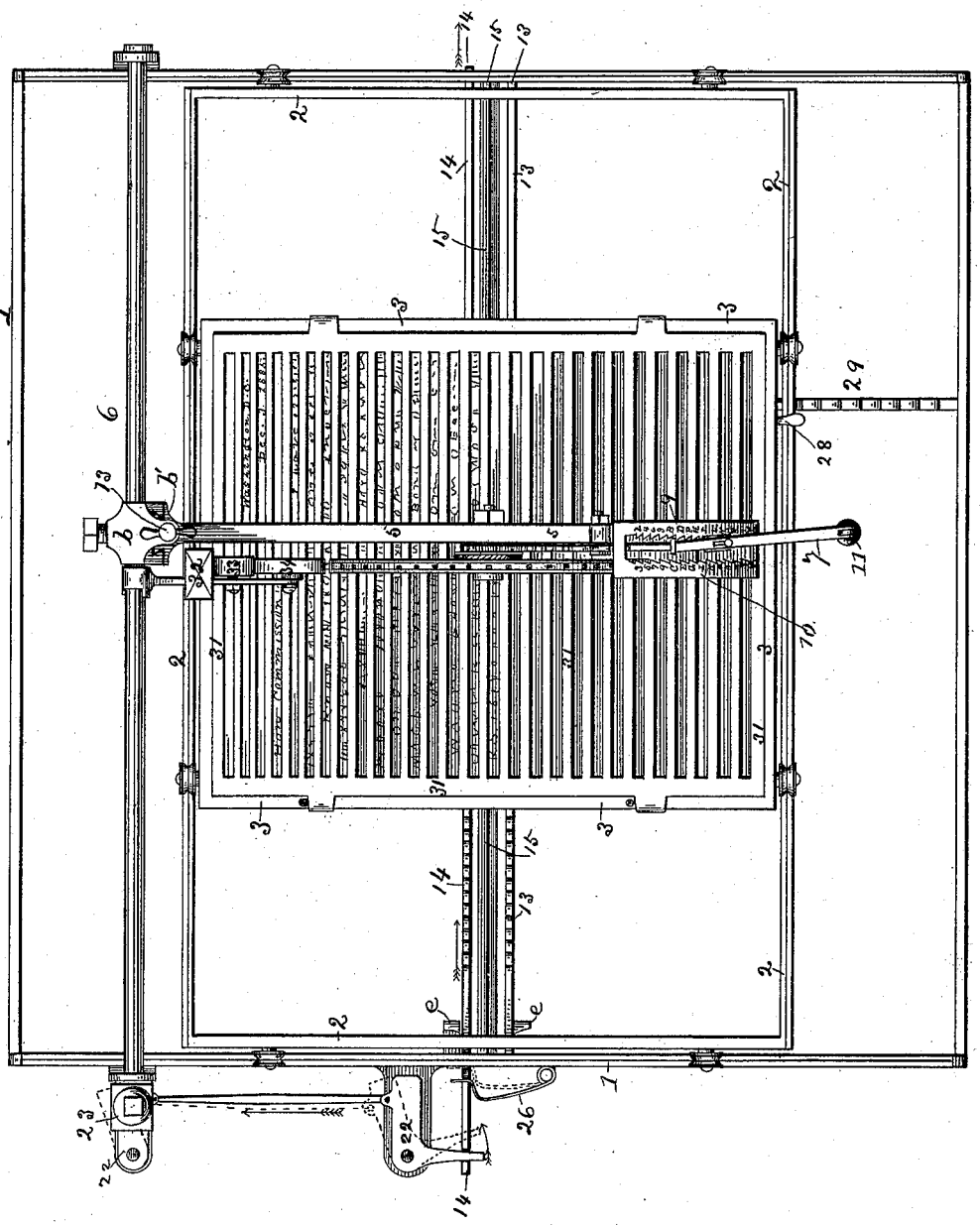
(No Model.) 4 Sheets—Sheet 1.

G. L. FERRIS.

TYPE WRITING MACHINE.

No. 384,142. Patented June 5, 1888.

Fig. 1.



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INVENTOR:
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ATTORNEYS.

(No Model.) 4 Sheets—Sheet 2.

G. L. FERRIS.

TYPE WRITING MACHINE.

No. 384,142. Patented June 5, 1888.

Fig. 2.

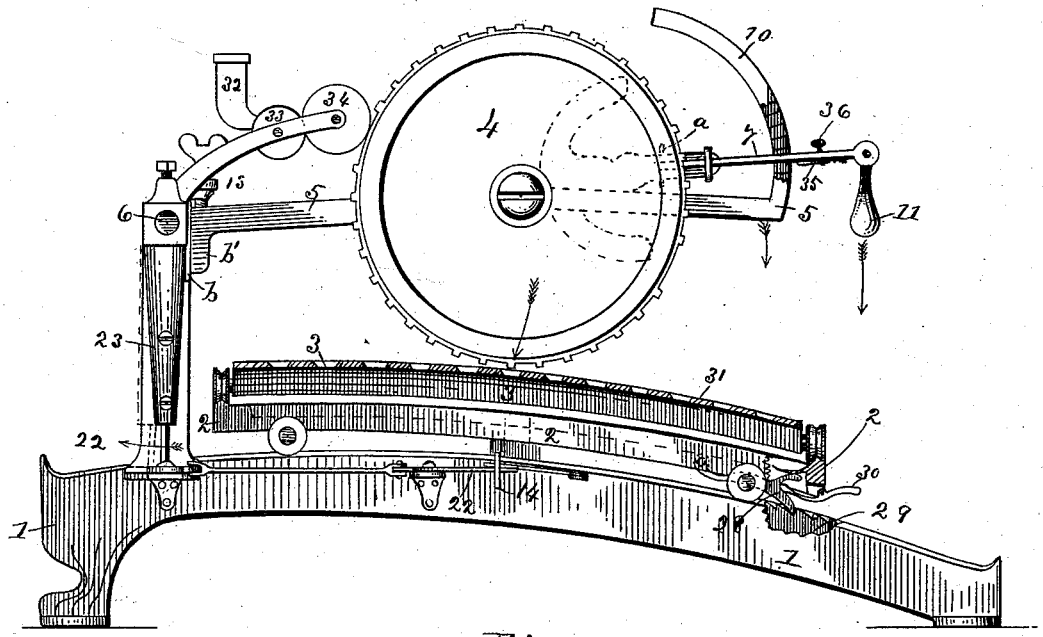
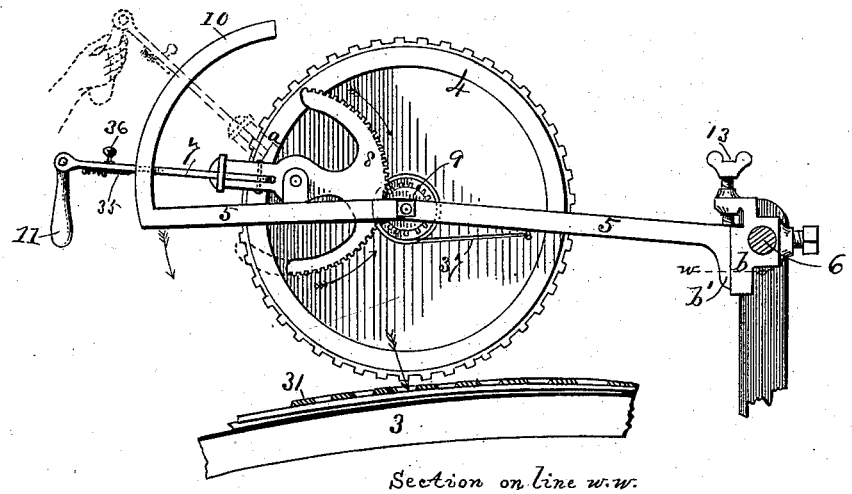
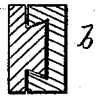


Fig. 3.



Section on line w.w.



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(No Model.) 4 Sheets—Sheet 3.

G. L. FERRIS.

TYPE WRITING MACHINE.

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Fig. 5.

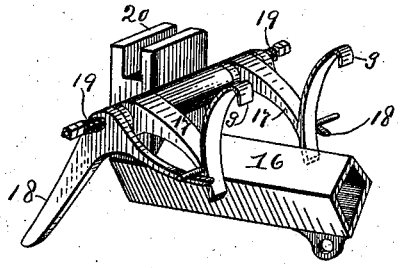


Fig. 4.

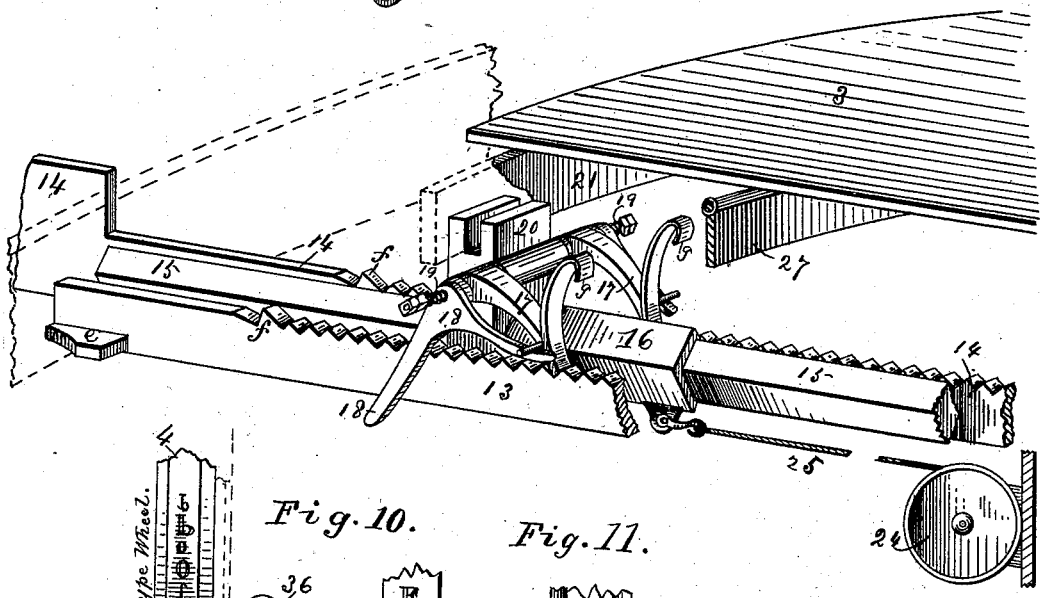


Fig. 10.

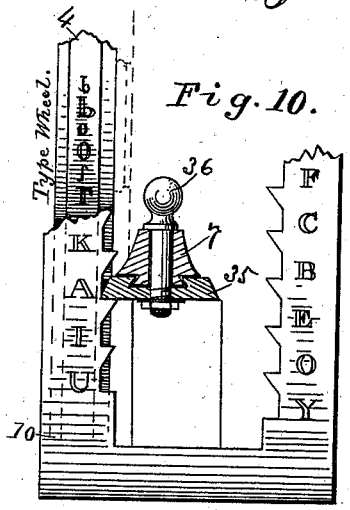
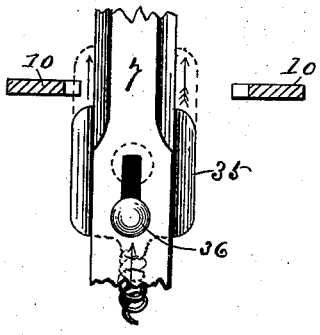


Fig. 11.



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(No Model.) 4 Sheets—Sheet 4.

G. L. FERRIS.

TYPE WRITING MACHINE.

No. 384,142. Patented June 5, 1888.

Fig. 6.

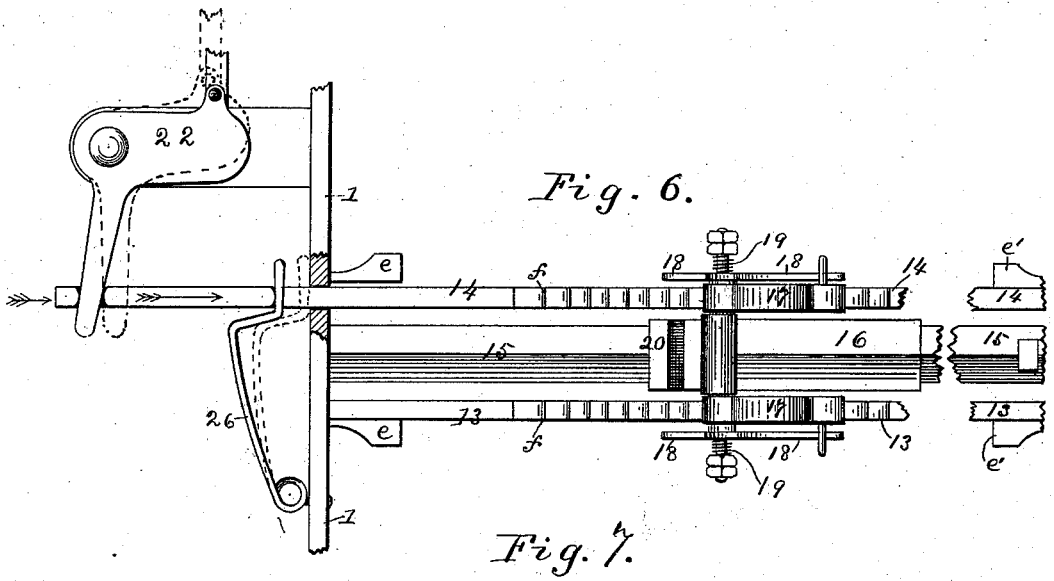


Fig. 7.

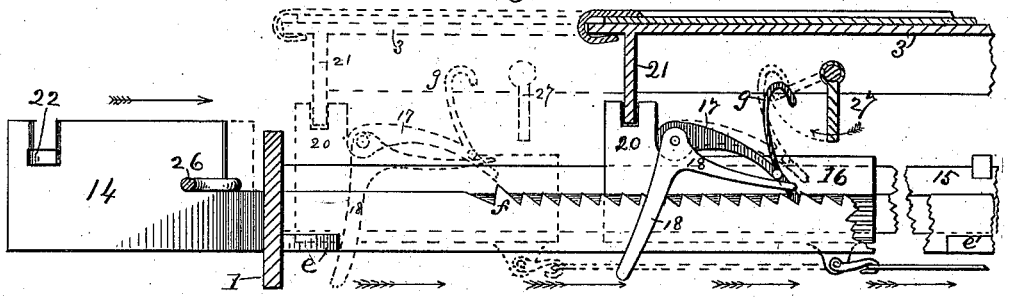


Fig. 8.

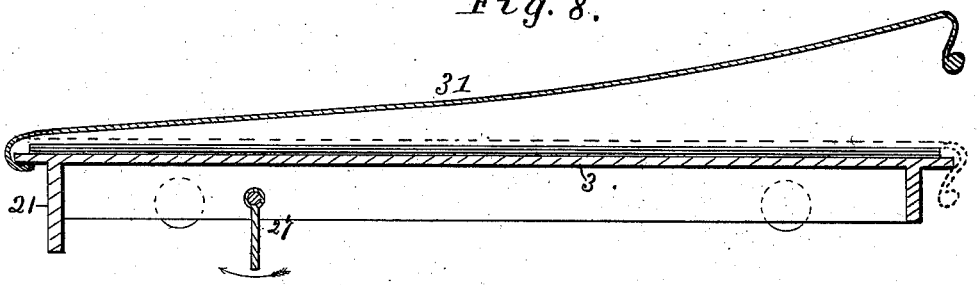
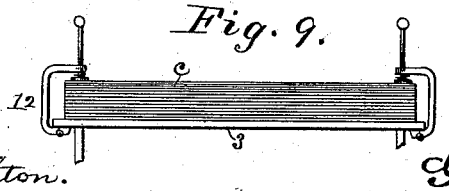


Fig. 9.



WITNESSES:
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INVENTOR:
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UNITED STATES PATENT OFFICE.

GEORGE L. FERRIS, OF ST. LOUIS, MISSOURI.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 384,142, dated June 5, 1888.

Application filed December 12, 1885. Serial No. 185,482. (No model.)

To all whom it may concern:

Be it known that I, GEORGE LESLIE FERRIS, of St. Louis, in the State of Missouri, have invented a new and useful Improvement in Type-Writing Machines, of which the following is a description.

My invention is an improvement in that class of type-writing machines in which a vertically and laterally swinging hand lever operates a printing type-wheel and paper-feeding mechanism.

The improvement aims, chiefly, at greater simplicity of construction and ease and rapidity of operation, and is embodied in the construction and combination of parts hereinafter described and claimed, and shown in the accompanying drawings, (four sheets,) in which—

Figure 1, Sheet 1, is a plan view of the machine. Fig. 2, Sheet 2, is an end view. Fig. 3, Sheet 2, is a cross-section showing a part of the apparatus. Fig. 4, Sheet 3, is a perspective view of a portion of the mechanism for feeding the table on which the paper is clamped. Fig. 5, Sheet 3, is a perspective view of the pawl and table-carrier detached. Figs. 6 and 7, Sheet 4, are views showing the construction and operation of devices for feeding the table. Fig. 8, Sheet 4, is a cross-section of the table and paper-clamp. Fig. 9 illustrates a modification. Figs. 10 and 11, Sheet 3, are sectional detail views showing portions of the notched letter-bars, the type-wheel, and the hand printing-lever.

The skeleton frame or bed 1 of the machine is supported in a position inclined to the operator. This supports another frame or carriage, 2, which is provided with small grooved wheels that run on the side bars of frame 1, so that it (2) may be moved from or toward the operator. On movable carriage 2 is placed the table 3, to which the paper is clamped.

The table 3 runs from right to left, it being for this purpose provided with grooved wheels that run on upper and lower bars of carriage 2. The table 3, and also the side bars of both carriage 2 and bed-frame 1, are slightly convexed or curved upward, as shown in Figs. 2 and 3, the object being to obviate any danger of more than one letter of the type-wheel 4 coming in contact with the paper at one time. The said type-wheel 4 is placed vertical and rotates on a journal fixed on a lever-arm, 5, which has an adjustable connection with a rock-shaft, 6, that extends across the machine from right to left above and in rear of the table 3.

The type-wheel 4 has on its periphery any characters it is desired to use in printing. For example, it may have only small caps or upper and lower case alternating, as shown in Fig. 10, or stenographic symbols. The type-wheel is rotated and depressed to bring any selected letter into contact with the paper by means of a hand printing-lever, 7, Figs. 1, 2, 3, which has its fulcrum on lever-arm 5, and is provided at its inner end with a segmental gear, 8, that meshes with a spur-gear, 9, fixed on the hub of the type-wheel 4. Said lever 7 is jointed at *a* to allow the slight lateral motion required to permit its engagement with the notched letter-bars 10, Figs. 1, 2, 3, 10, and 11, that are fixed on the outer end of lever-arm 5 and extend upward and curve inward, as shown. These bars 10 are notched on their inner sides, and letters or other printing-characters are inscribed on or otherwise applied to them, one being opposite each notch.

From the jointed outer end of the printing-lever 7 swings a knob, 11, Figs. 2 and 3, which is designed to be of such size and shape as will adapt it to be conveniently held in the hand of the operator. It has also the advantage of enabling the hand to be applied so that when the lever 7 is raised to its highest limit the hand will offer little or no obstruction to view of the letters on the bars 10.

I will now describe in detail the vertically-adjustable connection between the lever-arm 5 and rock-shaft 6, before incidentally referred to. (See Figs. 1 and 3.) The lever-arm must be held normally, so that when the type-wheel 4 is depressed the letter which is underneath will strike the paper as flat as possible. To provide for required adjustment for this purpose, I employ the coupling *b*, which is clamped on rock-shaft 6 by means of a screw. I also propose to employ a block or package of paper, Fig. 9, Sheet 4, of considerable thickness and secured by clamps, so that the delay and annoyance heretofore incident to removal and insertion of a sheet of paper every time one is printed may be avoided, for by use of such

block when a page has been printed the sheet may be instantly torn off and work resumed on the fresh page beneath. It is, however, obvious that when such package of paper is used the type-wheel must be adjusted higher than when one or a few sheets are placed on the table. To provide for this necessary change, I construct the coupling *b* with a dovetail socket (see section, Fig. 3) and the inner end of the lever-arm proper with a corresponding tenon, *b'*, which is adapted to slide vertically in said socket and is adjusted by a screw, 13, that passes through the projecting head of the coupling *b* and enters the tenon *b'*, as shown.

I will now describe the mechanism by which the table 3 is operated to feed the paper from right to left; but as a preliminary it may be stated that when the printing-lever is pressed down the rock-shaft 6 rotates a small fraction of a revolution, and its fixed pendent arm 23 is thus vibrated far enough to impart a short reciprocation, through the medium of an elbow-lever and link, to ratchet-bar 14. The table 3 is detachably connected with a carrier which is operated by such movement of the ratchet-bar, and hence the table is fed along at each depression of the printing-lever.

Beneath the table and extending lengthwise of the frame 1, Figs. 1, 4, 6, and 7, are three parallel bars—to wit, fixed ratchet-bar 13, a movable (reciprocating) ratchet-bar, 14, and an intermediate fixed polygonal bar, 15. On the latter slides a device, Figs. 4 and 5, that performs the function of both pawl and table-carrier. The device consists of a tube, 16, and two hinged pawls, 17, and two friction-pawl lifters, 18, springs 19, and notched head or block 20. The tube 16 conforms to the shape of the rod 15, on which it slides. The notched or slotted head 20 receives a bar, 21, applied to the under side of the table 3, Figs. 4 and 7. One pawl 17 engages the fixed ratchet-bar 13 and the other pawl 17, the movable ratchet-bar 14. The latter is reciprocated by means of an elbow-lever, 22, and a vibrating pendent arm, 23, fixed in one end of the rock-shaft 6, the three (bar, lever, and arm) being loosely connected, so that the oscillation of the shaft is converted into rectilinear or axial movement of the bar. It will now be seen that if the hand printing-lever 7 be moved laterally and engaged with a notch of one of the lettered bars 10 and then depressed the lever-arm (and with it the type-wheel 4) will be carried down, thus rocking shaft 6, vibrating arm 23, and elbow-lever 22, and moving ratchet-bar 14 a corresponding distance—that is to say, the length of a tooth. The table 3 being connected with the grooved carrier-head 20, and the latter with the movable ratchet-bar 14 by means of a pawl, 17, it is apparent that the reciprocation of the bar 14 will cause intermittent "feed" or a step-by-step movement of the table from right to left. This movement is made against the stress of a coiled ribbon-spring, 24, arranged as shown in Fig. 4, and connected with the carrier by a cord, 25. To prevent such spring causing backward movement of the table when the bar 14 is moved back by its spring 26 (see direction of arrows, Figs. 6 and 7) is the function of the fixed ratchet-bar 13 and its pawl 17. Supposing, now, that the table has reached the proper limit of its movement to the left, it is obviously necessary to raise the pawls 17 and hold them disengaged from the ratchet-bars 13 and 14 while the table is moved to the right, or back to the position required to begin printing the next line. For this purpose I employ devices 18, which have in this instance the form of elbow-levers 18, Figs. 4, 5, 6, 7, the same being pivoted to the head 20 at their angles. When the table reaches the proper limit of its movement, the pendent arms of these levers 18 strike stops *e*, (see dotted lines on the left, Fig. 7,) so that their other arms are thrown up and raise the pawls 17 by contact with pins or other lateral projections thereof. To hold the pawls 17 thus elevated, I rely on the friction caused by the spiral springs 19 applied to the pivot-pins of the pawl-lifters 18. So soon as the pawls are thus disengaged from the ratchet-bars 13 and 14, spring 24 draws the table 3 back to the right, and the pawls 17 are again brought down and re-engaged with their respective ratchet-bars by contact of the pendent arms of the lifters 18 with stops *e'*. Thus the table is reciprocated automatically, (instead of by hand, as usual in other typewriters,) and in this particular requires no attention on the part of the operator.

In Figs. 4 and 7 it will be noted that the tooth of each ratchet-bar 13 and 14 at the left is higher—*i. e.*, longer—than the others. The object of this is to insure the pawls 17 being lifted high enough at the outset to clear all the other teeth of said bars. It is frequently necessary to move the table back by hand before its limit of feed-movement has been reached. I therefore provide the pawls 17 with hooks *g*, Figs. 4, 5, 7, and pivot a flat bar, 27, Figs. 4 and 7, in the under side of the table, so that when turned on its axis one edge will engage said hooks (see dotted lines, Fig. 7) and thereby lift the pawls 17 and hold them elevated while the table is being moved back.

The aforementioned groove in the head 20 of tube 16 enables the table to be moved upward as the page is printed, and at the same time maintains the connection between them, since the fixed bar slides freely in said groove. The table 3 slides right and left on carriage 2, and the latter moves toward and from the operator on frame 1. To hold the latter and thereby the table at any point to which it may be adjusted, I employ the hinged pawl 28, Fig. 2, which engages a ratchet-bar, 29, forming a portion of bed-frame 1. A hinged finger-piece, 30, serves to lift this pawl 28 out of engagement with the bar 29 when it is desired to bring the carriage 2 (and table) down to the starting position.

Several copies may be made of the matter

printed on the original by means of thin carbon sheets; but to enable this to be done the pressure on the printing-lever and type-wheel must be increased beyond what is requisite for printing on the top sheet of the series, in order to compact or press the sheets together with sufficient force.

In order to compact several loose superposed sheets so that they will take the desired type-impression, each must be pressed on the next below with a force sufficient to expel the air between them. If, however, the sheets are pressed or held down by a separate device, the type wheel would not be pressed so hard as would be otherwise requisite. I propose to wholly or mainly remove the necessity for such additional pressure by means of a skeleton frame or plate, 31, Figs. 1 and 8, having parallel slots spaced the same distance apart as the lines to be printed. This is elastic and normally curves upward at the ends, so that when laid on the paper sheets, as shown in dotted lines, it will press firmly on the central or median portion of them. It is secured by clamping over the edge of the table 3. The type-wheel 4 prints in the spaces or slots, as will be readily understood.

In Fig. 2 I have shown an ink-holder, 32, distributing-wheel 33, and inking-roller 34, the latter running in contact with the type-wheel. I propose to journal these wheels on an arm or support that is hinged or jointed so that it may be moved back out of the way when the type-wheel has sufficient ink.

In several figures, especially Figs. 1, 10, and 11, I illustrate a device attached to the printing-lever, and by which lower-case letters may be printed. It consists of a sliding plate, 35, secured to the under side of the printing lever 7, and having a pin, 36, that projects up through a lengthwise slot in the latter. As appears in Fig. 10, lower-case letters alternate with upper case on type-wheel 4. So long as the plate 35 is held retracted by its spring, as shown in full lines, Fig. 11, only upper-case letters will be printed; but by sliding plate 35 forward, as shown in dotted lines, Fig. 11, it will come opposite to and may then engage a notch on bars 10, and its thickness being thus added to the lever 7 the latter is not depressed so far, and hence the type-wheel is not rotated quite so far as when the plate is retracted or out of the way, and hence a lower-case letter which is intermediate of two capitals will be printed. Thus, as shown in Fig. 10, when the plate 35 is engaged in notch A this letter will not be printed, but the lower-case letter a instead.

In brief, the sliding plate 35, when moved inward, (by requisite pressure with thumb or finger on pin 36,) changes and limits the throw of the lever 7 and the rotation of the type-wheel 4 corresponding to the distance between a lower-case letter and the capital of the same letter on the periphery of said wheel, so that such lower-case letter comes underneath and is printed. Of course the same means operating in the same way will enable numerals or other characters to be printed successively or alternately with the letters; but in such case the numerals, &c., will necessarily be inscribed on the bars 10 along with the letters.

In order to prevent any play or backlash of the type-wheel gear 9 and segment 8 when worn, and also to aid in raising the hand-lever 7, I apply a spring or elastic cord, 37, as shown in Fig. 3, one end being attached to the lever-arm 5 and the other to the hub of the type-wheel 4. The cord exerts constant tension on the wheel, thereby tending to rotate it and to elevate the outer or free end of the printing-lever 7.

By the direct gear-connection between the hand-lever and printing-wheel the number of parts and the friction are reduced to a minimum, so that the printing can be done with less exertion and greater rapidity than would be otherwise practicable.

I do not claim a type-wheel mounted on a journal fixed in a pivoted hand-lever adapted to vibrate in a vertical plane, since I am aware this is not new; but

What I claim is—

1. In a type-writing machine, the combination of the type-wheel, the vibrating lever-arm, the pivoted and jointed hand-lever having a segmental end, a spur-gear attached directly to the type-wheel, the notched lettered bars fixed on said lever-arm, the rock-shaft, the reciprocating table, and rod, lever, and bar for connecting the latter two, whereby the depression of the lever-arm and its attachments imparts intermittent movement to said table, substantially as shown and described.

2. In a type-writing machine, the combination, with the table, of the movable ratchet-bar, a feed-pawl engaging therewith and attached to said table, the vibrating type-wheel and rock-shaft, to which it is indirectly attached, and rod and lever for connecting said shaft and ratchet-bar and converting the rotary reciprocation of the one into rectilinear reciprocation of the other, as shown and described.

3. In a type-writing machine, the combination of the pivoted elbow-lever and the vibrating pendent arm connected thereto with the movable and fixed ratchet-bars, the table, and a sliding pawl-carrier connected with the latter, the rock-shaft, vibrating lever-arm, type-wheel, and a hand printing-lever, all arranged to operate substantially as shown and described.

4. In a type-writer, the combination of the pivoted pawl-lifters 18 with the sliding table-carrier, the pawls 17, hinged to the latter, the horizontal ratchet-bars, carrier-supporting bar 15, and stops with which said lifters come in contact automatically, as shown and described.

5. In a type-writing machine, the combination of pressure or friction springs with the pivoted pawl-lifters, the carrier, pawls pivoted thereto, and fixed and movable ratchet-bars, substantially as shown and described.

6. In a type-writing machine, the combina-

tion, with ratchet-bars, pawl, and table-carrier, and pawls hinged thereto, of the pawl-lifters, which are adapted to maintain their position when raised and thereby hold the pawls elevated, as and for the purpose specified.

7. In a type-writing machine, the combination of the table and its bar 21, the tubular slide 16 and its slotted head 20, the guide-bar 15, the ratchet-bars, and pawls pivoted to said slide, all as shown and described, and operating as specified.

8. In a type-writing machine, the combination of the table, the ratchet-bars, a sliding pawl-carrier and pawls, and a lifter adapted to engage with the latter for raising them out of engagement with the ratchet-bars for the purpose of enabling the table to be moved back to its original position, as shown and described.

9. In a type-writing machine, the combination, with the table and ratchet-bars, of the pivoted bar, the pawls having hooks that lock with the latter, and the sliding pawl-carrier with which said table is connected, all as shown and described.

10. In a type writing machine, the combination, with the ratchet-bars having a tooth at their left extremity longer than the others, the sliding table and pawl-carrier, and the pawls pivoted thereto, of pivoted levers for lifting the latter, the same turning on their bearings with sufficient friction to enable them to sustain the weight of the pawls, as shown and described.

11. In a type-writing machine, the combination of friction-springs with the pivoted pawl-lifters, the pawls, ratchet-bars, and the table, as shown and described, for the purpose specified.

12. In a type-writing machine, the combination of stops with the pivoted pawl-lifters, the pawls, ratchet-bars, a sliding pawl-carrier, and the table connected thereto, as shown and described.

13. In a type-writing machine, the upwardly-projecting notched letter-bars, in combination with the lever-arm, type-wheel, and jointed printing-lever, as shown and described.

14. In a type-writing machine, the type-wheel arm and rock-shaft having sliding connection which permits vertical adjustment of the wheel, substantially as and for the purpose specified.

15. In a type-writing machine, the combination of type-wheel, rock-shaft, and lever-arm, the socket, the sliding tenon, and a screw for holding them in the desired relative adjustment, all as shown and described, for the purpose specified.

16. In a type-writing machine, the combination, with the type-wheel, of the table and the track on which it runs, both curved or made convex, as shown and described, for the purpose specified.

17. In a type-writing machine, the combination, with the rock-shaft and lever-arm carrying the type-wheel, of a clamp attached to said shaft and adapted for adjustment around the same, for the purpose of enabling the lever-arm to be set at the required angle, as shown and described.

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Witnesses:
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