

Dec. 11, 1945.

S. H. PLUM, 2D

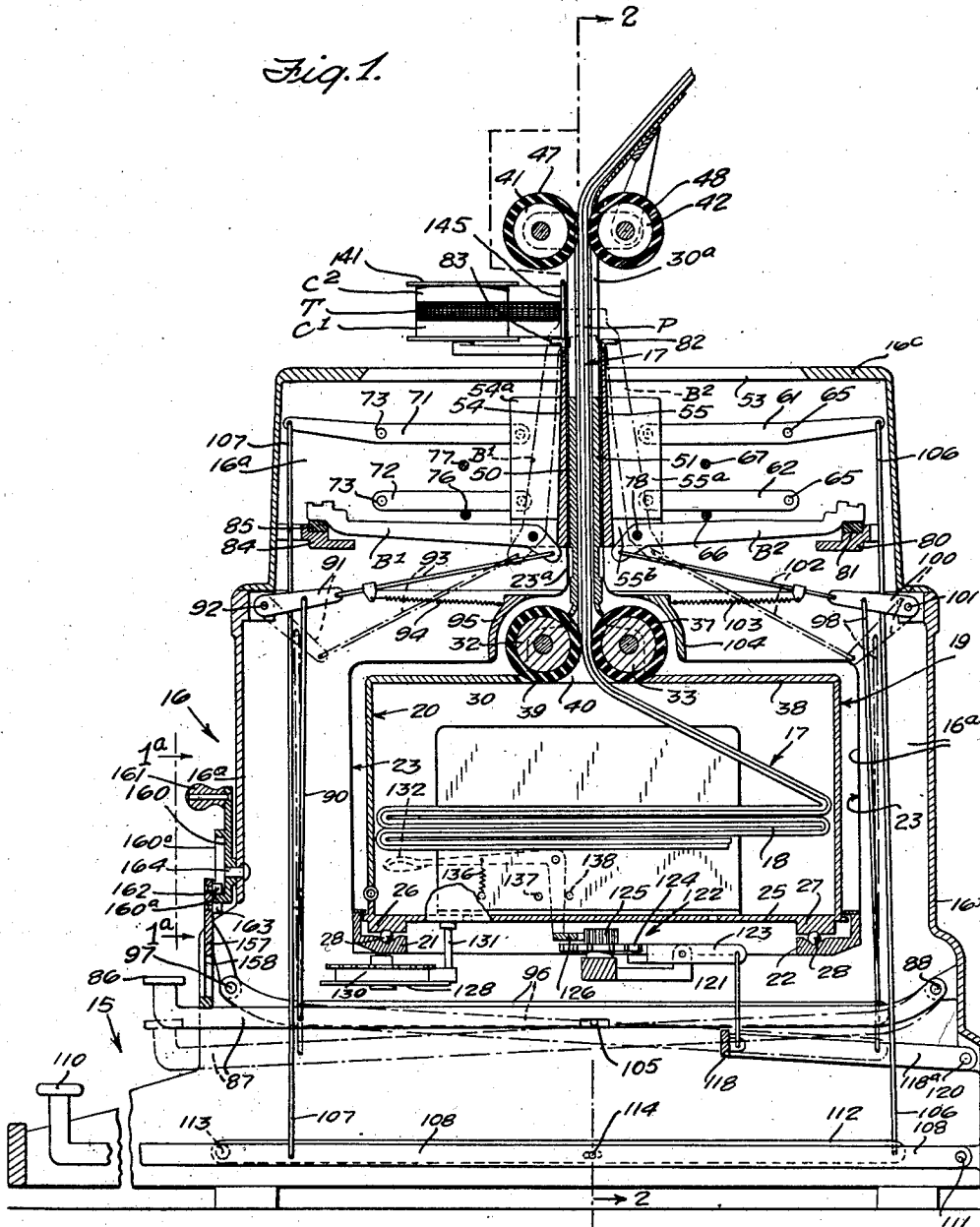
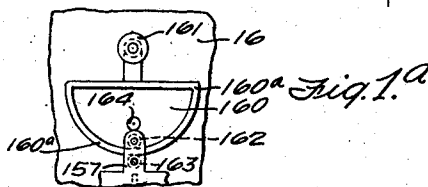
2,390,554

TYPEWRITING AND MANIFOLDING

Filed Feb. 23, 1940

4 Sheets-Sheet 1

Fig. 1.



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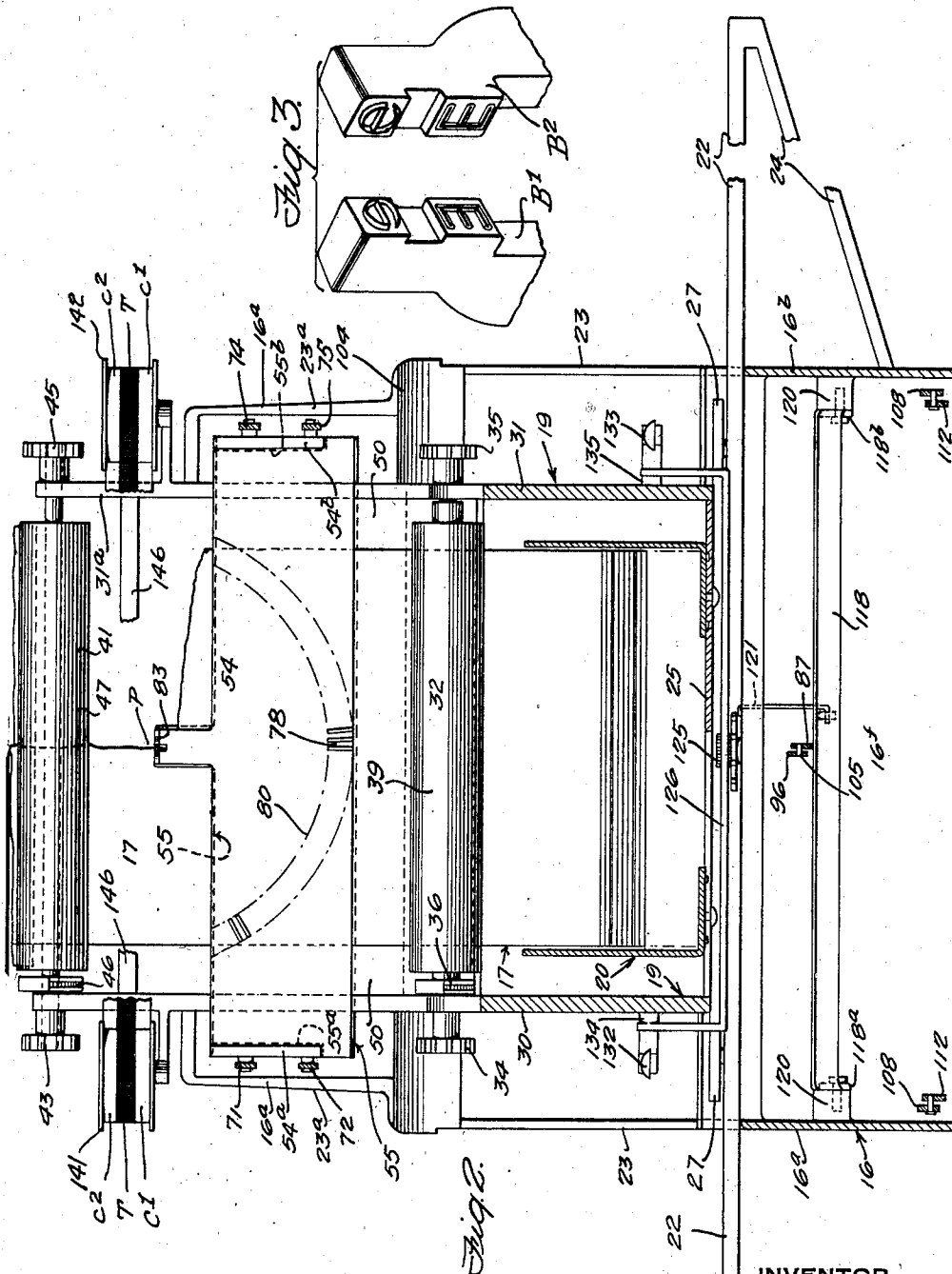
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TYPEWRITING AND MANIFOLDING

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4 Sheets-Sheet 2



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TYPEWRITING AND MANIFOLDING

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4 Sheets-Sheet 3

Fig. 4.

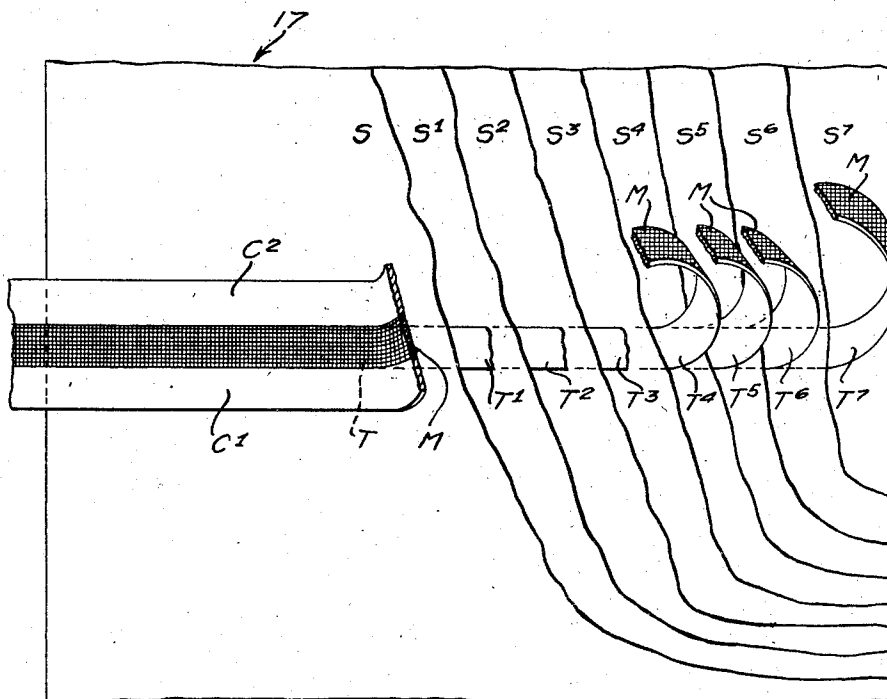
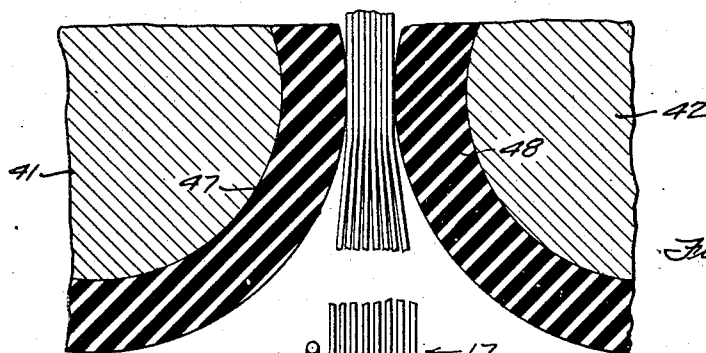
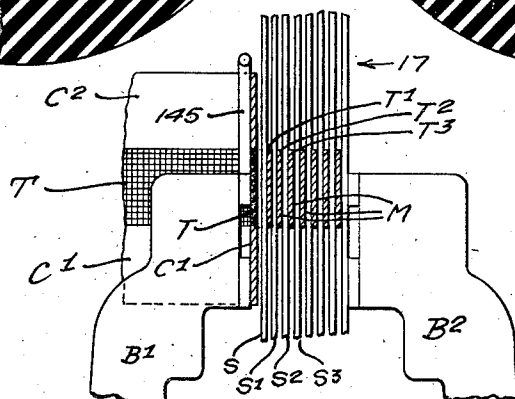


Fig. 5.



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TYPEWRITING AND MANIFOLDING

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4 Sheets-Sheet 4

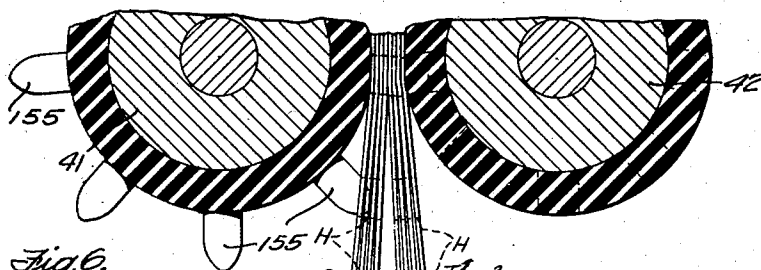


Fig. 6.

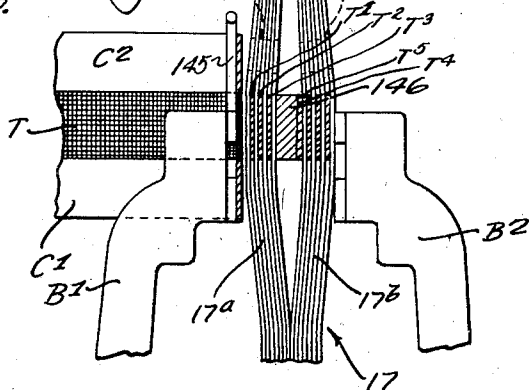
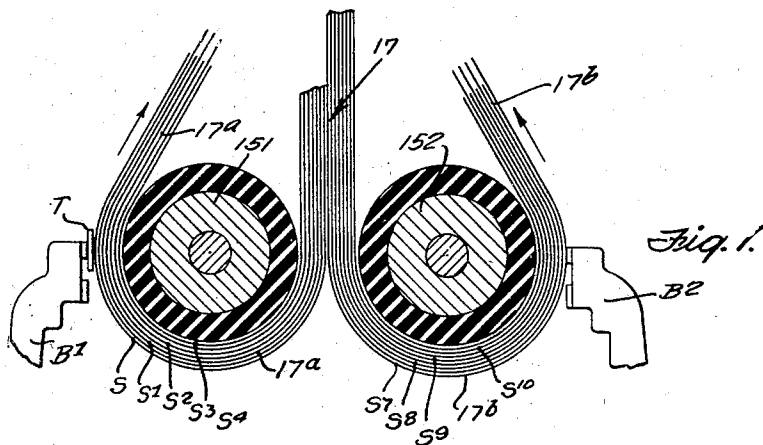


Fig. 1.

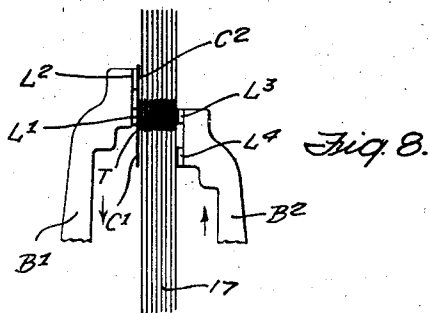


Fig. 8.

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UNITED STATES PATENT OFFICE

2,390,554

TYPEWRITING AND MANIFOLDING

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Application February 23, 1940, Serial No. 320,398

14 Claims. (Cl. 197—126)

This invention relates to a method and apparatus for typewriting and manifolding.

One of the objects of this invention is to provide an improved typewriter construction of greater printing or typing capacity, and capable of embodiment in inexpensive, dependable and rugged form. Another object is to provide a construction of the above-mentioned character in which manifolding or the making of "copies," such as carbon copies, will be simplified and will be carried on with greater facility, greater efficiency and greater clarity of reproduction. Another object is to provide a method and apparatus capable of achieving reproduction as by so-called carbon or like or other transfer material, in greater quantity or number than has heretofore been possible. Another object is to provide a method and apparatus of type movement or control for improving generally the production of "copies" as by a transfer material, to achieve greater precision and clarity of such reproduction, and to carry out such objects by way of an apparatus that will be inexpensive in construction, efficient in action and easy to operate. Another object is to provide a method and apparatus for increasing the number of duplications or copies made by the use of a transfer material over what has heretofore been possible.

Another object is to carry out such objects as those noted above by way of apparatus in which may also be embodied mechanisms or devices usually and by now of standard or well known construction, such as, carriage advancing mechanism, carriage release, back spacer, etc., etc., as are usually controlled from a standard type of keyboard and such as are usually found desirable in typewriting machines and manifolding machines. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts and in the several steps and relation and order of each of the same to one or more of the others, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which are shown by way of illustration several of the various possible embodiments of the mechanical features of my invention,

Figure 1 is a transverse sectional view showing the complete apparatus;

Figure 1^a is a fragmentary front elevation as seen along the line 1^a—1^a of Figure 1;

Figure 2 is a longitudinal sectional view as seen along the line 2—2 of Figure 1;

Figure 3 is a detached schematic perspective view on an enlarged scale showing one form of construction and arrangement of coacting type bars;

Figure 4 is a plan view, with parts progressively broken away, showing one form of interrelationship between the sheets of paper and a transfer material;

Figure 5 is a fragmentary transverse sectional view on an enlarged scale showing one form of type bar action upon the stack or batch of sheets;

Figure 6 is a view like that of Figure 5 showing a modified form of construction and arrangement;

Figure 7 is a view like that of Figure 5 showing another form of arrangement;

Figure 8 is a detached fragmentary end elevation illustrating a form and method of shift for selection between upper and lower case.

Similar reference characters refer to similar parts throughout the several views in the drawings.

Referring first to Figures 1 and 2, I prefer to embody the features of my invention in such a way that any type or arrangement of keyboard and associated parts thereof, such as are available in several standard forms, may be employed; indicated generally at 16 in Figure 1 is a frame providing at the lower forward portion thereof a suitable opening or space in or at which are exposed the keys, preferably arranged in any suitable or standard arrangement to form a keyboard generally indicated at 15. This keyboard, aside from including keys bearing the letters of the alphabet, numbers, punctuation marks, and other signs, or the like, may include also such other keys, devices and controls as may be desired and preferably in such form or forms as are found in present-day typewriter or manifold machine construction, since, as will be readily understood by those skilled in this art, the various features of my invention are capable of embodiment in such mechanical form as to readily facilitate embodiment thereof in combination with such other controls, keys, devices and related mechanism, or vice versa. Accordingly, I have not shown such other keys, controls and related mechanisms in the drawings, and have preferred to confine the drawings and the ensuing description only to such mechanism or parts appropriate to typify the carrying out in practical form of the various features of my invention.

To better illustrate the various features of my invention, let it be assumed that the apparatus

is intended for manifolding and is to employ a web made up of any desired number of individual and superimposed sheets of paper; in Figure 4 such a web is generally indicated at 17, being in width appropriate to the capacity of the machine as to width and by way of illustration the individual sheets S, S¹, S², S³, etc., superimposed upon each other may be of a width of say eight inches. This composite web may be of any suitable length and usually and preferably is, throughout its length, subdivided or sectionalized by transverse perforations spaced along at, for example, ten inch intervals, each section thus representing the size of a letter-head, bill-head, or the like. Preferably, the web 17 is initially folded back and forth upon itself along these lines of perforation, thus to form a stack of any suitable thickness or height and in Figure 1 I have indicated at 18 a portion of such a stack. It is preferably in such stacked form that the composite web 17 is furnished or made available and in such case I prefer to provide the apparatus with a magazine 20 (Figures 1 and 2) for receiving such a stack 18, thus to charge the apparatus with the paper to be employed.

From the magazine 20 the web is fed and supplied in preferably an upward direction to the printing point and where such a magazine is to be employed I preferably arrange it as part of a carriage, generally indicated at 19, so that it will partake of step-by-step movement, say to the left, in response to the actuation of the keys of the keyboard. And in such case I prefer to provide guideways or rails 21, 22 that extend in spaced relation through the frame 16, the end members 16^a and 16^b of which are provided with suitable openings 23, 23 through which the parallel spaced rails 21, 22 extend and through which also the carriage 19 may pass according to the direction of its travel lengthwise of the rails.

The rails 21, 22 may be given any suitable shape or cross-section, preferably somewhat angular, as is better shown in Figure 1, thus to interfit with the corners of the openings 23, 23 so that the latter may aid in supporting and alining the rails, and they may be secured in position in any suitable way. Since they preferably overhang both sides of the machine (see Figure 2) suitable brackets 24 may be employed to aid in supporting and bracing the overhanging portions of the rails.

The overhang of the rails at both sides of the machine is sufficient to accommodate the carriage 19 with its magazine 20 and the web that is supported and fed upwardly therefrom, as is later described, in the two extremes of travel appropriate to traversing the web crosswise relative to the printing point.

The magazine 20 may be given any suitable construction, illustratively in the form of a box or tray-like structure, as shown in Figures 1 and 2, and may have for its bottom the base or bottom 25 of the carriage 19 provided on its under side with spaced rails 26, 27 for coaction respectively with the spaced supporting rails 21, 22, and if desired and preferably the coacting rails may be interrelated to each other in any suitable way as by interposing roller or ball members 28 therebetween, to reduce friction and thus to make for greater ease of step-by-step movement of the structure in one direction and its return movement in reverse direction.

Extending parallel to each other and upwardly from the base 25 of the carriage 19 are two upright side frames 30 and 31, thus forming part of the carriage 19, and substantially centrally of

the magazine 20 and overlying it members 30 and 31 have journaled therein two feed rollers 32, 33 suitably geared together, if desired, and provided with suitable means, such as the thumb or hand-wheels 34, 35 (Figure 2) and preferably a yieldable pawl and ratchet mechanism 36 whereby one or both of the feed rollers 32, 33 may be manually rotated. Also, the feed rollers are preferably arranged in any suitable manner to grip therebetween the web 17, as shown in Figure 1, and preferably to accommodate themselves to various thicknesses of web. Illustratively, for this latter purpose, the feed rollers 32, 33 may be provided preferably each with a relatively heavy outer layer or sleeve 36, 37, respectively, of a resilient and yieldable material like rubber, the upper wall 38 of the magazine 20 being cut away or provided with a longitudinally extending opening 40 to expose the feed rollers 32, 33 appropriately to receive the web 17 from the stack 18 within the magazine 20.

The side frame members 31, 30 are extended upwardly as at 30^a and 31^a, as appears better in Figure 2, and at their upper ends the extensions 30^a, 31^a rotatably support feed rollers 41, 42, preferably arranged and constructed the same as rollers 32 and 33 and hence having thumb or hand-wheels 43 and 45 with a ratchet mechanism 46 (Figure 2) and again being preferably arranged to yieldably grip the web therebetween, as by outer sleeve-like portions 47 and 48 of a resilient and yieldable material like rubber.

The two pairs of feed rollers 32—33 and 41—42 will thus be seen to be spaced vertically from each other and with the web 17 brought up between the rollers of each pair, the web may thus be supported with suitable tautness, generally in a vertical plane at a suitable point in which as at P (Figures 1 and 2) is located the printing point or the point to which the type, preferably in the form of type bars, is moved to make the printing impression.

To facilitate charging of the pairs of feed rollers and to aid in supporting the web 17 therebetween, I preferably provide guiding means which conveniently and preferably take the form of two spaced plate-like members 50 and 51 extending vertically and parallel to each other from the discharge side of the lower rollers 32, 33 where, preferably the guide plates 50, 51 are curved or made divergent at their lower ends to facilitate entry of the web into the space between the guide plates 50, 51 as the web passes out from in between the lower rollers 32, 33. Guide plate members 50, 51 extend upwardly to a suitable extent, as indicated in Figure 1, and are held in position in any suitable way as, for example, by securing them at their vertical edges, to the extensions 30^a and 31^a of the side frames 30, 31, respectively, of the carriage 19, whence the guide plates 50, 51 also take part in strengthening or forming part of the carriage 19 forming virtually rigid cross ties between the upward extensions 30^a and 31^a of the side frames.

The frame 16 may be built up in any suitable way and its end walls 16^a and 16^b, apertured as at 23, 23, as above-described, are, furthermore, cut away or slit, as at 23^a (Figures 1 and 2) to form upward extensions of the apertures 23, 23 of sufficient width to permit free movement through these slotted portions 23^a of the upward extensions 30^a, 31^a of the carriage, together with the parts carried by these extensions, such as the guide plates 50, 51 and the lower rollers 32, 33, while the top 16^c of the casing 16 is also cut away

as at 53. Thus, the carriage 19 may freely move back and forth along the rails 21, 22, the apertured or slotted portions of the casing-like frame 16, as just described, insuring freedom of movement of the various parts of the carriage therethrough.

In the upper portion of the frame 16 and one on each side of the plane of the web 17, as the latter is held or positioned for printing between the upper and lower pairs of rollers 32—33 and 41—42, are supported preferably movable frames 54, 55 for supporting two sets of type bars of which type bar B¹ in Figure 1 is intended to typify or illustrate one set of type bars associated with and carried by the frame 54 and of which type bar B² is intended to typify the type bars associated with and carried by the frame 55.

Frames 54 and 55 are preferably movably mounted and may be of similar construction. Thus, frame 55 may have at its ends flanges or end parts like the parts 55^a and 55^b of Figure 2 by which movability of mounting may be achieved, but preferably in a manner to insure that the frame moves parallel to itself. For this latter purpose, I may utilize two pairs of parallel links such as one pair of links 61, 62, at one end of the frame 55, and a companion pair of parallel links (not shown) at the other end of the frame, these links being pivotally connected to the frame 55, preferably by way of the end parts 55^a and 55^b of the frame, while the other ends of the links are pivotally supported in the ends 16^a and 16^b of the casing-like frame 16. Suitable studs or pins, as indicated at 65 in Figure 1, may serve to form a pivotal support in the end walls for the parallel links. Likewise, vertically spaced studs or pins 66 and 67 in the ends of the frames may conveniently serve to limit the upper and lower positions which the frame 55 may assume in the manner later described; in Figure 1 link 62 rests on the stop pin 66 and in coaction with a similar stop pin (not shown) engaging the companion link (not shown) at the other end of the frame, frame 55 is dependably held in its lowermost possible position. If frame 55 is moved upwardly, it moves parallel to itself and its uppermost position is fixed by pin 67 and a companion pin (not shown) with which link 62 and its companion link (not shown) are respectively brought into engagement.

In a similar manner, frame 54 is mounted for movement by two pairs of parallel links of which, in Figure 1, links 71 and 72 are shown pivotally connected to the flange-like end part 54^a of the frame and pivoted to the end member 16^a of the frame by pins 73, 73, the end frame members also having vertically spaced pins 76 and 77 for limiting or fixing the extreme upper and lower positions of the frame 54 just as the two pairs of spaced pins 66, 67 function with respect to the frame 55 as above described.

At a suitable part of the frame 55, such as the lower part thereof and which is suitably constructed in any known manner for this purpose, are pivotally supported the various type bars of one set, so arranged that upon actuation the type-carrying ends thereof all move to the printing point P on the right-hand side of the web 17, as seen in Figure 1; the type bars are preferably of substantially identical or similar shape or conformation, like the type bar B² of Figure 1, being illustratively and preferably constructed in the form of a lever pivotally carried by the frame 55 as by the axis pin 78. Each type bar is in this manner hinged in a suitable slot in the lower portion 55^b of the frame which, in any known or

usual manner, is suitably curved and has the various slots for all of the type bars arranged on converging lines like radii, so that the type bars when individually actuated all swing their outer type-bearing ends to the printing point P.

Accordingly, the type bars when at rest, assuming, for example, the horizontal position shown in Figure 1, assume a fan-like disposition, there being provided interiorly of the upper portion of the frame 16 and suitably secured to the latter an arcuate bar 80 (Figures 1 and 2) preferably carrying a suitable upwardly exposed cushion 81, like rubber or the like, against which the outer ends of the type bars normally rest, as is clearly shown with respect to the type bar B² in Figure 1.

The type bars, like type bar B² of the set that is to the rear of the web 17, are suitably shaped or conformed, in any suitable or known manner, with preferably two letter or type formations, one for upper case and the other for lower case, but with the disposition of transfer material with respect to the sheets of the web 17, as is later described, the letter or type formations, constructed to be in relief, are the inverse of the type formations ordinarily found in typewriter constructions, that is, they are facsimiles in relief of the letters, numbers, signs, etc., and in Figure 3 I have shown the type head portion of the type bar B² on an enlarged scale with upper case letter "E" and lower case letter "e," and it will be seen that these type formations are facsimiles.

The upper portion of type bar frame 55 is provided with a suitably shaped type bar guide 82 (Figures 1 and 2), into the preferably tapered slot of which each actuated type bar enters to move its lower case letter or type formation to the printing point P. But upon shifting the frame 55 upwardly to the limit determined by the opposed studs 67, the type bars are similarly shifted upwardly and each actuated type bar again enters the slot of the type bar guide 82 and because of the shift the upper case type formation strikes at the printing point P.

The front type bar frame 54 is also provided with a type bar guide 83 (Figure 1) preferably of similar construction to that above described, and to coact with the type bars like bar B¹ also in the manner above described, there being within the frame 16 an arcuated type bar rest 84 provided with a suitable cushioning material 85 against which the type bars come to rest on their retrograde movement. The type bars of the front set, however, such as type bar B¹, carry type formations which are not facsimiles in relief of their respective letters, numbers, symbols, or the like, but are, as are usual in typewriter construction, the inverse of their respective letters, numbers, or symbols, as is better shown in Figure 3 where the type bar B¹, companion to the above-described type bar B², is shown on a larger scale to bring out more clearly the inverse type formation in relief for the lower case letter "e" and upper case letter "E," and to show also the companion or coacting relationship between the type formations on these companion type bars.

With the frame 54 in its lower position, actuation of a type bar swings the latter to bring the lower case type formation to the printing point P, while shifting the frame 54 to its upper position is effective to bring the upper case type formation of any actuated type bar to the printing point.

Thus, the type bars to the rear of the plane of the web 17 are mounted to move their respective

type formations to the printing point P from one side (the rear side) of the web 17, while the type bars on the other or front side of the web 17 are mounted to move their type formations to the same printing point P but from the other (the front) side of the web 17. Moreover, the type bar guides 83 and 82, as well as the formation of the type heads, are such that if two companion type bars, such as the bars B¹ and B², carrying the type formations for the letter "E," as shown in Figure 3, are simultaneously actuated, their respective type formations not only move to the same printing point P, but are in precise opposition and alinement with each other, and if the two type bar frames 54, 55 are simultaneously shifted, a similar relationship is maintained with respect to the other case of type formation of the two companion front and rear type bars. To achieve simultaneous or synchronized actuation of front and rear type bars from the keyboard, I may use any suitable form of mechanism, and in the drawings I have shown, by way of illustration, one possible form of mechanism for this purpose. Thus, in Figure 1, key 86 of the keyboard 15 is to actuate the "E" type bars B¹ and B² and the connection between the key 86 and the type bars, illustratively a mechanical system of connection, may comprise a key lever 87 extending rearwardly along the lower part of the frame 16 to a pivot 88 at its rearmost end, key 86 being mounted at its front end. A link 90 connects lever 87 to a lever 91 pivoted at an upper front portion of the frame, as at 92; lever 92 is connected to the short arm of type bar B² by a link 93.

Accordingly, if key 86 is depressed to swing key lever 87 in counter-clockwise direction about the pivot 88, link 90 swings lever 91 in clockwise direction and through link 93 lever 91 swings type bar B¹ to the printing position, the parts being suitably proportioned to insure suitable velocity of movement of the type head of the type bar and hence to insure adequacy of force of impact, the positions that these various parts assume with the type head at the printing point P being shown in broken lines in Figure 1.

Any suitable means may be employed to effect return to normal position of these parts at suitable velocity, for example, a spring 94 anchored to a suitable fixed part of the apparatus, such as a longitudinally extending member 95 that extends from end wall 16^a to end wall 16^b and, as shown in Figure 1, may serve to take part in covering over the upper portion of feed roller 32.

When key lever 87 is depressed, as just described, it also actuates a lever 96 which extends closely alongside of the key lever 87, having its forward end pivoted as at 97 at the front part of the frame with its other end extending rearwardly where it is connected by a link 98, companion to link 90, to lever 100 pivoted as at 101 at a rear upper portion of the frame and connected by link 102 to the short arm of the type bar B², a spring 103 secured to link 102 and to a fixed frame part 104 that is companion to the frame part 95 and which overlies the companion feed roller 33. A pin and slot connection 105 between levers 87 and 96, with the pin on lever 96 and underlying the downwardly open slot portion of lever 87, insures actuation of one by the other and the various lever arms and parts are preferably suitably proportioned, preferably to be symmetrical or similar with respect to the actuating parts for the front type bars and the actuating parts for the rear type bars, as to achieve not

only synchronization of movement toward and impact at the printing point but also of restoration of the parts to normal or starting positions. Similarity of structural arrangement of these parts also facilitates production and reduces cost of manufacture. Thus, levers 91 and 100 may be of identical construction and so also links 93 and 102, etc., etc. The mechanical connection between key lever 87 and lever 96 also insures that both front and rear mechanical systems together get the benefit of any means employed to bring about proper and synchronized return movement of the parts, as by way of springs 94 and 103, or by the weight or over-balance of the type bars B¹, B², for example.

Such a mechanical system of interrelating companion front and rear type bars, such as bars B¹ and B², to their individual or appropriate key, like key 86, also simplifies manufacture, construction and maintenance, making for symmetry of arrangement and construction (compare, for example, the linkages to the left of the line 2—2 of Figure 1 with the linkages to the right thereof) and in such case the type bars of the rear set with their respective numbers, letters, symbols, and the like, are mounted and carried in frame 55 but arranged symmetrically, with respect to the plane of the line 2—2 of Figure 1, to the type bars of the front set carried in frame 54, and the latter set can conveniently be arranged or grouped according to any one of several now standard arrangements in typewriter construction.

Thus, depressing any key, such as the key for the letter "A," causes the synchronous actuation of two "A"-bearing type bars to the printing point P but from opposite sides of the web 17, and when a shift in the case is required, type bar-carrying frames 54 and 55 are synchronously shifted. An illustrative system, preferably mechanical, for effecting such a shift may be like that shown in Figure 1 where links 61 and 71 of frames 55 and 54, respectively, are extended to form levers, having connected thereto links 106, 107 which extend downwardly along the rear and front walls, respectively, of the casing or frame 16 to the lower or bottom portion of the latter. Link 107 is connected to a key lever 108 whose front end bears the shift key 110 and whose rear end is pivoted to the frame, as at 111. Link 106 is connected to a lever 112 that extends alongside of lever 108 toward the front part of the machine where it is provided with a pivot 113 secured to a suitable fixed part of the frame 16, such as its side wall 16^a, a suitable, preferably double acting, connection, such as the pin and slot connection 114, being provided as between key lever 108 and lever 112.

Thus, depression of shift key 110 swings key lever 108 in counter-clockwise direction and swings lever 112 in clockwise direction, the lever arms involved being so proportioned that vertical links 107 and 106 partake of simultaneous and equal downward movements, thus swinging levers 71 and 61 in respective directions synchronously to move the type bar carrying frames 54 and 55, respectively, into uppermost positions as determined by the stop pins 77 and 67. If desired and preferably, levers 108 and 112 are duplicated, as indicated in Figure 2, each pair extending alongside of the opposed end walls 16^a and 16^b, and similarly vertical links 107 and 106 are duplicated, extending upwardly for connection with the extended portions of the links which are respectively companion to links 71 and 61, such as link 63 of Figure 2; in such case, key 110 is preferably

arranged in the form of a bar that extends crosswise of the keyboard and rigidly connects the two laterally spaced levers 108 rigidly together. With this preferred duplicate arrangement, better precision and nicety of shifting of the type bar carrying frames 54 and 55 may be achieved.

Any suitable and preferably standard form of known type of mechanism may be employed to effect step-by-step movement of the carriage 19 in response to key actuation. An illustrative form of mechanism may comprise a universal bar 118 that extends crosswise of and underneath all of the key bars 87 which, with their companion levers, like lever 96, are preferably arranged in the same respective horizontal planes, all of bars 87 being preferably pivoted coaxially with the pivot 88 and all of the levers 96 being pivoted coaxially with the shaft 97. Universal bar 118 has two arms 118^a and 118^b which extend to the rear wall 16^c where suitable brackets provide pivotal supports 120, 120 (Figures 1 and 2). Thus, the actuation of any key lever depresses universal bar 118 which, by a link 121, is connected to a suitable carriage escapement mechanism generally indicated at 122, whose pawl 123 permits the escapement wheel 124 to rotate one increment in response to the return upstroke of universal bar 118, thus permitting pinion 125 to rotate throughout such an angle that the rack 126, carried by the carriage 19, that mates with it, advances the carriage 19 toward the left by a distance equal to the width of one letter or symbol.

Any suitable means may be used to propel the carriage 19 in this step-by-step movement, such as a spring-wound drum 128 (Figure 1) secured at a suitable point to a fixed part, such as the under side of rail 21 and having wound onto or off of it, depending upon the direction of travel of the carriage 19, a tape 130 whose one end is connected to a downwardly projecting stud or post 131 on the carriage 19.

Thus, moving the carriage 19 toward the right, as viewed in Figure 3, unwinds the tape 130 and stores energy in the spring within the drum 128, such stored energy subsequently winding the tape 130 up step-by-step as permitted by the above-mentioned escapement mechanism.

A carriage release may be provided and that may comprise two key levers 132, 133, in the form of bell crank levers (Figure 1) pivoted as by studs 134 and 135, respectively, to the side frames 30 and 31 of the carriage; the vertical arms of these two levers extend downwardly below the bottom 25 of the carriage where they are rigidly connected to the rack bar 126, suitable spring means 136 (Figure 1) urging the levers and hence the rack bar 126 toward the pinion 125 and thus maintaining the two in mesh. But actuation of either carriage release lever 132 or 133 against the action of the spring 136 and within the limits provided by spaced stops 137 and 138 moves the rack bar 126 out of mesh with the pinion 125.

With a mechanism of the above-described character, I may now effect printing or typing and duplication in various ways. Thus, referring now to Figures 4 and 5, let it be assumed that the web 17 is made up of plain sheets S, S¹, S², etc., of paper, in suitable number; in such case, I provide a multiple transversely extending transfer means or strip which, when the web 17 is first fed upwardly toward the feed rolls 41, 42, has its component parts interleaved or alternated with the sheets of the web 17; thus, this means may comprise strip or ribbon-like materials impregnated with or otherwise having applied thereto

or treated with suitable transfer media and in a preferred arrangement, the transfer medium may be a material such as is employed in the making of so-called "carbon" paper, or as is employed for manifolding work, being indicated in Figure 4 by the reference character M. This medium M is carried by strips T, T¹, T², T³, etc., and preferably appears only on the back face thereof, as is indicated in Figure 4. The strips T, T¹, T², etc., may be made of any suitable material, such as a paper of suitable tensile strength, or synthetic materials, like Cellophane, etc. Strips T¹—T⁷ related, respectively, with their media M facing toward sheets S¹—S⁷ respectively, are preferably relatively narrow. The front strip T, however, which overlies the front sheet S of the web 17 and which may take the form of so-called typewriter ribbon saturated or impregnated with a transfer medium, preferably is extended laterally, and preferably on both sides throughout its length, as at C¹ and C², being throughout the regions or parts C¹ and C² free from transfer medium. Accordingly, if made of paper, Cellophane, or the like, this front strip C¹—T—C² carries the transfer medium on its back or under face throughout a width commensurate with the width of strips T¹, T², etc., the tape-like regions of the medium M of all of these strips overlying each other and hence registering excepting for the sheets S, S¹, S², etc., with which they are alternated.

Suitable means, such as spools 141 and 142, are provided for supporting the strip form of media, where my invention is carried out with the use of such strip media, crosswise of the web 17 and in line with the printing point P, and any suitable arrangement of support and feed control for such spools may be utilized.

By way of illustration, the spools 141, 142 may be supported by brackets 143 and 144, respectively, from the carriage upright extensions 30^a and 31^a, respectively (see Figure 3), the center line or center plane of the aligned and registering strips T, T¹, T², etc., extending horizontally through the printing point P to which, as above described, the type bars converge in pairs from the two sides of the web 17. Any means (not shown) may be used to effect feeding or shifting of the composite transfer strips in any suitable way, such as by a step-by-step feed of one spool suitably synchronized with the step-by-step movement of the carriage 19, as is known and understood in the typewriting art. Also, any suitable type of guide, particularly for the front strip T, analogous to the guide or support for a typewriter ribbon, may be utilized, and in Figures 1 and 5 such a guide is indicated at 145.

Accordingly, when the keys are depressed for lower case printing or reproduction, each depressed key effects a synchronized movement at suitable power or velocity of two type bars, such as bars B¹ and B² (Figures 1 and 5), to the printing point, one type bar B¹ carrying a facsimile type formation (see Figure 3), while the other, type bar B², for example, carries the inverse thereof, and the force or energy with which these two type formations are moved toward each other, and hence against the respective sides of the composite web 17, the two type formations, being in accurate alinement and in registry throughout, one type bar with its type formation acts as an anvil for the other type bar with its type formation, and each type formation coacts with the other in effecting printing or transfer of the corresponding letter or symbol, such as the

lower case letter "e" on all of the sheets S¹, S², S³, etc.

In this manner, greater fidelity of transferred outline of the letter, number, symbol, or the like, is achieved than has heretofore been possible; the power or pressure with which the composite web 17 with its interposed transfer media 15 by the above-described action affected, insures concentration of the force or pressure and hence its dissipation only throughout the comparatively small total area represented by the effective face of the type formation, and in this manner not only better outlines are achieved but also I am enabled to produce more "copies" than has heretofore been possible.

As is better shown in Figure 5, it will be seen that the strips T, T¹, T², etc., with their media M, are aligned, as above-described, with the point or line to or along which the type formations of the two type bars converge to apply the pressure or blows, from both sides, to the composite web 17; where lower case is being produced, the upper case type formations, being in the lower part of each type head, are inactive or ineffective to cause a printing or transfer action for the region between them is devoid of transfer medium M and the upper case type formation on the front type bar B¹ is screened or prevented from printing or like action because of the portion C¹ of the front strip which portion remains interposed between that type formation and the web 17.

When an upper case symbol or letter has to be reproduced, the shift key or bar 110 is depressed, thus raising the type bar carrying frames 54 and 55 at both front and rear of the web 17 (Figure 1), whence depression of a type key is effective to bring the upper case formation of both type bars to the line or point of printing which, as above noted, is coincident with the center line or center horizontal plane through the transfer strips T, T¹, T², etc., thus reproducing on the sheets S, S¹, etc., the corresponding upper case impression. During such action the two lower case type formations, being at the upper ends of the two type heads (see Figure 3 and Figure 5) are ineffective, being displaced upwardly beyond the aligned transfer strips T, T¹, T², etc., and the portion C² of the front ribbon or tape now acting to screen the front sheet S from the lower case type formation of the front type bar.

I may, however, achieve the advantages of better and clearer reproduction and of increased capacity of "copy" reproduction in other ways without departing from the scope or spirit of my invention. Thus, let it be assumed that, as is current practice in manifolded operations, the sheets S, S¹, S², etc., of the web 17 have their back faces treated, like so-called carbon paper, to carry the transfer medium. In such case I need not employ the tape-like interposed strips T¹, T², T³, etc., of Figures 4 and 5, and hence utilize, by way of the spools 141, 142, simply a plain typewriter ribbon, or the like, to effect printing by the front type heads onto the front sheet S. In such a way, in doing away with the carrier strips T¹, T², T³, etc., for the medium M, I can still further increase the number of "copies." But in such case I prefer to make suitable provision to prevent undesired action or interference where each type head carries more than one type formation, such as upper case and lower case, and hence I may utilize an arrangement like that shown in Figure 6 where the web 17, coming up from the feed rollers 32, 33 (Figure 1) and through the guide plates 50, 51, is subdivided into

two sections 17^a and 17^b, preferably by way of suitable means to limit the vertical expanse of the two sides of the web that are exposed to the type heads to areas or vertical widths commensurate with the vertical dimension of the two opposed type formations that are to do the printing. Such a means may take the form of the member 146 of Figure 6, being somewhat like a bar of suitable material, such as metal, hard rubber, or the like, extending crosswise of the web 17 with its horizontal center line in registry with the horizontal plane in which the printing point or line of direct approach to each other of the two opposed type formations and presenting to each half 17^a and 17^b of the web 17 a face whose vertical dimension is preferably only slightly in excess of the vertical dimension of the tallest type formation on any type bar. At its opposed ends member 146 may be secured in any suitable way to the upright extensions 30^a, 31^a (Figure 2) of the carriage with its central vertical plane coincident with the central vertical plane of the vertical portion of the web 17 as the latter extends from the lower pair of rollers 32, 33 to the upper pair of rollers 41, 42. The spools 141, 142 may in this instance carry a transfer strip or ribbon T, brought, as above described, across the printing point in front of the front sheet S.

The member 146 may have any desired degree of hardness and of rigidity; for example, it may be relatively yieldable or flexible in a direction from the right to the left and vice versa, as viewed in Figure 6, thus to permit, if so desired, a better equalization or distribution throughout the sheets of the two web sections 17^a and 17^b of the pressures or forces exerted thereon by the synchronized type heads of the type bars; the greater the rigidity in such direction, the less may be such distribution or equalization but good results are still achievable even if member 146 is made relatively rigid.

By such a means, therefore, I am enabled to cause the web 17 to expose forwardly and rearwardly, in the horizontal plane of printing, portions of small vertical dimension commensurate with the vertical dimension of the type conformations, and thus I am enabled to shift from upper case to lower case and vice versa without allowing an unselected case of type formation to interfere with the action of the selected case. I may, however, desire to shield the front sheet S from the possibility of an unselected case of type formation on a type bar and in such case the ribbon or transfer strip T in advance of the front sheet S preferably has marginal portions C¹ and C², as above described, to shield the web in a manner now clear, in view of the detailed description of such action in connection with Figures 4 and 5.

Or, instead of utilizing a means like the member 146 of Figure 6, I may utilize an arrangement shown in Figure 7 where I employ two printing platens 151 and 152 for the front and rear sets of type bars, respectively, positioning the two platens at the plane of printing with the web 17 coming, for example, downwardly between the two platens, whence it is divided into two sections 17^a and 17^b, which pass, respectively, about the platens 151 and 152 to merge in upward movement in two printed sections 17^a and 17^b, whence the sheets may be separated or united into a single now printed batch. With such an arrangement the front type bars, such as type bar B¹, and the rear type bars, such as type bar B², are

again shiftable in the manner above described for the selection of upper or lower case, the axis or line of printing being coincident with the plane or line through the axes of the two platens 151, 152. I need employ a transfer strip or ribbon T only in advance of the front sheet S which may be in the form of an ordinary typewriter ribbon and suitably supported in any known or suitable way, such as has been indicated above by way of illustration. Here, again, the action of the front type bars and the action of the rear type bars are synchronized, the sheets S—S⁵, for example, of section 17^a of the web being printed by the front type bars, such as type bar B¹, which carries type formations that are the inverse of the letters, numbers, or symbols, and at the same time and synchronized therewith the sheets, such as sheets S⁷—S¹¹ of the other section 17^b of the web, are operated upon by the rear type bars, such as type bar B², which carry type formations that are facsimiles of the letters, numbers, symbols, or the like, to be reproduced. Thus, the capacity as to numbers of copies reproduced, at one operation is vastly increased over what has heretofore been possible. Also, with such an arrangement, selection of upper or lower case is followed by printing operations that are free from interference by unselected case on the actuated type bars, the platens again limiting, due to their curvatures, the vertical range of multiple web that becomes exposed to the type formations.

The shift or selection of upper or lower case I may also carry on in a way to avoid interference of printing or reproduction; thus, in Figure 8 is indicated largely diagrammatically a front type bar B¹ and a rear type bar B² but the type heads, carrying type formations of the character described above and shown in Figure 3, have the type formations arranged differently. Thus, type bar B¹ has its lower case type "e" at the lower portion of the type head, as at L¹ and its upper case type "E" at the upper portion, as at L², while the type head of type bar B² has its facsimile type formations "e" and "E" arranged in reverse order, namely, the lower case is at the upper portion as at L³ and the upper case is at the lower portion as at L⁴. In normal or lower case position, the type carriers 54, 55 are vertically displaced from one another, that is carrier 54 is higher than carrier 55, so that the lower case type formations L¹ and L³ are in juxtaposition to each other when moved synchronously to the printing point. Thus, upper case type formations L² and L⁴ move to the web 17 at respective points that are free from juxtaposed support, so that no impression or transfer results. This is clearly shown in Figure 8.

To select upper case the shift key or shift bar is actuated to shift the front type bar carrier 54 downwardly and the rear type bar carrier 55 upwardly and thus to reverse the relative vertical displacement so that now, when two mating or companion type heads are synchronously driven to the printing point, the upper case type formations L² and L⁴ are in alinement for printing or reproduction, while lower case element L¹ becomes displaced downwardly from the printing point and lower case element L³ is displaced upwardly, again so as not to interfere with the printing and reproducing action of the selected case. If desired, the ribbon T employed with the arrangement of Figure 8 may have marginal shield portions C¹ and C² acting as above described in connection with Figure 5.

Thus, I am enabled to achieve better and im-

proved printing and reproduction and for manifolding I am enabled to achieve the reproduction of a greatly increased number of copies. Details and embodiments of steps and structural elements of my invention may be widely varied according to various factors, such as the results desired or the purpose to be carried out. For example, while I have not mentioned the use of so-called "carbon" paper, in sheet form, as interposed between successive sheets S, S¹, etc., of the web 17, it is to be understood and it will be seen that the broad features of my invention are equally applicable to the use of such interposed sheets of material bearing carbon or like transfer medium. Nor is my invention to be interpreted as limited to the use of webs of successive subdivisions and it will be seen also that the advantages of my method and apparatus may be carried out as in ordinary typewriting practice where the sheets operated upon are not in web form and are usually, by way of illustration, letter size. Also, and as earlier pointed out, and as will be readily understood by those skilled in the art, various adjuncts or features common in the typewriter or manifolding art may be utilized in conjunction with the broader features of my invention; for example, if it is desired to maintain registry of the various sheets of web by means other than the yielding pressure feed rollers 32—33 and 41—42, various such other means are known in the art, and in Figure 6, simply by way of illustration, of such adaptability, I have indicated the feed rollers 41 and 42 as embodying pins 155 positioned, for example, at their respective ends for entry into marginal holes or perforations H in the sheets of the web, and such pin type of construction may take any suitable form and may be of the type where the pins are mounted on one roller while the companion roller has recesses (Figure 6) which are successively entered by the pins as the rollers are rotated to effect feeding.

In so far as certain mechanical features of my invention are concerned, I may also and preferably do provide for flexibility and wide range of operation. Thus, referring again to Figure 1, I may mount the pivot 97 for all of the levers 96 by which the rear type bars are actuated on a common mounting of any suitable form, such as a cross-bar 157 arranged to be shiftable in a vertical direction as, for example, by guideways 158 arranged in, for example, the end frame walls 16^a and 16^b and provide for a suitable manual control thereof. Thus, I may mount a cam 160, as by the stud 164, on the front of wall 16^a to be swung by a handle 161 to cause its eccentric cam rim 160^a, engaged between two pins 162 and 163 on the carrier 157, to lower or raise the latter (see Figures 1 and 1^a).

In normal position, under the control of the manual element 161, the axis of the pivots 97 is in uppermost position, as shown, and the action of the apparatus is as above described. But shifting the control 161 to swing cam 160 so as to depress the carrier 157 in its guides 158 moves the common axis or the axes of pivoting of all of the levers 96 downwardly to a sufficient extent to remove the pins 105 on the levers 96 out of the range of action of the slotted portions of their respective actuating key levers 87, whereupon actuation of the keyboard results in actuation of the front type bars, such as bar B¹, the rear type bars, such as bar B², remaining inactive. Where such an arrangement is employed, a member like the part 146 of Figure 6 or a platen structure like

that shown in Figure 7, is preferably utilized so as to provide a backing to support the paper, whether it is one sheet or several sheets, upon which the front type bars B¹ are thus made active.

With such an arrangement, the apparatus can be readily accommodated to the burden of work which particular circumstances may impose upon it. Thus, for lighter work of typing or of reproduction, the rear type bar set may be put out of action and for heavier work, such as work requiring the production of many copies, the rear type bar set may thus be quickly brought into action.

Thus, it will be seen that there has been provided in this invention a method and apparatus in which the various objects hereinabove set forth, together with many thoroughly practical advantages, are successfully achieved. It will be seen that the method and apparatus are of wide adaptability and that, though I have hereinabove mentioned the typewriting and manifolding art I do not mean or intend to be limited literally to typewriting or manifolding as such and rather, where I employ the term "typewriting" or "manifolding," or analogous terms, they are not to be construed as terms of limitation but are to be interpreted broadly to mean and include the fields of other types of machines, such as tabulating machines, calculating machines, and various so-called "business" machines, and other specific forms of machines in which my method of printing or transferring from type formations may be practiced.

As many possible embodiments may be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinabove set forth, or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a typewriting machine, or the like, in combination, a frame having a keyboard and two sets of movable type elements, means for supporting a plurality of sheets with transfer material between successive sheets and in relation to a printing point or line, means supporting said two sets of movable type elements so that corresponding type elements from each set move to the said point or line of printing from opposite sides of the central plane extending through the sheets and move toward each other in substantial alignment and juxtaposition, said sheet-supporting means supporting said sheets with said central plane intermediate of said two sets whereby corresponding type elements from each set approach each other and said plurality of sheets from opposite sides of said central plane, mechanism for synchronously actuating corresponding type elements of said two sets from respective keys of said keyboard, the type elements of said two sets bearing said inverse and facsimile type formations in upper and lower case, means, controllable from said keyboard, for effecting relative shifting between said sheet-supporting means and two sets of type elements, thereby to effect selection of either upper or lower case, a ribbon-like element carrying a transfer medium being interposed, adjacent an outermost of said sheets, in the path of movement of type elements to said sheet, and means for shielding those portions of said outermost sheet that are juxtaposed to type formations of unselected case from effecting a

printing or transfer impression when the type elements are actuated to effect printing or transfer impressions by a selected case of type formations.

2. In a typewriting machine, or the like, in combination, a frame having a keyboard and two sets of movable type elements, means for supporting a plurality of sheets with transfer material between successive sheets and in relation to a printing point or line, means supporting said two sets of movable type elements so that corresponding type elements from each set move to the said point or line of printing from opposite sides of the central plane extending through the sheets and move toward each other in substantial alignment and juxtaposition, said sheet-supporting means supporting said sheets with said central plane intermediate of said two sets whereby corresponding type elements from each set approach each other and said plurality of sheets from opposite sides of said central plane, mechanism for synchronously actuating corresponding type elements of said two sets from respective keys of said keyboard, there being alternated with said plurality of sheets strip-like material bearing transfer media, said type elements having each upper and lower case type formations and means operable from said keyboard for effecting relative shift between said sheet-supporting means and said sets of type elements to effect case selection, means for supporting said strip-like material so that each intersects the line of printing, said strip-like material having aligned edges spaced by such a distance from the line of printing that an unselected case type formation on an actuated type element becomes juxtaposed beyond said aligned edges, there being a strip-like material in advance of the front one of said plurality of sheets having an edge aligned with said aligned edges and having means free from transfer effect extending beyond its edge to shield said front one of said plurality of sheets from the unselected case type formation of an actuated type element.

3. In a typewriting machine, or the like, in combination, a frame having a keyboard and two sets of movable type elements, means for supporting a plurality of sheets with transfer material between successive sheets and in relation to a printing point or line, means supporting said two sets of movable type elements so that corresponding type elements from each set move to the said point or line of printing from opposite sides of the central plane extending through the sheets and move toward each other in substantial alignment and juxtaposition, said sheet-supporting means supporting said sheets with said central plane intermediate of said two sets whereby corresponding type elements from each set approach each other and said plurality of sheets from opposite sides of said central plane, mechanism for synchronously actuating corresponding type elements of said two sets from respective keys of said keyboard, and means controllable at will for making ineffective the type elements of one of said sets.

4. In a typewriting machine, or the like, in combination, a frame having a keyboard and two sets of movable type elements, means for supporting a plurality of sheets with transfer material between successive sheets and in relation to a printing point or line, means supporting said two sets of movable type elements so that corresponding type elements from each set move to the said point or line of printing from opposite

sides of the central plane extending through the sheets and move toward each other in substantial alignment and juxtaposition, said sheet-supporting means supporting said sheets with said central plane intermediate of said two sets whereby corresponding type elements from each set approach each other and said plurality of sheets from opposite sides of said central plane, mechanism for synchronously actuating corresponding type elements of said two sets from respective keys of said keyboard, said means for synchronously actuating the type elements of said two sets in response to actuation of keys in said keyboard comprising shiftable means operated when shifted into one position to make one set of type elements ineffective and when shifted into another position to make both sets of type elements synchronously effective in response to keyboard actuation, and means for controlling said shiftable means.

5. In a typewriting machine, or the like, in combination, a frame having a keyboard and two sets of movable type elements, means for supporting a plurality of sheets with transfer material between successive sheets and in relation to a printing point or line, means supporting said two sets of movable type elements so that corresponding type elements from each set move to the said point or line of printing from opposite sides of the central plane extending through the sheets and move toward each other in substantial alignment and juxtaposition, said sheet-supporting means supporting said sheets with said central plane intermediate of said two sets whereby corresponding type elements from each set approach each other and said plurality of sheets from opposite sides of said central plane, mechanism for synchronously actuating corresponding type elements of said two sets from respective keys of said keyboard, said means for synchronously actuating the type elements of said two sets in response to actuation of keys in said keyboard comprising two sets of devices, one for each set of type elements, said two sets of devices having disconnectable operative connection means, and means for controlling the latter.

6. In a typewriting machine, or the like, in combination, a frame having a keyboard and two sets of movable type elements, means for supporting a plurality of sheets with transfer material between successive sheets and in relation to a printing point or line, means supporting said two sets of movable type elements so that corresponding type elements from each set move to the said point or line of printing from opposite sides of the central plane extending through the sheets and move toward each other in substantial alignment and juxtaposition, said sheet-supporting means supporting said sheets with said central plane intermediate of said two sets whereby corresponding type elements from each set approach each other and said plurality of sheets from opposite sides of said central plane, mechanism for synchronously actuating corresponding type elements of said two sets from respective keys of said keyboard, said means for synchronously actuating the type elements of said two sets in response to actuation of keys in said keyboard comprising two sets of levers, one set for each set of type elements and each set of levers comprising a lever for each type element of its corresponding set of type elements, with selective means for causing or preventing actuation of one lever of one set by its corresponding lever of the other set.

7. In a typewriting machine, or the like, in combination, a frame having a keyboard and two sets of movable type elements, the corresponding type elements of said two sets having respectively type formations that are the inverse and facsimile of the respective symbols, means for supporting a plurality of sheets with transfer material between successive sheets and in relation to a printing point or line, said supporting means having means for effecting step by step progression of the plurality of sheets as a unit relative to said printing point or line, means supporting said two sets of movable type elements so that corresponding type elements from each set move to the said point or line of printing from opposite sides of the central plane extending through the sheets and move toward each other with the inverse type formation substantially aligned with and juxtaposed to the facsimile type formation, the plurality of sheets being by said first-mentioned supporting means supported intermediate of the two sets of type elements whereby the inverse and facsimile type formations of corresponding type elements approach said plurality of sheets from opposite sides thereof, mechanism for synchronously actuating corresponding type elements of said two sets from respective keys of said keyboard, the type elements of said two sets bearing said inverse and facsimile type formations in upper and lower case, and means controllable from said keyboard for effecting relative shifting between said sheet-supporting means and said two sets of type elements, thereby to effect selection of either upper or lower case, and an elongated bar-like member intersecting the line of printing and subdividing said plurality of sheets into two groups, one on each side thereof, and one for each of said sets of type elements.

8. An apparatus for typewriting or manifolding comprising two sets of corresponding and selectable type elements, the corresponding type elements of said two sets having respectively type formations that are the inverse and the facsimile of the respective symbols, with means mounting them so that selected corresponding type elements with their respective inverse and facsimile type formations move toward and approach each other along paths which at the printing point always coincide in a line, whereby the inverse type formation and the facsimile type formation of any selected corresponding type elements operate as anvils each for the other, and means for supporting in a single batch a plurality of sheets with interposed suitable transfer media in a position to intersect said line of approaching movements of said type elements at said printing point whereby said plurality of sheets and interposed transfer media are compressed between the inverse and facsimile type formations of selected corresponding type elements and each of said type formations acts as an anvil for the other.

9. An apparatus for typewriting or manifolding comprising two type elements, one having a type formation that is the inverse of the symbol it is to reproduce and the other having a type formation that is a facsimile of the same symbol, means mounting said two type elements for relative movement so that one of them approaches the other with said type formations in alignment, and means for supporting a single batch of sheets with interposed transfer media between said two type elements and in a position to be compressed, upon said relative movement of said inverse and facsimile formations, thereby and therebetween.

10. In a typewriting machine, or the like, in

combination, a frame having a keyboard and two sets of movable type elements, the corresponding type elements of said two sets having respectively type formations that are the inverse and facsimile of the respective symbols, means for supporting in a single batch a plurality of sheets with transfer material between successive sheets and in relation to intersect a printing point or line, said supporting means having means for effecting step by step progression of the plurality of sheets as a unit relative to said printing point or line, means supporting said two sets of movable type elements so that corresponding type elements from each set move to the said point or line of printing from opposite sides of the central plane extending through the sheets and move toward each other with the inverse type formation substantially aligned with and juxtaposed to the facsimile type formation, whereby each type formation forms an anvil for the other, the plurality of sheets comprising said batch being by said first-mentioned supporting means supported intermediate of the two sets of type elements whereby the inverse and facsimile type formations of corresponding type elements approach said plurality of sheets from opposite sides thereof and compress said batch therebetween, and mechanism for synchronously actuating corresponding type elements of said two sets from respective keys of said keyboard and to effect approaching movements of corresponding inverse and facsimile type formations at respective rates to strike said batch substantially simultaneously from opposite sides thereof to effect compression therebetween of said sheets and transfer material, whereby each of said corresponding type formations acts as an anvil for the other.

11. An apparatus for producing multiple clear copies upon an assembly of superposed record sheets having transfer material strata interposed therebetween, including a pair of opposing type members carrying respective inverse and facsimile type formations and having means mounting them for movement into engagement with the opposite sides of the assembly to imprint thereon by pressure corresponding registering indicia on opposite sides of the assembly from which the impressed indicia is simultaneously transferred by said transfer material strata from opposite sides of the assembly to intermediate sheets thereof, and means for synchronizing the operation of the opposing type members.

12. The herein described method of producing multiple clear duplicate copies of inscribed indicia upon superposed sheets of record material having transfer strata interposed therebetween, including simultaneously striking definite character outlines on the opposite external sheets of such assembly and thereby impressing thereon corre-

sponding indicia in registering relation with each other, the indicia impressed on one external sheet being the reverse of that impressed on the opposite external sheet and transferring the impressed indicia by the interposed transfer strata from one sheet to another throughout the assembly.

13. An apparatus for producing multiple clear copies upon an assembly of superposed record sheets having transfer material strata interposed therebetween, including a pair of opposing type members carrying respective inverse and facsimile type formations and having means mounting them for movement into engagement with the opposite sides of the assembly to imprint thereon by pressure corresponding registering indicia on opposite sides of the assembly from which the impressed indicia is simultaneously transferred by said transfer material strata from opposite sides of the assembly to intermediate sheets thereof, means for supporting said superposed record sheets with said interposed transfer material strata in a single substantially flat assembly extending transversely between said opposing type members to present substantially plane opposite sides for respective engagement by said opposed type members, and means for synchronizing the operation of the opposing type members.

14. An apparatus for producing multiple clear copies upon an assembly of superposed record sheets having transfer material strata interposed therebetween, including a pair of opposing type members carrying respective inverse and facsimile type formations and having means mounting them for movement into engagement with the opposite sides of the assembly to imprint thereon by pressure corresponding registering indicia on opposite sides of the assembly from which the impressed indicia is simultaneously transferred by said transfer material strata from opposite sides of the assembly to intermediate sheets thereof, means for supporting said assembly of superposed record sheets with said interposed transfer material strata in position between said opposed type members and having a bar-like member extending through substantially the middle of the assembly of sheets in a position between said opposing type members to thereby bulge those portions of the opposite sides of the sheet assembly that are engaged by said opposing type members outwardly from the center plane of said assembly, and means for synchronizing the operation of the opposing type members to effect simultaneous transmission of the pressure exerted by said opposing type members to the respective sides of said bar-like member and through the respective portions of said sheet assembly that are bulged outwardly by said bar-like member.

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