No. 765,532. PATENTED JULY 19, 1904.

J. D. WHITE.

TYPE WRITING MACHINE.

APPLICATION FILED OCT. 13, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

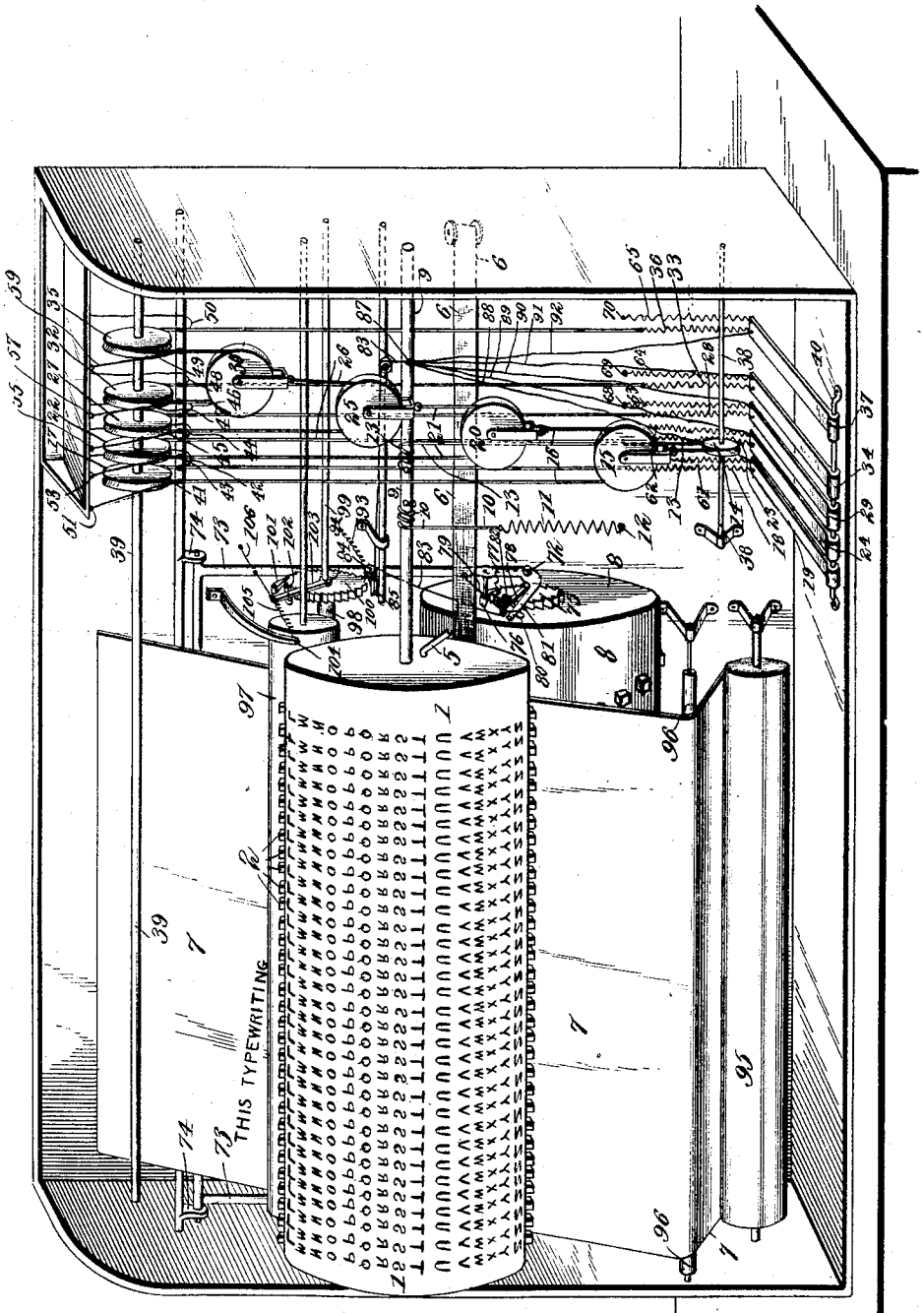


Fig. 1.

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Fig. 2.

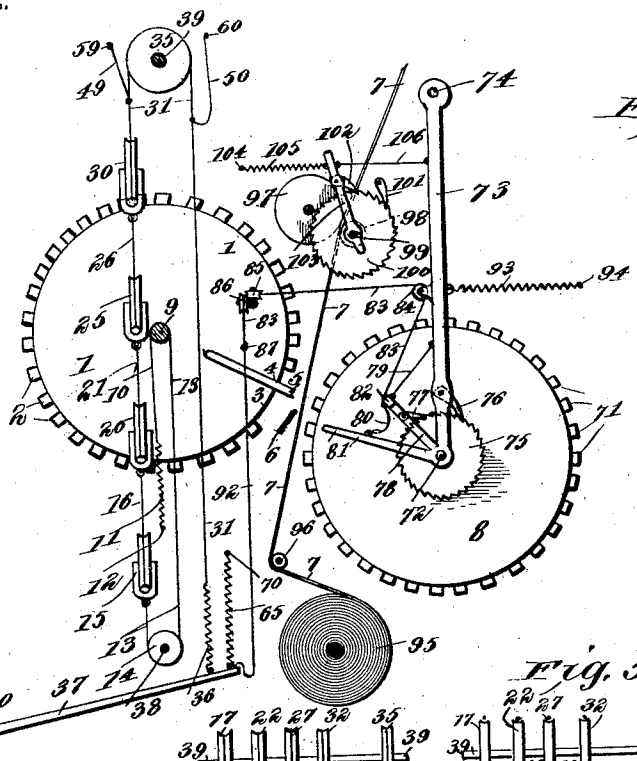


Fig. 3.

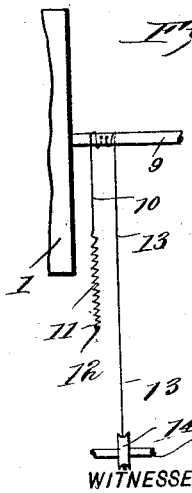


Fig. 4.

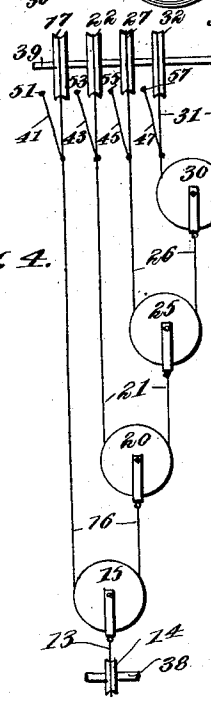
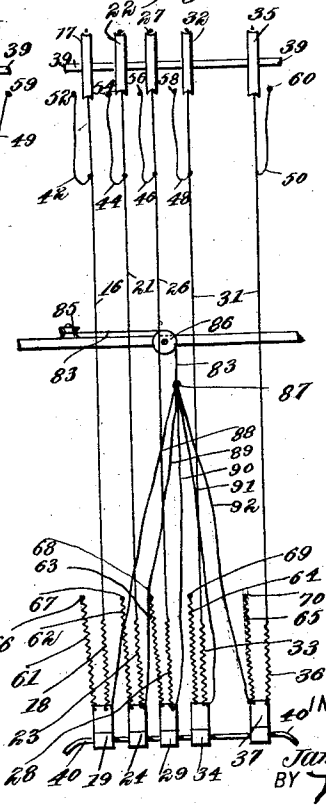


Fig. 5.



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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 6.

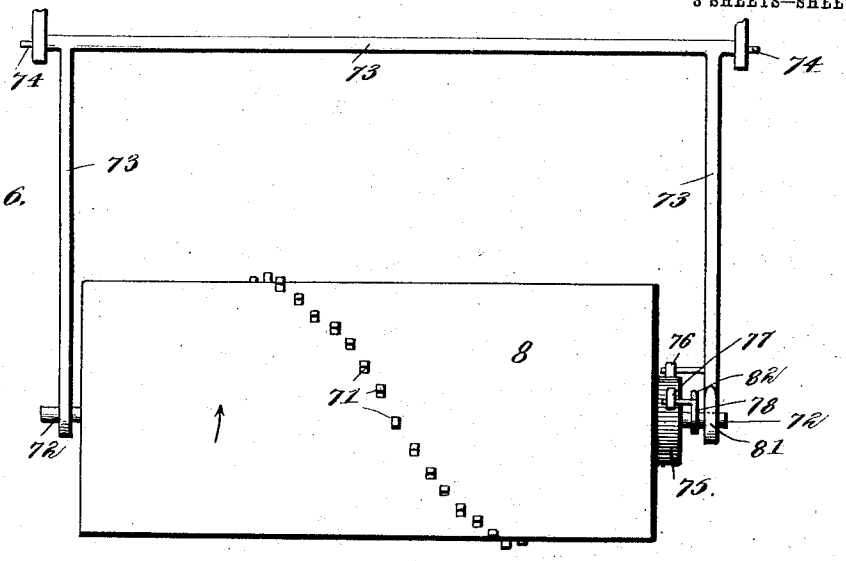


Fig. 7.

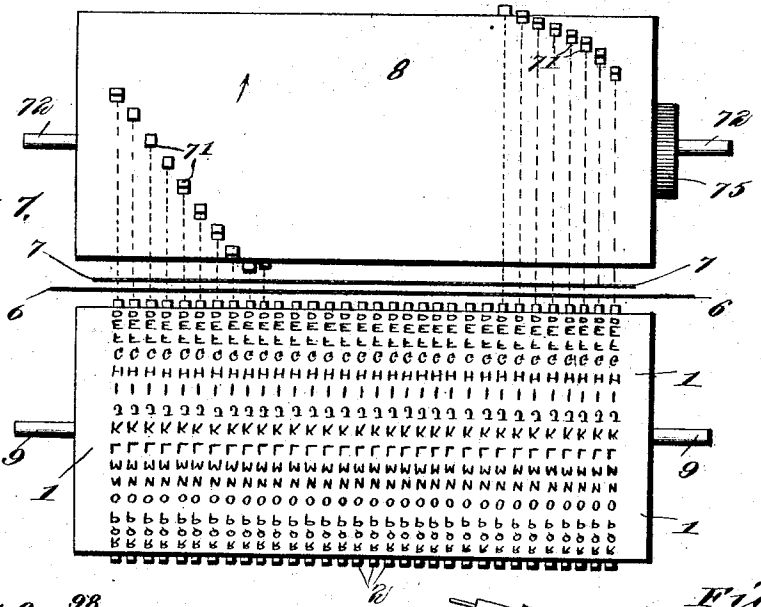


Fig. 8.

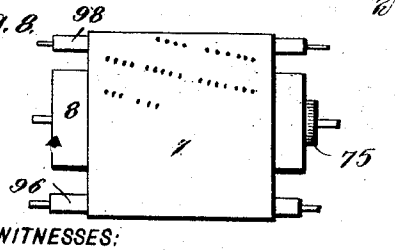
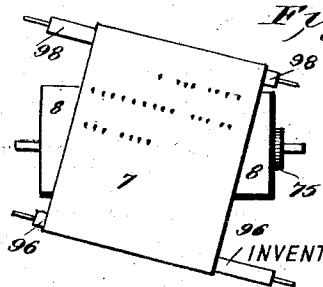


Fig. 9.



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No. 765,532. Patented July 19, 1904.

UNITED STATES PATENT OFFICE.

JAMES DUNDAS WHITE, OF LONDON, ENGLAND.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 765,532, dated July 19, 1904.

Application filed October 13, 1903. Serial No. 176,878. (No model.)

To all whom it may concern:

Be it known that I, JAMES DUNDAS WHITE, a British subject, residing at 50 Clanricarde Gardens, London, England, have invented new and useful Improvements in Type-Writing Machines, of which the following is a specification.

My improvements relate to hand-operated printing-machines of the class which includes type-writing machines and stenographic machines.

The objects of my invention are to provide a machine in which as character after character is struck the printing passes along from left to right without corresponding lateral movement of the types or converse lateral movement of the paper and in which as the characters are printed in continuous succession line after line is printed in sequence, the new line commencing after the previous one is completed without any special movement or attention on the part of the operator. For this purpose I use, combined with other mechanism, a type-cylinder and a hammer-cylinder resembling those described in my patent of the United States for improvements in printing-telegraph receivers, No. 743,122, dated November 3, 1903.

I shall describe the invention as operated by a mechanism of keys, lines, and pulleys somewhat resembling that described in my patent of the United States for improvements in type-writing machines, No. 723,567, dated March 24, 1903, whereby a large number of movements may be effected by a small number of keys used singly and in various combinations and as operated by hand-actuated mechanism; but I do not limit my invention to the particular actuating devices here described. The movements of the cylinders and the spacing up of the paper may be operated by any other mechanical or electromechanical devices.

Referring to the drawings, Figure 1 is a perspective view of my type-writing machine. Fig. 2 is a diagrammatic end view of the working parts. Figs. 3, 4, and 5 are diagrammatic front views showing in three fractional parts the arrangement of the lines and pulleys by which the keys cause the type-cylinder to revolve, Fig. 4 showing the front run of the lines and Fig. 5 the rear run of the same lines. Fig. 6 is a front view of the rocking frame and hammer-cylinder 8 detached and as seen looking from left to right in Fig. 2. Fig. 7 is a view from above of the type-cylinder and the hammer-cylinder in apposition to one another and with the paper between them. Fig. 8 is a view showing how the printing is effected in lines slanting across the paper when the paper is fed up at right angles to the axis of the hammer-cylinder, and Fig. 9 is a view showing how the printing may be effected in lines straight across the paper if the paper is fed up at a suitable angle which is not at right angles to the axis of the hammer-cylinder.

The type-cylinder 1, which is preferably a hollow cylinder of light metal, has along its surface a succession of longitudinal rows of type 2 2. Each longitudinal row has different characters from every other row, and the number of characters in each row is the same as the number of letter-spaces which it is proposed to have in the line of print. In the drawings they are represented as thirty-two. These rows of characters are parallel to the axis of the cylinder, and they are placed around it one beside another, so that the general effect resembles that of a series of similar type-wheels similar set along the same axis. The longitudinal rows may be of any required number. In the drawings they are represented as thirty-two, of which thirty are occupied by characters and the remaining two are blank. One of these blank rows (indicated in Fig. 2 by the numeral 3) is normally at what I shall call the "printing-level," while the other (marked 4) corresponds to spacing and has at the end of the cylinder opposite it a projecting arm 5. This arm is utilized to effect spacing, as will be described later on.

The type-cylinder 1 is set on the axle 9 so that it revolves with that axle, which is caused to revolve by the following devices: Attached to that axle (see Figs. 1 and 3) is the line 10, which is led round that axle in one direction and has its other end attached, through the

spring 11, to the fixed point 12 on the back of the case, the purpose of this arrangement being to cause the axle and cylinder to revolve backward to the normal position on the relaxation of the contrary tension. That contrary tension is effected by means of the non-elastic line 13, which at one end is made fast to the axle and is led round the axle in the direction opposite to that of the line 10. The degree to which the axle and cylinder are revolved depends on the extent to which this line 13 is drawn out.

The line 13 is passed round the grooved wheel 14, Figs. 1, 2, 3, 4, and the end of it is made fast to the axis of pulley 15. Through this pulley is led the line 16, of which one end is passed up around the front of grooved wheel 17, Fig. 4, and then is led downward behind the wheel 17, Fig. 5, and made fast to the spring 18, attached to the key 19, while the other end of this line 16 is made fast to the axis of pulley 20. Through this pulley is led the line 21, of which one end is passed up round the grooved wheel 22 and is then led downward and made fast to the spring 23, attached to the key 24, while the other end is made fast to the axis of pulley 25. Through this pulley is led the line 26, of which one end is passed up round the grooved wheel 27 and is then led downward and made fast to the spring 28, attached to the key 29, while the other end is made fast to the axis of pulley 30. Through this is led the line 31, of which one end is passed round the grooved wheel 32 and led downward and made fast to the spring 33, attached to the key 34, while the other end is passed round the grooved wheel 35 and led downward and made fast to the spring 36, attached to the key 37. The grooved wheel 14 is set so that it can revolve freely on the stationary axle 38, while the grooved wheels 17, 22, 27, 32, and 35 are set so that they can each revolve freely on the stationary axle 39, and the keys 19, 24, 29, 34, and 37 are pivoted separately along the stationary axle 40. The range to which the lines are moved by the movement of the corresponding keys is regulated as regards each line by two check-lines, Figs. 2, 4, 5, those for the line 16 being marked 41 and 42, those for the line 21 being marked 43 and 44, those for the line 26 being marked 45 and 46, and those for the two ends of the line 31 being marked, respectively, 47 and 48 and 49 and 50. These ten check-lines are respectively made fast to the adjustable stops 51, 52, 53, 54, 55, 56, 57, 58, 59, and 60. Of each pair of check-lines one keeps the corresponding line from being drawn too far in one direction and the other keeps it from being drawn too far in the other direction, as shown in the side view of the check-lines 49 and 50 in Fig. 2. Normally the check-lines which prevent the pulley system from descending too far are tight and the others are slack; but when the key or keys are used one or more of these check-lines become slack and one or more of the other series come into play. These check-lines are (to show the arrangement more clearly) drawn as angling to their respective lines at somewhat exaggerated angles. These various check-lines are so arranged that the same range of movement is allowed to the lines 16, 21, and 26 that the end of the line 31, which is next in series, has the same range; but the other end of that line has only half that range. From these features, combined with the general effect of the pulley system, it will be evident that the keys when depressed in regular succession operate their respective lines so as to draw out the line 13 in proportions which are in geometrical progression. Thus if the extent to which the depressing of the key 19 draws out the line 13 be represented by the quantity "sixteen" the similar action of the key 24 will be represented by the quantity "eight," that of the key 29 by the quantity "four," and those of the keys 34 and 37 by the quantities "two" and "one," respectively.

Normally the type-cylinder has one of the blank rows at the printing-level and the various parts are so proportioned that the depressing of the various keys singly and in their various combinations rotates the type-cylinders so as to bring the various other rows to the printing-level. Thus the key 37 when used alone brings to the printing-level what may be called the "first" row, (marked 4, which in Fig. 2 of the drawings is blank and corresponds to spacing,) the key 34 similarly brings to the printing-level what may be called the "second" row, the key 29 the "fourth" row, the key 24 the "eighth" row, and the key 19 the "sixteenth" row. The intermediate rows, as well as the rows from the seventeenth to the thirty-first, inclusive, are brought to the printing-level by the various combined movements of the keys. Thus, for instance, the combined movement of keys 37 and 34 brings round the third row, the combined movement of keys 34 and 29 the sixth row, the combined movement of keys 34, 29, and 24 the fourteenth row, and the combined movement of all the keys brings round the thirty-first row. For simplicity I have shown the rows of characters ranged round the type-cylinder in strict alphabetical order; but they are preferably arranged in such order as suits the convenience of the operator, the commoner letters being allocated to the smaller and simpler movements. To assist the operator, the five keys may be enameled in five different colors—as, for instance, red, white, blue, green, and yellow—and there may be fitted on the machine a plate setting out in their usual order the various characters and indicating the corresponding key or combination of keys by a band or bands of the corresponding color or colors.

The system of lines and pulleys is arranged

in the order as here described, (in preference to the contrary order as described in the specification of my patent of the United States, No. 723,567, already referred to,) in order that the weight of the pulleys may not operate to draw the type-cylinder from the normal position. To relieve the lines of the weight of the keys, (see Figs. 2 and 5,) the five keys are supported, respectively, by the springs 61, 62, 63, 64, and 65, attached to the fixed points 66, 67, 68, 69, and 70. The other five springs by which the lines are attached to the keys are of such a stiffness as not to yield substantially until the corresponding check-lines become tight, but to yield after that. This allows for a further movement of the keys, which while ineffective so far as any further revolving of the type-cylinder is concerned is utilized to effect printing, as will be described presently.

The hammer-cylinder 8 is a light cylinder of about the same length as the other, having around it arranged as a single-turn spiral (see Figs. 6 and 7) a series of projections 71 71, which I shall call the "hammers" or "impact-faces" and which are of the same number as the letter-spaces which it is proposed to have in the line of print or the number of characters in any one longitudinal row of characters on the type-cylinder. In the drawings they are represented as thirty-two. The hammers on the one cylinder are of about the same length and breadth as the characters on the other, and the two cylinders are set so that each hammer on the hammer-cylinder is opposite one of the circular series of type on the type-cylinder, as shown in Fig. 7. The hammer-cylinder 8 is on the axle 72, Fig. 2, which is journaled in the rocking frame 73, this latter being pivoted on a stationary center 74, so that with movement about that center the frame 73 may be rocked so as to make the hammer-cylinder 8 strike against the type-cylinder 1, the paper 7 and the printing-ribbon 6 being between them. The parts of the cylinders between which the blow takes place are of the hammer-cylinder the hammer which is at the printing-level and of the type-cylinder the character opposite that hammer of the row of characters which is at the printing-level. Besides this rocking movement the cylinder 8 has a rotary movement, which is effected as follows: On the end of the cylinder is the ratchet 75, which has as many teeth as there are hammers on the cylinder. Upon this ratchet engages a detent-pawl 76 (to prevent reversing) and also the pawl 77 on the arm 78, which arm is pivoted at 72 and has a range of movement which is restricted by the check-lines 79 and 80, Fig. 2, one of which, 79, is attached to the principal part of the rocking frame 73, while the other, 80, is attached to the arm 81, which projects from that frame. The weight 82 tends to make the arm 78 descend toward the arm 81, so that normally the line 79 is tight and the line 80 is slack. The proportions are such that each upward movement of the arm 78 sends the ratchet 75 and the cylinder 8 one step round, so that by successive movements of this kind (the arm 78 falling back after each movement) the hammers or impact-faces are brought successively to the printing-level.

The rotation and the rocking of the hammer-cylinder 8 are effected by means of the line 83, which is attached at one end to the arm 78, is led through a pulley 84 on the frame 73, thence round the grooved and right-angularly-arranged wheels 85 and 86, (which revolve freely on stationary axles,) and the other end of it is attached at 87 (see Fig. 5) to five lines 88, 89, 90, 91, and 92, which are respectively connected to the five keys. These lines are so proportioned as to be slack normally, but so that when any key is pressed down the corresponding line gradually tightens. This gradual tightening does not effect any movement of the hammer-cylinder till the type-cylinder has been rotated, as described; but the proportions are such that the further movement of the key (which is ineffective so far as the type-cylinder is concerned) makes one of its lines 88 to 92 actually tight and causes it to operate the line 83 and the hammer-cylinder in the following way: With the tightening of any of these lines 88 to 92 or of any combination of them the resulting tightening of the line 83 first moves the arm 78 so as to send the cylinder 8 one step round, and when the tightening of the check-line 80 prevents further movement of that arm causes the frame 73 to rock, so that the cylinder 8 strikes against the type-cylinder 1, while as soon as the tension is relaxed the parts return to the normal position, that return being aided by the spring 93, attached to the fixed point 94. Between the cylinders are the printing-ribbon 6 and the paper 7, and the effect of the stroke is to effect printing on the ribbon side of the paper where the parts of the cylinders between which the blow takes place come into contact. The parts which thus come into contact are (as already said) of the hammer-cylinder the impact-face or hammer, which is at the printing-level, and of the type-cylinder the opposite character of that row of characters which is at the printing-level. From the spiral arrangement of the hammers, combined with the step-by-step movement which brings them successively to the printing-level, it will be evident that as stroke after stroke is given the printing passes along from left to right (as viewed in Figs. 6 and 7) and the last impact-face on the right is followed by the first on the left, thus beginning a new line.

The following arrangement may be adopted for spacing up the paper: The paper 7, (see Fig. 2,) which is of a flexible character, is fed from the roll 95 round the small roller 96. Thence it passes between the cylinders and is held in position between the small rollers 97

and 98, the latter being set on the axle 99. At the end of the roller 98 and revolving with it round the axle 99 is the ratchet-wheel 100, on which engages the detent-pawl 101 (to prevent reversing) and also the pawl 102, which is fitted on the arm 103. That arm is attached to the fixed point 104 by the spring 105 and to the frame 73 by the inelastic line 106. As often as the frame 73 is rocked toward the type-cylinder 1 the spring 105 draws the arm 103 toward the point 104, while the return of the frame 73 draws (by means of the line 106) the arm 103 in the other direction. The parts are so proportioned that each such return movement sends the ratchet (and so the rollers) one step round, thus moving up the paper a very little after each stroke. The effect of this movemement is that as character after character is printed each new character, besides being next the other, is on a slightly-lower level, as seen in Fig. 8, and by the time one line is completed the paper has been spaced up sufficiently for the next line to be begun sufficiently far below it. The difference of level between the last character of the preceding line and the first character of the next one is the same as the difference of level between any two adjoining characters.

The various parts are suitably proportioned, and the characters on the type-cylinder are preferably so fashioned as to make the slope of each character conform to the slope of the alinement. If the paper is fed up at right angles to the axis of the hammer-cylinder, the effect is to print the lines slantingly across the paper, as shown in Figs. 1 and 8; but if the paper is fed slantingly at a suitable angle the characters may in relation to the paper be printed straight across it, as shown in Fig. 9. In the latter case the axes of the paper-rollers are oblique to the printing-level.

Spacing without printing is effected thus: When the blank-row 4 (see Fig. 2) on the type-cylinder 1 is brought to the printing-level and the frame 73 and hammer-cylinder 8 are rocked, the projecting stop-arm 81 encounters the projecting arm 5, (these arms passing outside the paper 7,) so that further movement is prevented and printing is not effected; but the proportions are such that this restricted movement, though it does not effect printing, moves the hammer-cylinder a step round and spaces up the paper in the same way as if printing had been effected.

I have described this type-writing machine as having a keyboard of five manually-operated keys and a type-cylinder with thirty-two rows of characters, including two blank rows; but I do not limit my invention to these particular numbers. It will be evident that the increase of the system of keys, lines, and pulleys by one of each of these, making six keys and five pulleys, will provide for the operation of a cylinder having sixty-four rows and that a further increase to seven keys and six pulleys will provide for the operation of a cylinder having a much larger number.

I am aware that a stenographic and type-writing machine has been heretofore devised in which a sheet of paper passes between a series of anvil-faces progressing spirally around an axis and a series of straight-line printing-faces arranged like comb-teeth on the ends of depressible levers and adapted to advance and press the paper against the successive anvil-faces along the spiral series as the latter is intermittently rotated, and I do not claim this principle of action.

In my invention a cylinder is provided with a series of alphabets and characters which progress around the cylinder and the letters and characters of which series are multiplied or repeated in parallel alinement with the axis, so that there is a straight series of similar letters or characters arranged in rows parallel to the axis and another cylinder is arranged in parallel position to the first named and bears a single spirally-progressing series of impact-faces on the other side of the paper, which cylinder is both intermittently rotated and moved bodily as a hammer to bring one of its impact-faces against the paper and the selected type-face of the other cylinder, that other cylinder being turned mechanically so as to bring at will any row of type to the printing-level, and the hammer-cylinder having suitable mechanical means for giving it a step-by-step movement and for projecting it bodily against the other, as hereinbefore described.

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

1. A hand-operated type-writing machine comprising a type-cylinder having circularly-arranged series of alphabets or characters disposed around the cylinder with each character of each circular series repeated in rows parallel to the axis of the cylinder, a hammer-cylinder arranged parallel to the first-named cylinder and bearing a single row of spirally-arranged impact-faces, mechanical devices for turning one cylinder and for imparting to the other cylinder both a rotary step-by-step movement and an integral lateral movement to deliver the printing-blow, and a keyboard with manually-operated keys connecting with and actuating said mechanical devices, substantially as and for the purpose described.

2. A hand-operated type-writing machine, comprising a rotarily-oscillating type-cylinder having circularly-arranged series of alphabets or characters disposed around the cylinder with each character of each circular series repeated in rows parallel to the axis of the cylinder, a hammer-cylinder arranged parallel to the first-named cylinder and bearing a single row of spirally-arranged impact-faces, mechanical devices for actuating both cylinders, one set of devices being arranged

to rotarily advance the type-cylinder to bring the row of the required character to the printing-level and then rotarily retract it, and the other set of mechanical devices being arranged to progressively rotate the hammer-cylinder a step at a time and also cause it to move laterally to deliver the printing-blow, and a keyboard with manually-operated keys for setting into action these mechanical devices, substantially as and for the purpose described.

3. A hand-operated type-writing machine, comprising a type-cylinder having circularly-arranged series of alphabets or characters disposed around the cylinder with each character of each circular series repeated in rows parallel to the axis of the cylinder, a hammer-cylinder arranged parallel to the first-named cylinder and bearing a single row of spirally-arranged impact-faces, mechanical actuating devices for both cylinders, a keyboard with manually-operated keys operating and controlling said actuating devices and feeding devices for the paper also operated and controlled by the keys, substantially as and for the purpose described.

4. A hand-operated type-writing machine comprising a type-cylinder having circularly-arranged series of alphabets or characters, disposed around the cylinder with each character of each circular series repeated in rows parallel to the axis of the cylinder, mechanical devices for turning this cylinder, a hammer-cylinder arranged in movable bearings parallel to the first-named cylinder and bearing a single row of spirally-arranged impact-faces, mechanical devices for both rotating this hammer-cylinder with a step-by-step movement and also projecting it bodily toward the other to deliver a printing-blow, paper-feeding rolls arranged obliquely to the axis of said cylinders, means for feeding the paper in the direction of its length at each printing-blow and a keyboard with manually-operated keys controlling said devices, substantially as described.

5. In a hand-operated type-writing machine, the combination of a type-cylinder having circularly-arranged series of letters or characters disposed around the cylinder with each character of each circular series repeated in rows parallel to the axis of the cylinder, a hammer-cylinder arranged parallel to the first-named cylinder and bearing a single row of spirally-arranged impact-faces and means for rotating and bringing the cylinders together, substantially as described.

6. A type-writing machine consisting of the combination of a type-cylinder having circularly-arranged series of letters or characters disposed around the cylinder with each character of each circular series repeated in rows parallel to the axis of the cylinder, a hammer-cylinder arranged parallel to the first-named cylinder and bearing a single row of spirally-arranged impact-faces, means for bringing the two cylinders together, paper-rolls and means for feeding the paper between the cylinders at each printing-blow, substantially as described.

7. In a hand-operated type-writing machine, the combination of a type-cylinder having circularly-arranged series of letters or characters disposed around the cylinder with each character of each circular series repeated in rows parallel to the axis of the cylinder, a hammer-cylinder arranged parallel to the first-named cylinder and bearing a single row of spirally-arranged impact-faces, means for rotating and bringing the two cylinders together and a keyboard with manually-operated keys controlling said means, substantially as described.

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