of the paper effected by said spring, means, including a handle, for re-tensioning said spring from time to time independently of the web of paper, and means controlled by said handle to operate a carriage-return punch which forms one of the set of punches.

40. A perforating machine comprising a set of punches, a spring having means to feed a web of paper, punch-operating keys having means to control the movements of the paper effected by said spring, means, including a handle, for re-tensioning said spring from time to time independently of the web of paper, means controlled by said handle to operate a carriage-return punch which forms one of the set of punches, and means to indicate the progress made in perforating the sheet for each line of writing.

41. A perforating machine comprising a set of punches, a spring having means to feed a web of paper, punch-operating keys having means to control the movements of the paper effected by said spring, means, including a handle, for re-tensioning said spring from time to time independently of the web of paper, means controlled by said handle to operate a carriage-return punch which forms one of the set of punches, and means being provided for the retraction of the carriage-return punch to normal position independently of said web-feeding spring.

42. A perforating machine comprising a set of punches, a spring having means to feed a web of paper, punch-operating keys having means to control the movements of the paper effected by said spring, means, including a handle, for re-tensioning said spring from time to time independently of the web of paper, and means controlled by said handle to operate a carriage-return punch which forms one of the set of punches;

said handle being loosely connected to said spring to permit the handle and the carriage-return punch to return to normal positions independently of the spring.

43. A perforating machine comprising a set of punches, a spring having means to feed a web of paper, punch-operating keys having means to control the movements of the paper effected by said spring, means, including a handle, for re-tensioning said spring from time to time independently of the web of paper, means controlled by said handle to operate a carriage-return punch which forms one of the set of punches, said handle being loosely connected to said spring to permit the handle and the carriage-return punch to return to normal positions independently of the spring, and a key to operate said carriage-return punch independently of said handle.

44. A machine to perforate a web to control the operation of a typewriting machine, comprising a row of key-operated punches, one of which is out of line with the others and in advance thereof, to form a perforation for controlling the operation of a case-shifting key of the typewriting machine, and means controlled by the keys to feed a web past the punches.

45. A perforating machine comprising a set of punches, a set of keys to operate them, a web-feeding roll, a spring to drive said roll, an escapement wheel connected to said roll, key-operated escapement devices to control said wheel, a clutch between said spring and said roll and said escapement wheel, to permit the spring to be re-tensioned independently of the roll and escapement wheel, and a back-check to prevent retraction of the escapement wheel during the re-tensioning of the spring.

46. A machine to perforate a web to control the operation of a typewriting machine, comprising a row of key-operated punches, two of which are out of line with the remainder and in advance thereof, to form perforations for controlling the operations of alternate case-shifting keys of the typewriting machine.

47. A machine to perforate a web to control the operation of a typewriting machine, comprising a row of key-operated punches, including two punches one of which forms a perforation to control the setting of the case-shifting mechanism of the typewriter to upper case position, and the other of which controls the return of said case-shifting mechanism to normal position.

48. A machine to perforate a web to control the operation of a typewriting machine, comprising a row of key-operated punches, including two punches one of which forms a perforation to control the setting of the case-shifting mechanism of the typewriter

to upper case position, and the other of which controls the return of said case-shifting mechanism to normal position, both of said punches being in line with the rows of punches and in advance thereof.

49. A machine to perforate a web to control the operation of a typewriting machine, comprising a row of key-operated punches, and web-feeding means controlled by the keys; one of said punches having a dimension as great as the extent of the web-feeding movement, so that repeated operations of said punch form a single long slot in the web, to control the duration of the depression of the tabulator key of the typewriting machine.

50. A machine to perforate a web forming one of two alternately effective webs, to control the operation of a typewriting machine, comprising web-feeding means and a row of key-operated punches, including a punch to make a perforation to cause the cessation of movement of the active web and to bring the inactive web into action.

51. A machine to perforate a web to control the operation of a typewriting machine, comprising web-feeding means and a row of key-operated punches, including a key to form a perforation to effect the stoppage of the typewriter-operating machine.

52. A machine to perforate a web for controlling the operation of a typewriting machine, comprising a set of key-operated punches, a web-feeding mechanism including a universal bar actuable by any of the punch-operating keys, and a supernumerary key to actuate the universal bar to feed the web without perforating the same.

53. A machine to perforate a web to control the operation of a typewriting machine, comprising a row of punches, a typewriter keyboard whose keys are connected to said punches, said keyboard including a space-key bar mounted in front of the remaining keys and connected to an appropriate punch, and web-feeding means controlled by all the keys.

54. A machine to perforate a web to control the operation of a typewriting machine, comprising a row of punches, a typewriter keyboard whose keys are connected to said punches, said keyboard including a space-key bar mounted in front of the remaining keys and connected to an appropriate punch, web-feeding means controlled by all the keys, and also including a carriage-return key, alternate case-shift keys, a tabular key, a key to stop the operation of the typewriter operator, and a key to cause the active web in the typewriter operator to become idle and the inactive web to become active.

55. A machine to perforate a web to control the operation of a typewriting machine, comprising a row of punches, a typewriter

keyboard whose keys are connected to said punches, said keyboard including a carriage-return key, alternate case-shift keys, a tabular key, a key to stop the operation of the typewriter operator, and a key to cause the active web in the typewriter operator to become idle and the inactive web to become active; all of said keys connected to means to feed the web after every punching operation, and a supernumerary key to feed the web without punching the same.

56. A machine to perforate a web or sheet to control the operation of a typewriting machine, comprising a row of key-operated punches, a pair of rolls to draw the web past the punches, and means controlled by the keys and connected to the roll which is under the web, to drive the same; the roll which is above the web being releasable to permit manipulation of the paper.

57. A machine to perforate a web or sheet to control the operation of a typewriting machine, comprising a row of key-operated punches, a pair of rolls to draw the web past the punches, means controlled by the keys and connected to the roll which is under the web, to drive the same; the roll which is above the web being releasable to permit manipulation of the paper, and means to press the releasable roll against the other roll.

58. A perforating machine comprising a set of elbow levers, each comprising an upstanding rear arm and an arm extending forwardly therefrom and bearing a key at its forward end, punches operable by said upstanding arms, a universal bar operated by said upstanding arms, and web-feeding means controlled by said universal bar.

59. In a perforating machine, the combination with punches, of key-bearing levers, yielding devices to transmit movements between the levers and the punches, and means to regulate said yielding devices independently of one another.

60. In a perforating machine, the combination with punches and keys, of spring devices to operate the punches, trips to enable the keys to first tension and then release the spring devices, to enable the latter to operate the punches, and means for adjusting said spring devices.

61. In a perforating machine, the combination with a row of punches, of a row of springs connected to said punches, a row of key-operated levers or members having trips to connect them to said punches, springs to return the trips and levers to normal positions; the trips constructed to tension and release the springs at the depression of the keys and to reconnect with the springs at the return of the keys to normal positions, and means for adjusting the springs independently of one another.

62. A machine to perforate a web to control the operation of a typewriting machine, comprising a row of key-operated punches, one of which is out of line with the alphabet punches to form a perforation for controlling the operation of a case-shifting key of the typewriting machine.

63. A machine to perforate a web to control the operation of a typewriting machine, comprising a row of key-operated punches, including two punches one of which forms a perforation to control the setting of the case-shifting mechanism of the typewriter to upper case position, and the other of

which controls the return of said case-shifting mechanism to normal position; the last-mentioned punch being out of line with the row of alphabet punches and in advance thereof, for the purpose specified. 15

LYMAN R. ROBERTS.
CHARLES L. DAVIS.

Witnesses as to Lyman R. Roberts:

JOHN O. SEIFERT,
K. FRANKFORT.

Witnesses as to Charles L. Davis:

JOHN G. MILLER,
STEPHEN T. SMITH.