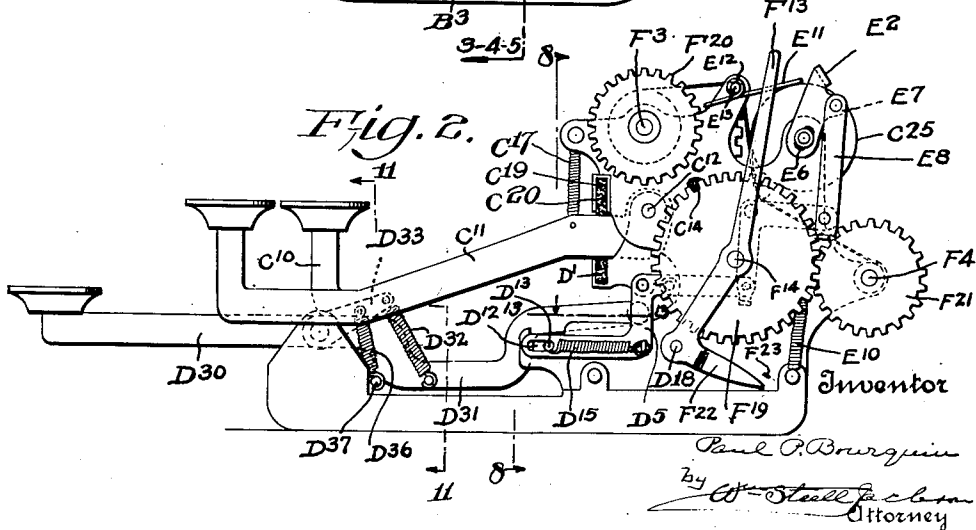
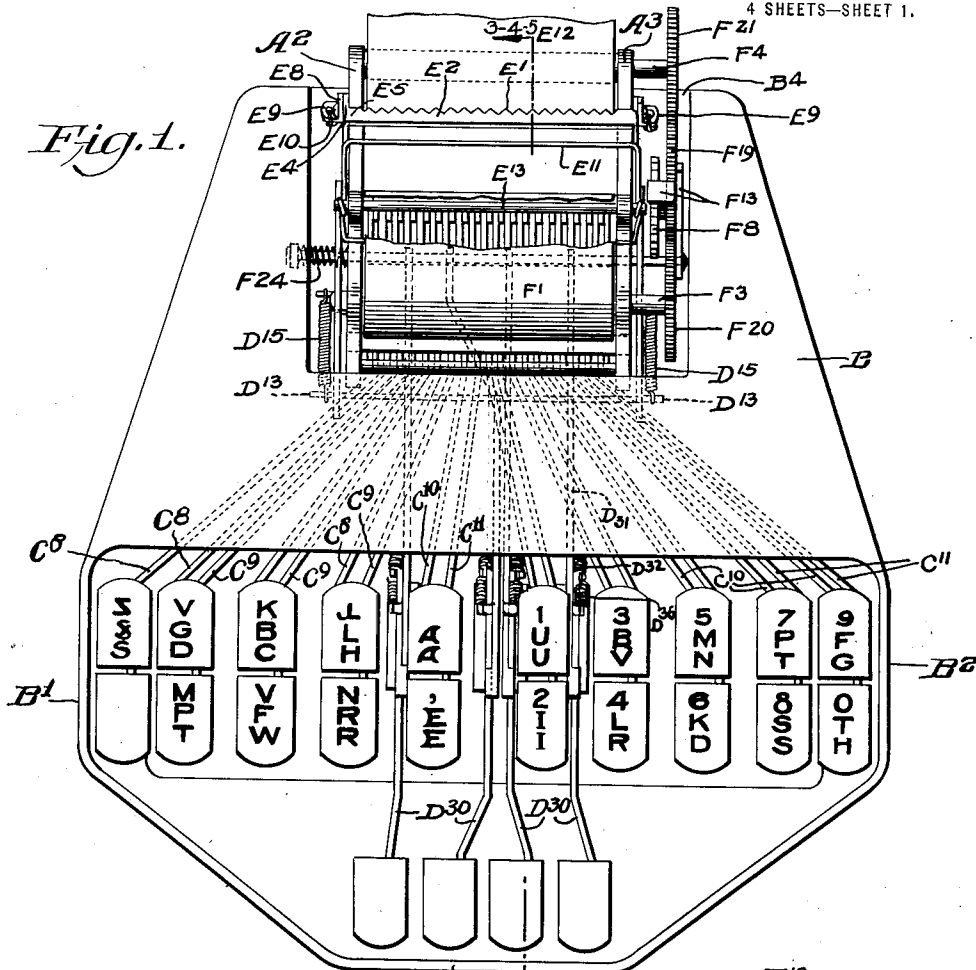


P. P. BOURQUIN.
 MULTIPLE IMPRESSION TYPEWRITER.
 APPLICATION FILED JAN. 27, 1919.

1,395,994.

Patented Nov. 1, 1921.

4 SHEETS—SHEET 1.

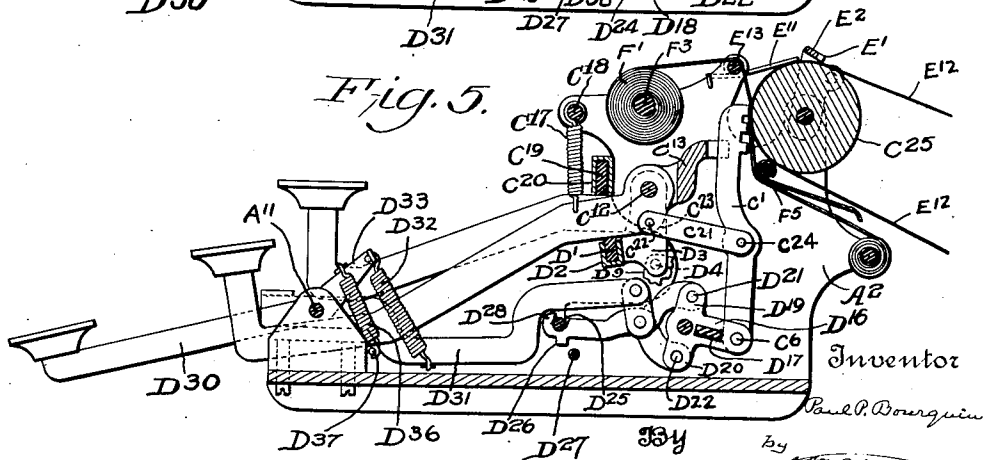
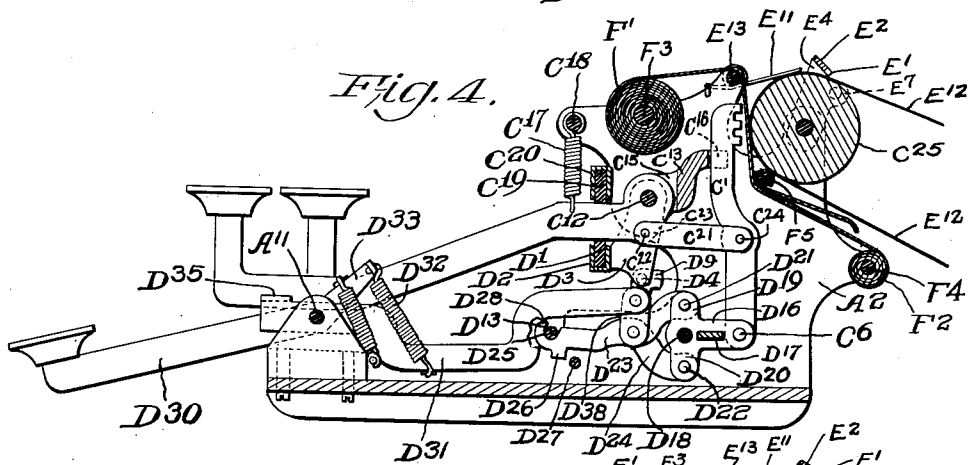
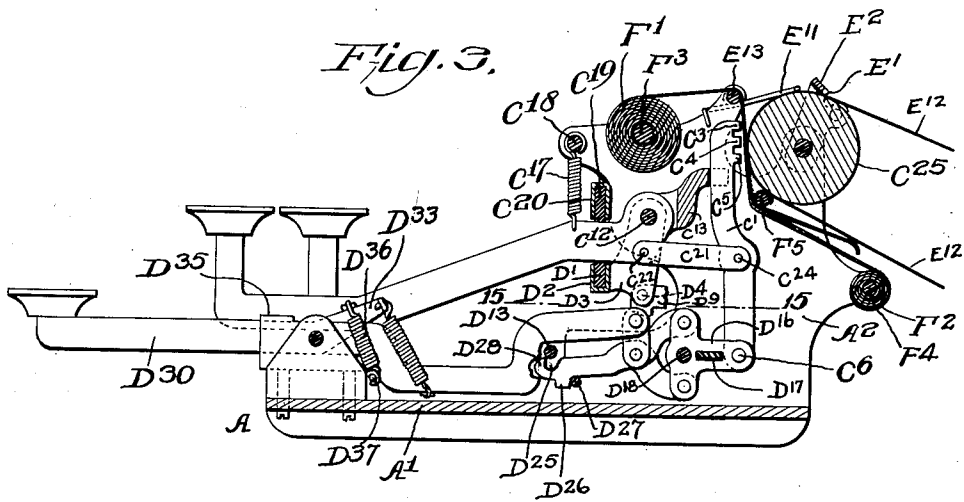


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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

Fig. 6.

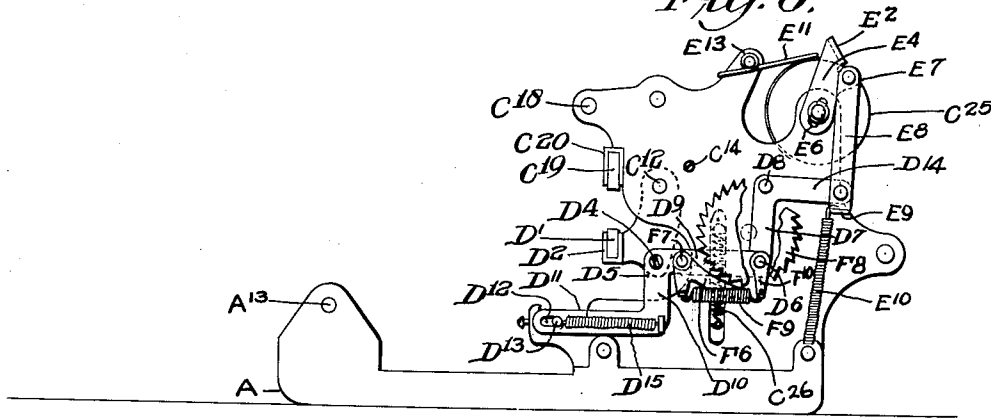


Fig. 7.

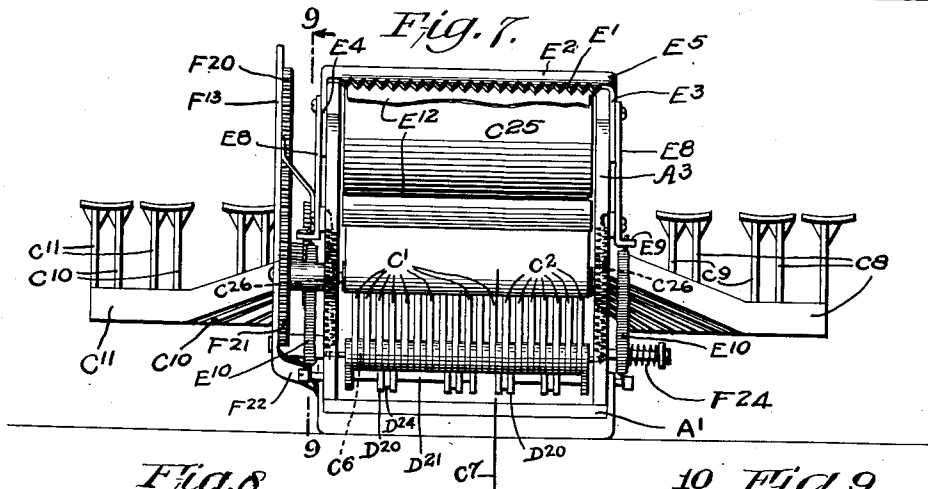


Fig. 8.

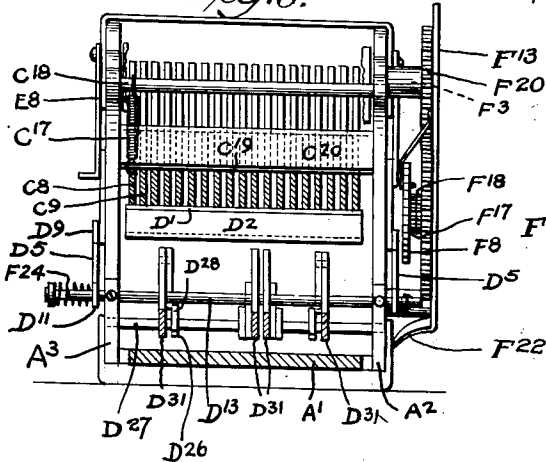
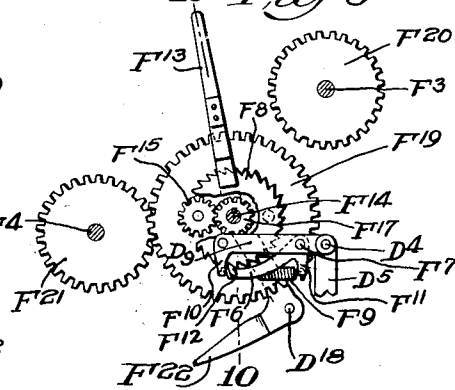


Fig. 9.



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1,395,994.

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4 SHEETS—SHEET 4.

Fig. 11.

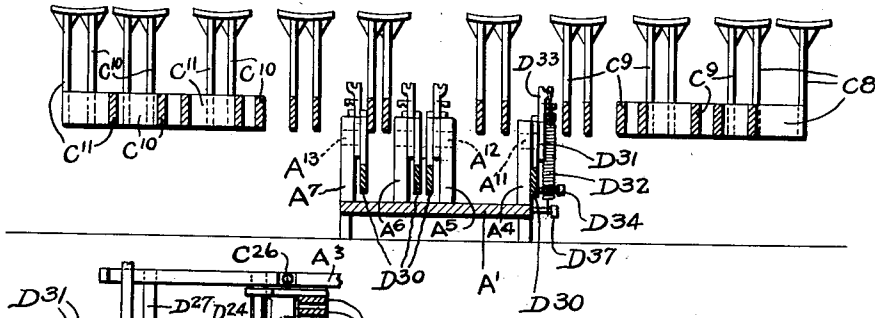


Fig. 15.

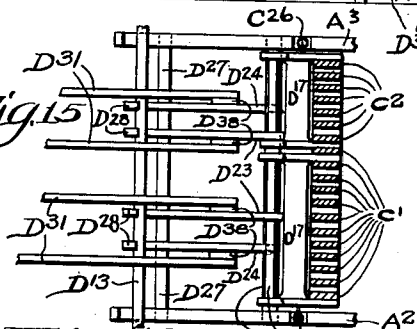


Fig. 10.

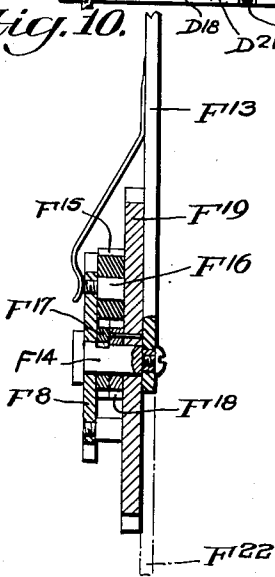


Fig. 12.

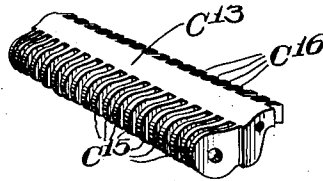


Fig. 13.

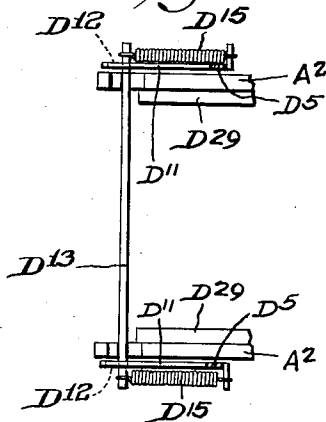
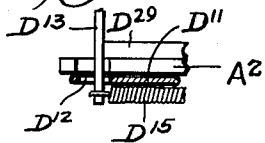


Fig. 14.



Inventor
 Paul P. Bourquin
 by *Wm. Steel Jackson*
 Attorney

UNITED STATES PATENT OFFICE.

PAUL P. BOURQUIN, OF PHILADELPHIA, PENNSYLVANIA.

MULTIPLE-IMPRESSION TYPEWRITER.

1,395,994.

Specification of Letters Patent.

Patented Nov. 1, 1921.

Application filed January 27, 1919. Serial No. 273,226.

To all whom it may concern:

Be it known that I, PAUL P. BOURQUIN, a citizen of the United States, residing at 161 W. Seymour street, Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Multiple-Impression Typewriter, of which the following is a specification.

My invention relates to typewriting machines of a special character, intended for use in verbatim reporting, and in which no lateral shift of the type with respect to the paper takes place, and a number of keys are struck and impressions made simultaneously without intermediate longitudinal paper spacing. I have preferred to designate this as multiple-impression typewriting.

The purpose of my invention is to separate the type-shifting operation into two parts, of which one, requiring depression of the proper shift key, is preparatory. The shift is then effected by depression of the particular lever corresponding to the character intended to be printed.

A further purpose is to provide an initial short stroke of the shift key, to place the parts in position for operation by printing key depressions, followed by a relatively large non-working shift key-stroke, so as to make the total shift key stroke approximately equal to that of the printing key.

A further purpose is to divide the shift keys or trigger keys substituted therefor, into two parts, spring connected to give resilient movement between them for the purpose of using a short stroke only while providing for full stroke of these keys.

A further purpose is to interlock printing-key-connected mechanism with type-bar-shifting mechanism by a trigger which performs no shifting operation, preferably delaying the connection for operation of the trigger until partial movement of the printing key has been made.

A further purpose is to prepare for type bar shift by operation of a shift key and to thereafter accomplish it by a special universal bar controlled by any of the printing keys.

A further purpose is to place short stroke type bars in nearly vertical position, and to shift the bars by vertically shifting the pivots upon which they are supported and operated.

A further purpose is to shift the position of a parallel series of type bars, to present different printing type faces, by moving their pivots in a direction generally parallel to the length of the bars when at rest.

A further purpose is to support the type bars upon a rocker arm and rock it in different directions for two different shifts, using the intermediate position for the normal position.

A further purpose is to provide a double shift for the type bar, locking against the shift by a normal locking position of the two arms through which the shift is accomplished, and freeing from the locking position and engaging the arm with a universal bar for movement of the arm through the operation of a shift key.

Where a type bar is shifted to present a different type face coincidentally with its printing stroke to bring it into contact with the paper, a further purpose is to stop the shifting movement before the printing stroke is completed.

A further purpose is to operate the type shifting mechanism, the paper feeding mechanism or the ribbon feeding mechanism, or two or all of these, from the universal bar.

A further purpose is to operate the type bars by lever connections engaging the bars between their pivots and their type faces.

A further purpose is to operate a short stroke type bar by pressure transversely to its length applied at a point between the pivot and the type.

Further purposes will appear in the specifications and in the claims thereof.

I have preferred to illustrate my invention by but one form thereof, selecting a form which is simple, practical, efficient, and highly advantageous, and which at the same time well illustrates the principles of my invention.

Figure 1 is a top plan view of the preferred embodiment of my invention.

Fig. 2 is a side elevation of the structure seen in Fig. 1, omitting the cover.

Figs. 3, 4, and 5 are sections of Fig. 1, on lines 3—3, 4—4, and 5—5, respectively.

Fig. 6 is a side elevation omitting some of the parts.

Fig. 7 is a rear elevation of the construction shown.

Fig. 8 is a section upon line 8—8 of Fig. 2.

Fig. 9 is a section upon line 9—9 of Fig. 7.

Fig. 10 is a fragmentary section corresponding to line 10—10 of Fig. 9.

Fig. 11 is a section upon line 11—11 of Fig. 2.

Fig. 12 is a perspective view of a comb frame shown in other figures.

Fig. 13 is a fragmentary top plan view of part of the shift-operating mechanism.

Fig. 14 is a fragmentary view of a part of the structure in Fig. 13 with the parts in different positions.

Fig. 15 is a fragmentary section upon line 15—15 of Fig. 3.

Similar reference characters in the drawings indicate like parts.

The description of the structure embodying my invention naturally divides itself into a number of interrelated parts, which overlap, and which will be described separately with reference to the frame structure and cover; operation of different type banks from separate groups of keys; the key-board; type-bar operating mechanism, as distinguished from the type shifting mechanism; the trigger setting mechanism for type shifting; the subsequent type shifting by movement of the printing key; the paper feeding mechanism; and the ribbon feeding mechanism.

The frame and cover.

The frame A is mounted upon a base plate A¹, which is conveniently skeletoned for lightness, and upon which are mounted side housings A², A³, and side pivot plates A⁴, A⁵, A⁶, and A⁷, affording support for bearing shafts A¹¹, A¹², A¹³, for trigger levers hereinafter described.

The said frame housings A², A³, are united by a number of tie rods and braces, which perform other functions also in connection with their general frame function and will be described in connection with the several constructions to which their other functions are directed.

For the same purpose of keeping the parts relating to different functions separate and distinct, various adjustments and connections mounted upon the frame will be described in connection with the parts which they adjust or to which they are connected.

The cover B comprises a pair of mating, reversely placed, side members B¹ and B² adapted to be screwed to the base A¹, and united in front and in the rear by bars of strips B³, B⁴.

Operation of different type banks from separate groups of keys.

Corresponding to the two parts of the machine, there are two distinct sets of type bars, C¹, C², with separate shifting and oper-

ating mechanisms but using the same universal bar and the same ribbon and paper feeds. Each set is preferably supplied with three type faces or banks, C³, C⁴, C⁵, of which bank C⁴, for convenience the nearer, is normally used and the other two, for convenience treated as upper and lower case, are thrown into position for use by shift key mechanism hereinafter described.

The division of the bars into sets is made because it is desirable to use one bank or case of some of the type bars at the same time that a different bank or case of other type bars is used. The capability of use of any of three banks or cases of one set of bars with any of the three banks or cases upon one or more other sets of bars gives greater flexibility of operation. I have found it desirable to divide the machine into but two such parts.

The bars C¹ and C² of the two sets are pivoted at their lower ends upon separate pivot rods C⁶, C⁶, which rods are mounted on lever arms and are capable of being rocked about the pivots of these arms; *i. e.*, "shifted," as later described. The division line between the bars is shown in Fig. 7 as at C⁷.

Each of the type bars C¹ or C² is operated by a separate key lever and connections, and these levers and connections are divided into two parts or divisions corresponding to the divisions of the bars, at the left and right of the machine (Figs. 1 and 7) as previously indicated, and for the same reason.

The construction used on each side for this purpose comprises a group made up of two rows of keys for its set of type bars. The characters are preferably distributed among the keys as shown, in agreement with the corresponding type faces, except that the middle or normal (neutral) types correspond to the nearer ends of the keys. The keys form distinct and separate rows as indicated, except at the extreme left in Fig. 1, where the farther and nearer keys are upon the same lever C⁸.

The keyboard.

All of the characters shown upon the keys and used upon the type bars are common English characters (see Fig. 1) except for the lower case character upon the left hand key (a reversely turned Z for both S and Z), the upper case on the same key (having a diagonal bar through the letter S, used for both S and X), the upper case upon the forward bank key fourth from the left (a combined J and L, for both characters), the lower case upon the fourth key from the right in the upper key bank (a combined B and R for both characters), and the lower and neutral case keys fifth from the left in both banks, (an A and E having curved

sides, separately for those letters and together instead of O).

Type bar operating mechanism.

5 The key levers C^8 and C^9 are served by one pair of shift keys and the levers C^{10} and C^{11} by another pair thereof, as later described.

10 The key levers C^8 , C^9 , C^{10} , and C^{11} are all pivoted upon a common rod C^{12} , which passes through between the side frame members and acts as one of the tie rods between them. The rod C^{12} also helps to support a double comb frame C^{13} , (Fig. 12), which is held against rocking by screws C^{14} . The comb frame is provided with tines C^{15} and C^{16} , which guide and space the key levers and type bars respectively.

15 Each of the key levers is spring retracted as by a spring C^{17} , connected with the lever near one end and with a rod C^{18} at the other. This rod forms an additional tie rod for the side frame members.

20 The retractive movement of the key levers is stopped by a bar extending across the machine, here shown as a resilient filling C^{19} in a channel bar C^{20} .

25 I improve the compactness by operating the bars by thrust rather than by tension. Each of the key levers is connected with its corresponding type bar by a link C^{21} , which is pivoted at one end at C^{22} to the heel C^{23} of the key lever, and at the other end at C^{24} to an intermediate part of the type bar. 30 The link is preferably nearly horizontal so that the distances of the type faces C^3 , C^4 and C^5 from the platen C^{25} are but little affected by the shift in the height of the type bars.

35 The links C^{21} preferably slope very slightly in the direction indicated, for the purpose of balancing the distances from the platen of the upper and lower case type when shifted, as nearly as possible. The extent of slope is exaggerated in the drawing. 40

45 For the same purpose (in view of the arcs of movement of the links represented by C^{21} and the arms indicated at D^{16} , which would withdraw the type faces from the platen if they were of equal length) the effective lengths of the arms D^{16} are made shorter than the effective lengths of links C^{21} , giving the arcs of movement of the arms D^{16} , for the same distance of type bar shift, 50 more swing to the left than is true to links C^{21} . The additional swing thus given the lower ends of the bars tilts them slightly about C^{24} as a center and additionally compensates.

60 The weight of the bars C^1 C^2 is counter-balanced by springs C^{26} which engage the rods C^6 at any suitable exposed points and are secured to the frame at their other ends (Figs. 6 and 7).

In operation, depression of any key causes 65 thrust upon its link C^{21} and pressure of the corresponding type face against the paper.

Type shifting mechanism.

70 All of the key levers operate upon the same universal bar D^1 , which is formed as a resilient filling within a channel D^2 , carried by swinging arms D^3 pivoted upon the rod C^{12} . At each side of the machine the swinging arm D^3 carries a pin D^4 , upon 75 which is mounted an S lever D^5 . For the immediate purpose this constitutes a floating link or bar only, but other functions cause it to be extended as indicated below. The bars are pivoted at one end each, as 80 at D^6 to a second lever (rocker arm) D^7 swinging about a fixed pivot D^8 . As the spacing between D^4 and C^{12} approximately corresponds to that between D^6 and D^8 , the floating bars D^5 of the levers D^5 lying between the pivots D^4 and D^6 therefore occupy 85 at all times approximately parallel positions. The radius of movement of each swinging pivot is sufficiently long so that the bar varies but slightly in height as it swings 90 as a link about the two pivot points C^{12} and D^8 .

The levers D^7 perform an additional function, as hereinafter pointed out, in causing 95 the paper to feed.

The levers D^5 are extended beyond the pivot point D^4 for the purpose of operating a second horizontal bar (D^{13}) each, and for convenience in reaching the lower part of the machine where these bars D^{13} are preferably located, the levers are dropped as at 100 D^{10} and are then extended to the left to form the lower reaches of the S bars.

The lower bar D^{11} of the S terminates in ends slotted at D^{12} to receive a type-shift 105 operating bar which is universal, in that but one bar is required for different sets of type-shifting mechanisms capable of being shifted at the same time in different directions, one set with respect to another. The 110 purpose of the slot is to permit the final movement of the lever D^5 required for the actual type impression while permitting movement of the type-shift operating bar D^{13} to be suspended, avoiding smudging of 115 the impression.

At some point upon the S lever or on one of its connecting parts tension is brought to retract it. This is done in the illustration through an end D^{14} of the bar D^9 , the 120 tension being applied, however, not to the arm directly but by means of a spring hereinafter described, and which is connected with a bar which is pivoted to the bar D^9 .

125 The type-shift operating bar D^{13} is normally held in the position shown in Fig. 6 by springs D^{15} secured to the bar at one

end each and connected to the levers D^5 at the other.

It will be noted that the type-shift operating bar D^{13} is operated from the type bar operating levers through the universal bar. This movement of the bar D^{13} is subsequently utilized to do the actual shifting of the type bars, the so-called shift levers being used for trigger-setting or selective purposes only.

Arms D^{16} carry the rods C^6 upon which the type bars C^1 and C^2 are pivoted at their lower ends. There are as many effective arms D^{16} and bars C^6 as there are separate banks of type bars C^1 C^2 . Though I have shown a pair of these arms D^{16} for each bank of type bars, I have coupled the two arms of each pair together by a web D^{17} . These arms D^{16} are all alike, as are the type bars. The arms are bell crank levers and, where intended for a double shift such as illustrated, are double bell cranks, pivoted upon a rod, or rods, D^{18} , which may extend across the machine and form a tie rod for the side frame members. The bell cranks shown have oppositely directed lever arms D^{19} and D^{20} , which are utilized to throw the bell crank levers in different angular directions for the purpose of shifting to the upper or lower banks of type as preferred.

The bell crank levers on the two sides of the machine are divided into sets just as the type bars and rods C^6 are divided, and the pairs of bell cranks of the two sides are connected by different pivot rods D^{21} and D^{22} respectively, which are adapted to connect the common type-shift bar D^{13} with the rocker arms for the purpose of shifting the type bars.

Each of the coupling bars D^{23} , D^{24} is provided with a slot D^{25} within which the rod D^{13} lies when the coupling bar is lifted (from the position seen in Fig. 3 to that in Fig. 4), and with a heel D^{26} for engagement with a convenient stop or stops here shown in the form of a rod D^{27} to prevent movement of the coupling bars toward the right when they are in their lowered positions (Figs. 4 and 5).

It will be obvious that with both coupling bars of either set in lowered positions, the heel D^{26} of one bar D^{23} will prevent movement of that bar to the right, checking clockwise turning movement of the rocker arm (Figs. 3-5) and the heel D^{26} of the other bar D^{24} will prevent movement of this second bar to the right, checking counter-clockwise turning movement of the rocker arm. Together the heels of the two bars will thus hold the rocker arm for that set stationary, maintaining the type bars in normal (middle) position.

The top openings of the slots D^{25} in these coupling bars D^{23} , D^{24} , normally do not quite register during the initial lifting of the cou-

pling bars with the normal position of the type-shift operating bar D^{13} . Therefore, full upward movement of these coupling bars cannot take place until the type-shift operating bar D^{13} has been moved slightly to the right (from the position of Fig. 3 to that of Fig. 4) by partial depression of a printing key. This is a preferred construction which, along with the diagonal direction of the slot (the undercutting), is used to insure retraction of the parts, and to maintain connection of the bar D^{13} with the coupling bar even when the shift key is prematurely released.

Prior to initial movement of a printing key, lifting of a coupling bar does not engage the type-shift operating bar within the appropriate slot D^{25} as the edge, overhang, or nose D^{28} of the coupling bar in that case strikes the type-shift operating bar D^{13} .

The remainder of the type shifting structure is selective rather than itself operative of the shift mechanism, and is concerned with the lifting of the proper coupling bar of either set to connect the type-shift operating bar and the coupling bar, so that the printing key by its depression will cause the shift of the type bar as well as its printing stroke.

It might be here noted that this double function of the printing key to shift the type bar to change the bank of type used (*i. e.*, the face presented) and also to cause the bar to print, makes it desirable to stop the movement of the type-shift operating bar D^{13} just before the impression of the type upon the paper so as to prevent smudging of the printed character, which would result from a combined striking and shifting movement at the time of contact. The type-shift operating bar D^{13} is stopped by bumpers D^{29} upon the adjoining parts of the side frame members, and which are engaged by the ends of the bar D^{13} to limit its stroke, permitting the lever D^5 to continue to move. During the extra movement of the type bars, the S levers continue to move forward, and this additional movement is accommodated by slots D^{12} , whose side walls move with respect to bar D^{13} . This movement of the S levers with respect to the bar D^{13} is resisted by springs D^{15} which subsequently cause retraction of the parts.

As stated, one reason for my preferring that the bar D^{13} in retracted position shall normally lie further to the left in the figures than the slots D^{25} of the coupling bars when they are in normal position, is that by undercutting these slots I can use the spring retraction of the type-shift operating bar D^{13} as a means of reliably bringing back to normal position the coupling bar D^{23} or D^{24} which has been last used; *i. e.*, until the heel D^{26} on the other bar D^{24} or D^{23} engages stop

D²⁷. The undercutting replaces the type bars in normal position without requiring carefully balanced retracting springs or other complicated construction to return the type bars and connecting parts, and forms a simple and effective full-stroke device.

The fact of full stroke retraction will be better understood when it is considered that the bar D¹³ will continue to cling to the right hand under edge of the nose D²⁸ during all of the return stroke, and this carries the coupling bar back until the heel of its mate will permit no further (opposite) movement of the first. The heel of the bar returned will then fall over the top of stop rod D²⁷.

Where the coupling bars D²³, D²⁴ are not intended to be lifted immediately with operation of the shift keys but are to wait instead for partial movement of the printing keys to move the type-shift operating bar D¹³, as in the form shown, preferred for the reasons indicated, it is quite desirable to split the movement of the selective or trigger setting key levers into two parts each, so that one of these can be given an immediate movement corresponding substantially to the movement of the printing keys while the final movement takes place later. This is conveniently arranged by splitting the key levers into two parts so that the initial movement can be provided by one part and movement of the other part of each key lever can lag behind the movement of the printing keys to any extent desired. This permits all of the keys, printing and type bank selecting (for convenience called shifting), to be given a uniform speed and extent of movement, providing full hand operation without especial accommodation of the fingers or thumb.

There is another reason for preferring to split the "shift" key levers into two parts each, in that the desired lifting function upon the coupling bars can be performed more conveniently in this way and with a smaller angular movement of any of the parts through the height of the machine, making the machine more compact than would otherwise be practicable.

Still another reason lies in the easier counterbalancing of the parts and the preferred location in an easily accessible position of any resilient connection which is to be interposed between the shift button and the coupling bars.

For the purpose then of more conveniently and effectively performing the function of resiliently lifting the coupling bars D²³ and D²⁴, I have divided the levers in the construction shown in the drawing so that all of the shift-key levers are formed in the same manner of two parts each, shown at D³⁰ and D³¹. One key lever on each side of the machine is connected to the coupling

bar D²³ on that side of the machine and the other key lever on each side of the machine is connected to a coupling bar D²⁴.

The arms D³⁰ and D³¹ for each divided lever are conveniently pivoted upon the same pivot pin, whether A¹¹, A¹² or A¹³, and are resiliently connected by means of springs D³² connecting extensions D³³ of lever D³⁰ with any points D³⁴ to the right of the pivot of levers D³¹.

The retractive movement of lever D³⁰ with respect to lever D³¹ may be restricted by a laterally extending heel D³⁵ upon lever D³¹ shown at the left of its pivot point in the figures, which heel engages lever D³⁰ to hold the two levers normally in the position shown in Fig. 3. In addition to the spring D³², the two levers are normally lifted together to the position shown in Fig. 3 by a spring D³⁶ connected with the extension D³³ of lever D³⁰ and with any fixed frame point D³⁷.

The right-hand end (as shown in Figs. 3-5) of each lever D³¹ is connected with an intermediate point in the corresponding coupling bar D²³ or D²⁴, as the case may be, by a link D³⁸, pivoted to the lever and arm. Since the resilience between D³⁰ and the bar D²³ or D²⁴ has been inserted between the parts D³⁰ and D³¹ of the lever, it is not necessary to make this link connection resilient to give it lost motion.

In operation:—It will be seen that depression of any shift key acts, through its arm, spring D³², arm D³¹ and link D³⁸, to strain the corresponding coupling bar D²³ or D²⁴ upwardly, but that the bar cannot lift until partial depression of one of the printing keys on either side of the machine causes the type-shift operating bar D¹³ to move past the nose D²⁸ into line with the slot D²⁵. The lifting of the coupling bar, when thus effected, releases its heel D²⁰ from engagement with the stop bar D²⁷, permitting the bar lifted to move to the right in the figures. This movement will take place as soon as further depression of the printing key causes further movement of the type-shift operating bar D¹³, turning the type bar rocker arm D¹⁶ in a clockwise or counter-clockwise direction to lower or lift the type bars according to which coupling bar, D²³ or D²⁴, is operated. In either event the other coupling bar will move to the left, a movement permitted by its heel D²⁰ since the lower, preferably straight portion of the coupling bar adjoining the heel merely slides upon the stop D²⁷.

Paper feed.

The paper feed and ribbon feed are both operated through the movement of bar or bars D⁹ and correlated parts. I prefer to operate the paper feed from lever arms D¹⁴ of rocker arms D⁷ since these lever arms D¹⁴

move in a generally up and down direction which is convenient for operation of the paper feed mechanism in the position which I deem most suitable.

Obviously other positions of the feeding mechanism would be more readily operated by different directions of movement and the mechanism with which the paper feed is most closely connected will depend upon a number of factors of which the position of the gripping mechanism itself is only one. The same comment applies to the many other features of construction described, in which I have illustrated a preferred form, as required by the statute, but in which various other forms will suggest themselves to the designer in view of my disclosure.

I prefer to have the gripping edge E^1 of the feed mechanism operate about the upper circumference of the platen C^{25} . The edge E^1 is shown as comprising the lower edge of the metal bar E^2 connecting sides E^3 , E^4 of a yoke E^5 pivoted conveniently about the axis of the platen. I show elongated openings or slots E^6 at the pivot points in order that the yoke may lift and lower with respect to the pivot point. The advantage of pivoting about the axis lies in the fact that the slot lengths can then be restricted to the extent of lifting and lowering movement desired with respect to the axis and need not take care of any eccentricity of the arc of movement of the yoke with respect to the circumference of the platen.

The yoke is provided with an ear or ears E^7 , to which a link E^8 is connected at one end, the lower end being connected conveniently, as stated, to the arm D^{14} . A lug E^9 provides a convenient fastening for spring E^{10} , previously referred to, which retracts the S bar and the yoke E^5 .

In operation:—The paper passing between the gripping face E^1 and the platen C^{25} will be advanced by downward movement of the outer end of arm D^{14} , which takes place during retraction of this arm and the S levers (*i. e.*, on the return or non-printing part of the stroke).

The platen moves along with the paper. However, on the upward movement of the arm D^{14} the yoke edge, instead of being drawn nearly radially toward the platen, will tend to lift away from it because of the upward thrust and the presence of the slots E^6 . At the same time it will swing in a counter-clockwise arc (Fig. 6) about the platen, with the result that the yoke will not carry the paper, nor the platen with it, in this direction of movement.

Though I deem this operation reasonably reliable with the mechanism indicated, I additionally insure the operation by providing a drag upon the paper and platen to prevent too easy movement in either direction. This

is accomplished by means of a mouse-trap spring E^{11} , bearing against the paper E^{12} at the middle of the spring, secured about a ribbon guide rod E^{13} , and held at the opposite end by engagement with any fixed part.

Ribbon feed.

The ribbon feed is most conveniently operated from the arm D^9 , in the design shown, but obviously might be connected to take advantage of movement of other parts of the present mechanism, or of other mechanisms operated from the key levers. I have planned to have the ribbon feed take place upon the opposite movement of the key lever to that upon which the paper feed is operated, and have selected the downward stroke of the key end of the levers for the ribbon feed in order to give positive movement and to avoid necessity for sufficient spring retraction to overcome sticking, which spring would oppose each printing stroke. I advance the ribbon so slightly at each stroke that there is no objectionable strain upon the ribbon and no smudging of the impression from its movement. The direction of movement upon which this is operated is not of much importance.

The ribbon shown as rolled at F^1 and F^2 is wound back and forth between shafts F^3 F^4 , and between them is guided past the type bars and platen by rods E^{13} and F^5 .

I have preferred to use a planetary gear construction for the ribbon feed and to operate it by a pawl and ratchet mechanism, of which the ratchet is carried by the gear support so that the planetary gear and ratchet can be shifted to feed the ribbon in either direction without interfering with the engagement of the pawl with the ratchet.

For this purpose I show a pawl F^6 , which is pivoted at F^7 upon the upper arm D^9 of the S lever. The pawl is held in normal engagement with a ratchet wheel F^8 by a spring F^9 , which is secured at one end to a lug F^{10} , movable with the arm D^9 , and at the other end to a heel F^{11} . Tooth end F^{12} of the pawl therefore swings in a nearly tangential line across the teeth of the ratchet wheel F^8 and the relation between the pawl F^6 and the ratchet wheel is not appreciably disturbed by moving the ratchet wheel bodily so that its adjoining surface follows the general tangential path. This permits me to mount the ratchet wheel F^8 to turn freely about a pin F^{14} fixed in a ribbon shift lever F^{13} at a distance above the rod D^{18} , about which this lever is pivoted.

The ratchet wheel carries a planetary gear unit, preferably a single gear F^{15} , of uniform diameter, which turns freely about its shaft F^{16} and engages on the interior with two gears F^{17} and F^{18} , of equal pitch

but of different diameter or of equal diameter but different pitch, or both may be different.

Of the sun gears F^{17} and F^{18} the former, 5 that nearer to the ratchet wheel F^8 , is keyed to the pin F^{14} , while the latter, that farther from the wheel F^8 , is loose upon the shaft F^{14} , but is secured to turn with a larger gear F^{19} freely mounted about the shaft F^{14} . 10 With swinging movement of the lever F^{13} to the right or left as the case may be, gear F^{19} comes into engagement with gears F^{20} and F^{21} respectively by which the shafts F^3 and F^4 are turned and the lever latches in 15 either of the two positions because of a snap or nose F^{22} fitting into appropriate recesses F^{23} in the two positions. The snap action is insured by a spring F^{24} , which tends to pull the shaft D^{18} of the lever toward the 20 body of the machine.

In operation:—The lever is set so as to bring the teeth of the gear F^{19} into engagement with one of the gears F^{20} , F^{21} . Normal right and left swinging movement of the 25 arm D^9 causes the pawl to move across and back over the teeth of the ratchet wheel, turning the ratchet wheel in one direction of movement and causing the planetary gear F^{15} to revolve about the shaft F^{14} as a center. 30 During one complete revolution of the gear F^{15} about the fixed gear F^{17} , its rotation about its own axis will be determined by the relative number of teeth in the two gears, and will rotate the movable gear F^{18} to an 35 extent corresponding to the difference in angles upon the gears F^{17} and F^{18} represented by their several engagements with gear F^{15} , (*i. e.*, to an extent equal to the difference in arcs spanned by the pitches of the teeth 40 upon the two gears). Evidently, it can be made to turn the movable gear F^{18} either forward or backward according to whether it has fewer or more teeth than the fixed gear.

45 Whatever the arrangement by which the movable sun gear is thus differentially driven with respect to the fixed gear, corresponding angular movement of the gear F^{19} ensues, turning the appropriate ribbon roll through 50 gear F^{20} or F^{21} .

It will be obvious that the exact connections shown can be greatly varied by the designer in view of my disclosure herein, and particularly that any part or parts of my 55 invention may be driven or controlled by or from different operating parts from those with which I have connected them.

It will also be evident that various parts of my construction are valuable individually 60 as well as in the combinations shown.

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

1. In a typewriting machine, two sets of 65 printing keys, a universal bar common to

both sets, ribbon and paper feed mechanisms operated by said bar, a second universal bar operated from the first universal bar, and separate type bar shifting mechanisms for the two sets of keys both operated by the 70 second universal bar.

2. In a multiple impression typewriter, the combination of two sets of type bars having each more than one impression face, 75 vertically shiftable to present different type faces, and separate shifting mechanism for the two sets whereby one bank of one set may be used with a different bank of the other set.

3. In a multiple impression typewriter, 80 the combination of two sets of vertically movable type bars, each having three type faces to the bar and normally striking upon the middle type faces, and a shifting mechanism operating upon the sets independently 85 to move the type bars upwardly or downwardly to utilize the other type faces.

4. In a device of the character stated, a type bar pivoted at its lower end and having a generally vertical position, a printing 90 key lever having a heel and pivoted at its inner end, spring retraction for the printing key, and a pusher bar pivoted to the heel of the key and to the type bar.

5. In a device of the character stated, a 95 type bar pivoted at its lower end and having a generally vertical position, a printing key lever pivoted near its inner end, spring retraction for the printing key and link connection between the printing key lever and bar 100 joining the latter eccentrically with respect to the pivot of the printing key lever.

6. In a device of the character stated, a type bar having type faces on one end and 105 pivoted at the opposite end, means for moving the bar longitudinally to present different printing faces, a printing lever for the bar, and pusher bar connections between the lever and type bar for causing the printing 110 of the type faces and having angular movement with respect to the type bar as it shifts longitudinally to present the different faces.

7. In a device of the character stated, a type bar moved longitudinally and also 115 adapted to swing about an axis in combination with rocker arm means for moving it longitudinally to positions above and below its normal position, and key-lever-operated means for swinging it to engage the type.

8. In a device of the character stated, a 120 divided shift key lever comprising first and second parts, a spring placing the second part of the shift key lever under tension when the first has been moved, a printing key lever, a bar moved by said printing key lever, 125 and type shifting mechanism moved by the second part of the shift key into engagement with the bar and operated by the bar.

9. In a device of the character stated, a two-part type shifting lever, the first part 130

being key operated, a spring between the first and second parts, tending to move the second part with movement of the first, a printing key lever, a type bar, lifting mechanism for the type bar, a shift operating bar, controlled by the printing key lever, and connections from the second part of the type shifting lever to the type bar lifting mechanism to cause it to engage with the type shift operating bar.

10. In a device of the character stated, a type bar, a printing key connected to operate the same, lifting devices connected with the type bar, a type shift operating bar controlled by the printing key, and a shifting key and connections adapted to engage the type lifting mechanism with the type shift operating bar.

11. In a machine of the character stated, a type bar, a rocker arm, shifting mechanism therefor, a printing key, a bar operated by the printing key extending transversely of the machine, and a resilient key-operated mechanism for engaging the rocker arm shift with the bar to cause the bar to tilt the rocker arm.

12. In a device of the character stated, a type bar having a plurality of printing faces, a printing key adapted to operate the type bar, a type shift operating bar controlled by the printing key, and separate key-operated mechanism having connections with the type shift operating bar to shift the type bar.

13. In a device of the character stated, a type bar having three type faces and adapted normally to print the middle type face, a printing key for moving the bar forward to cause the type to print, a rocker arm adapted to bring either extreme type face into printing position according to the direction of rocker arm movement, a pair of coupling bars connected with said rocker arm to rock it in different directions, a type shift operating bar moved by the printing key and shift keys and connections for bringing either of said coupling bars into engagement with said type shift operating bar to rock the rocker arm in either direction desired.

14. In a device of the character stated, a type bar having a plurality of type faces and in generally vertical position, a printing key lever adapted to move the bar horizontally about the lower end as a pivot, and type bar shifting mechanism adapted to lift or lower the pivot point at will to bring different type faces into printing position.

15. In a device of the character stated, a type bar having a plurality of printing faces and pivoted at its lower end, a printing key lever and connections adapted to move the bar horizontally to cause the printing therefrom, a type shift operating bar moved by

the printing key, and type shift key levers and connections for coupling the type bar pivot point with the type shift operating bar to lift or lower the pivot point at will.

16. In a device of the character stated, a type bar having a pivot point at the end farthest from the type, a printing key lever and connections adapted to throw said bar to print, a type shift operating bar controlled by the printing key lever, a pair of coupling bars adapted to be connected one at a time to the type shift operating bar, connections between the coupling bars and the pivot point of the type bar, and separate shift key levers and connections for engaging either of the links with the type shift operating bar at will to move the type bar pivot point and change the type in printing position thereon.

17. In a device of the character stated, a type bar having a plurality of type faces thereon and having a pivot point at the farther end thereof, a printing key lever and connections for causing the said type to print, a universal bar operated by said key lever, a type shift operating bar controlled horizontally from the universal bar, a pair of coupling bars having their ends below the type shift operating bar and adapted to engage with it, a double rocker arm having the opposite ends of the coupling bars connected with opposite lever arms thereof to tilt the rocker arm in different directions according to which coupling bar engages the type shift operating bar, means for selectively engaging the coupling bars with said type shift operating bar, and stop mechanism upon the coupling bars restraining them from movement, and restraining movement of the rocker arm when neither link is engaged with the type shift operating bar.

18. In a device of the character stated, a type bar having a plurality of printing faces and having a pivot point at the end thereof opposite the type, a printing key lever and connections therefor, a double rocker arm connected with the type bar pivot to lift and lower the same, coupling bars connecting with opposite arms of said rocker arm and having lugs thereon, a stop engaging said lugs in normal position to maintain the rocker arm in intermediate setting, a type shift operating bar movable longitudinally of the machine, and separate type shift levers connected with said coupling bars to free them from the stop, one at a time, and connect them with the type shift operating bar to shift the type bar.

19. In a machine of the character stated, a type bar pivoted at one end and having three type faces at the opposite end, a double rocker arm connected with the type bar pivot, coupling bars connected with the two remaining arms of the rocker arm and mov-

able in reversed directions with movement of the rocker arm, stop mechanism engaging said coupling bars to prevent a movement of the same in one direction, normally locking the rocker arm, a type shift operating bar adapted to move longitudinally of the machine, and lifting mechanism for freeing one or other of said coupling bars from the stop and engaging it with the type shift operating bar to shift the type bar longitudinally.

20. In a machine of the character stated, a type bar having a pivot point at one end and type at the opposite end, a printing key lever and connections therefor, a coupling bar for varying the type presented for printing, a type shift operating bar movable longitudinally of the machine, a stop preventing movement of the coupling bar, and a shift key lever and connections for releasing the coupling bar from the stop and connecting it with the type shift operating bar to cause shifting movement of the type bar.

21. In a device of the character stated, a type bar having upper, lower and intermediate faces, a printing key lever and connections for throwing the bar to print from one of the faces, a shift lever for said type bar adapted to move a different face into position to be printed by operation of the printing key lever, a type shift operating bar controlled by the printing key lever, a stop and connections from the shift lever adapted to engage the stop or the type shift operating bar at will.

22. In a device of the character stated, a type bar having a plurality of printing faces thereon, a printing key lever and connections therefor, a T lever having the stem connected to the type bar and pivoted at the intersection of the stem and head, a pair of coupling bars pivoted thereto at the head extremities, and a stop mechanism engaging both coupling bars to prevent movement of said coupling bars in one direction and permitting movement thereof in the opposite direction.

23. In a device of the character stated, a type bar having a plurality of printing faces thereon and pivoted at the end opposite said faces, a printing key lever connected to the bar, a link-controlled mechanism for shifting said pivot point, a type shift operating bar providing link movement, and shift-key-operated swinging mechanism for the link or links causing them to engage with the type shift operating bar.

24. In a device of the character stated, a type bar having type at one end and pivoted at the other end, a printing key lever and connections therefor, a shifting lever and slotted connections for changing the pivot point of the type bar, a type shift operating bar controlled by the printing key lever and normally out of register with the slot in the

shifting connections, and shift-key-lever-operated resilient mechanism tending to engage the shift lever connections and adapted to cause them to engage with the type shift operating bar during the movement of said type shift operating bar.

25. In a device of the character stated, a type bar pivoted at its lower end, a printing key lever and connections therefor, shifting mechanism connected with the pivot point, a type shift operating bar controlling said mechanism, and resilient means for causing the pivot-shift mechanism to engage the type shift operating bar at an intermediate point in the movement of said bar.

26. In a type bar shifting mechanism, a type bar having a plurality of printing faces, connections for lifting said type bar, a universal type shift operating bar, normally not interfitted with said connections but adapted to interfit therewith after partial movement of the type shift operating bar, a type shift key lever and resilient connections tending to bring said type shift operating bar and type bar connections into cooperating relation, a printing key lever, and means for moving the type shift operating bar by reason of movement of the printing key lever.

27. In a type bar shifting mechanism, a type bar having three printing faces, a rocker arm connected with said type bar and having two operating arms, coupling bars connected with said operating arms and having notched ends, a type shift operating bar normally out of line with the notches, two two-part shift key levers adapted to lift the coupling bars, one at a time, to bring their notched ends into engagement with the type shift operating bar, springs between the parts of the shift key levers, a printing key lever, and connections between the printing key lever and universal type shift operating bar to move the type shift operating bar, first to permit interfitting with the notch of one of the coupling bars and subsequently to move said coupling bar and shift the type bar.

28. In a type bar shifting mechanism, a type bar having three printing faces, a rocker arm connected with said type bar and having two operating arms, coupling bars connected with said operating arms and having notched ends and stops upon their opposite faces, the stops permitting movement in one direction but preventing movement in the opposite direction, a type shift operating bar normally out of line with the notches, two two-part shift key levers adapted to shift the coupling bars to bring their notched ends, one at a time, into engagement with the type shift operating bar, springs between the parts of the shift key levers, a printing key lever and connections between the printing key lever and universal

type shift operating bar to move the type shift operating bar first to permit interfitting with the notch of one of the coupling bars and subsequently to move said bar and shift the type bar.

29. In a type shift mechanism, a vertically movable type bar having different type faces, a rocker arm for shifting said type faces, a printing key lever, connections between the printing key lever and type bar, a coupling bar connected with the rocker arm, a type shift key lever, a type shift operating bar moved by reason of movement of the printing key and cooperating devices between the type shift key lever and coupling bar tending to cause engagement between the type shift operating bar and coupling bar, ineffective until partial movement of the type shift operating bar.

30. In a type bar shifting mechanism, a type shift operating bar, a printing key lever, a universal bar operated thereby, a link movable with said universal bar, a spring between said type shift operating bar and link, normally moving the type shift operating bar with the link, a type bar, connections between the type bar and type shift operating bar capable of shifting the type bar with movement of the type shift operating bar, a shift key lever, and devices for causing the connections of the type bar to engage said type shift operating bar, and a stop for the type shift operating bar engaged by it and limiting its movement and stretching the spring just before the type bar makes contact with the paper.

31. In a type bar shifting mechanism, a printing key lever, a type bar having a plurality of type faces, connections between the key lever and bar causing printing of the type, a rocker arm engaging said type bar to shift it, a link connected with the rocker arm, a universal type shift operating bar en-

gageable by said link, a type shift key lever and connections for bringing said link into engagement with the type shift operating bar, a universal bar operated by the printing key, connections between the universal bar and type shift operating bar, including a spring for permitting independent movement between them, and a stop engaged by the type shift operating bar just before printing of the type face on the paper to stretch said spring and limit shifting of the type bar.

32. In a type bar shifting mechanism, a type bar having different type faces thereon, a shifting lever and connections for said bar, one of the parts being notched, a universal type shift operating bar normally out of line with said notch, a type shift key lever and connections, resiliently pressing said type bar connections against the universal type shift operating bar, and a printing key lever and connections moving said type shift operating bar to permit engagement with the notch and thereafter cause movement of the type bar through its connections.

33. In a multiple impression typewriter, a plurality of type bars in generally vertical position each carrying a plurality of type faces, swinging supports for said type bars at the lower end and at an intermediate point, the supports being longer between pivot points at the intermediate point than at the lower ends, and lifting mechanism swinging one of these supports to shift the type bars.

34. In a multiple impression typewriter, a plurality of type bars, swinging supports for said type bars at intermediate points and at lower ends of the bars upon different arcs of movement, and shift mechanism throwing the bars by movement of the lower supports.

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