No. 775,739. PATENTED NOV. 22, 1904.

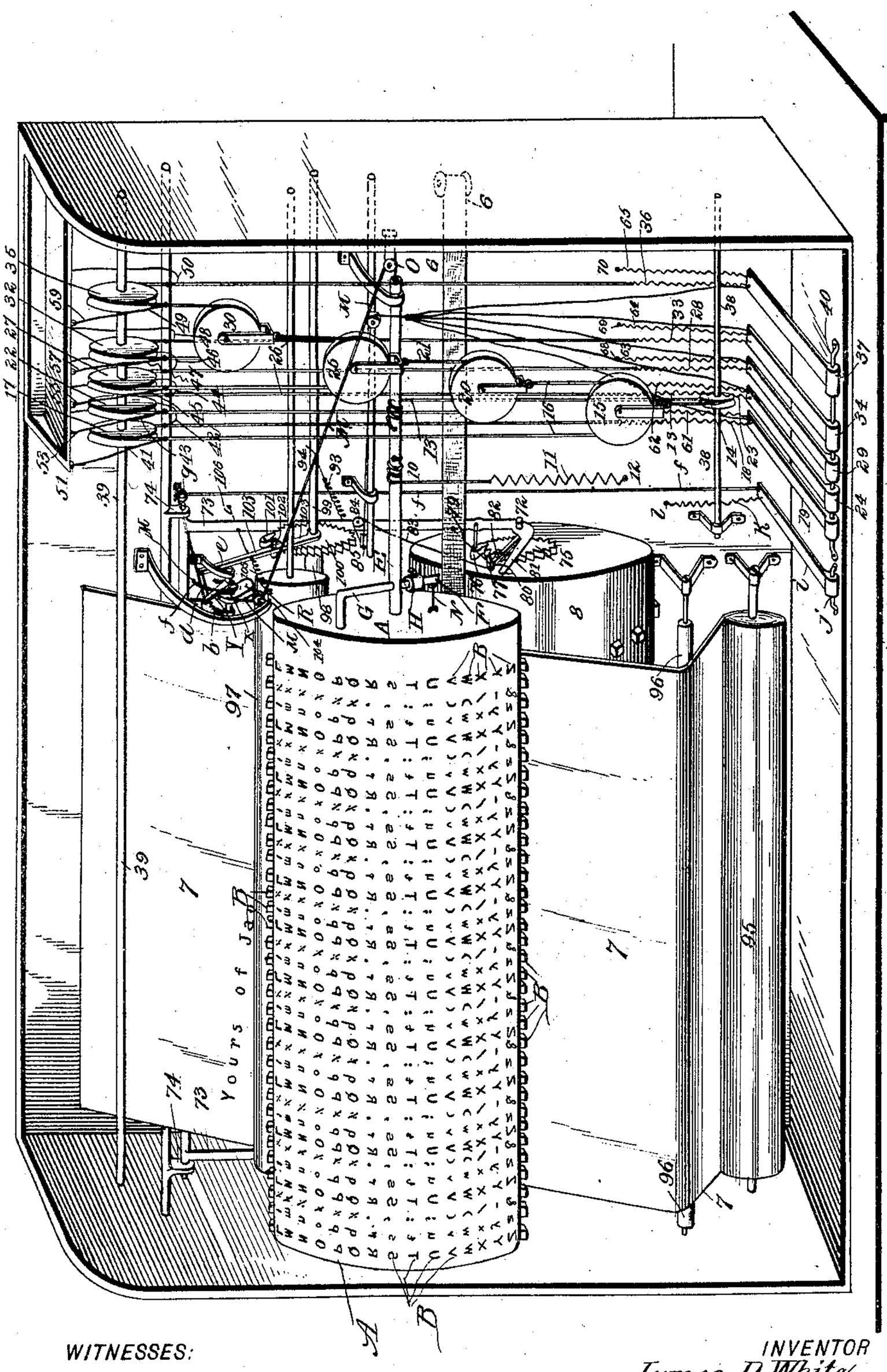
J. D. WHITE.

TYPE WRITING MACHINE.

APPLICATION FILED JUNE 14, 1904.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

Fred'k Haskins

Edw. W. Byrn

INVENTOR

James D. White

BY Munn & Co.

ATTORNEYS

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NO MODEL.. 5 SHEETS—SHEET 2.

Fig. 1.

WITNESSES:

Fred'k D. Bradford

Edw. W. Byrn.

INVENTOR

James D. White,

BY Munn & Co.

ATTORNEYS

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NO MODEL. 5 SHEETS—SHEET 3.

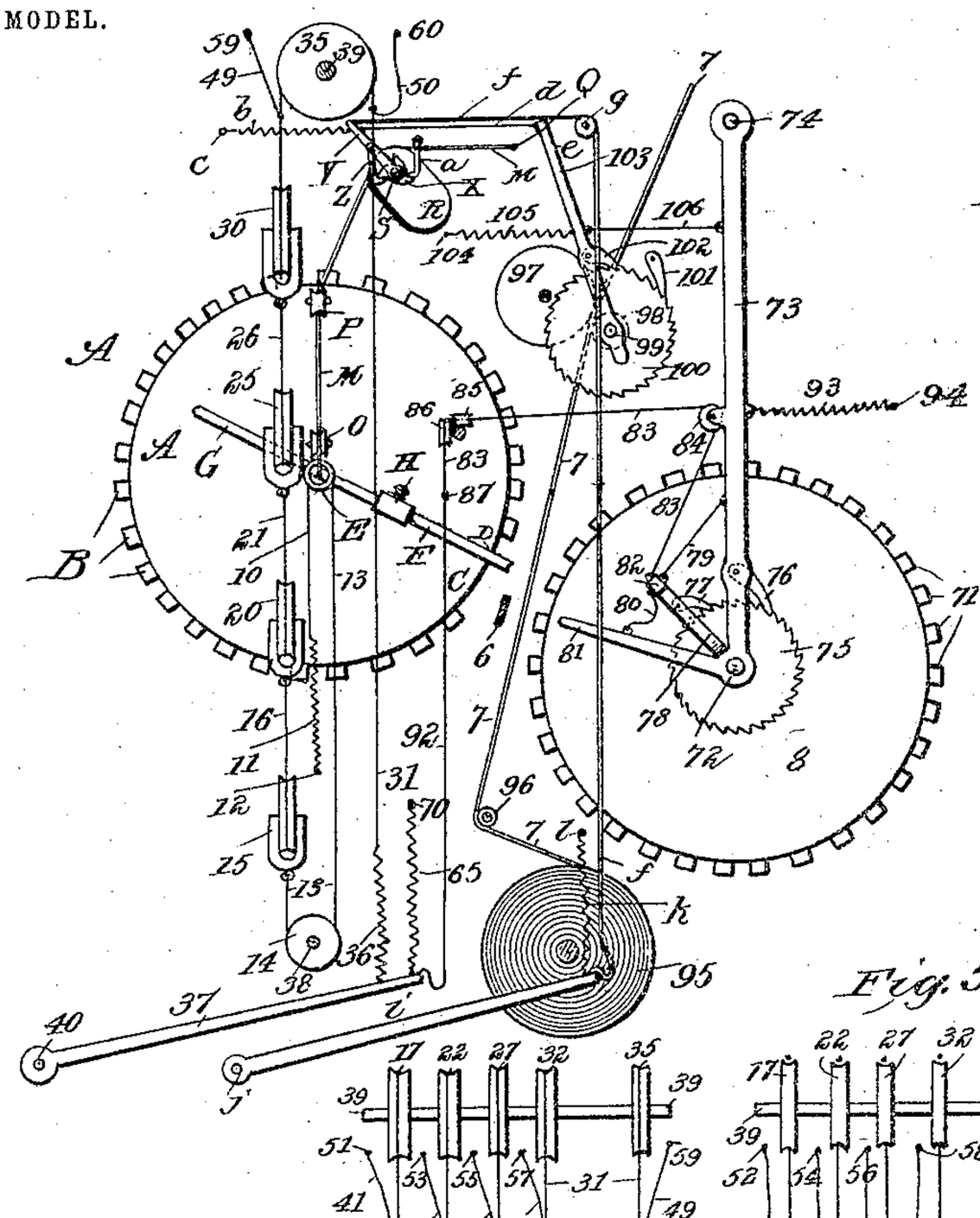


Fig. 2.

Fig. 3.

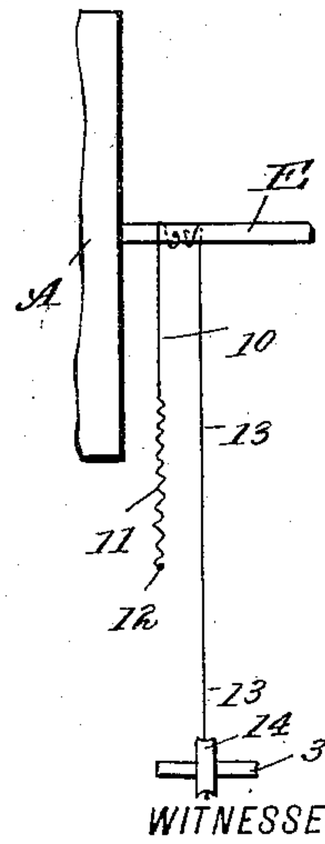


Fig. 4.

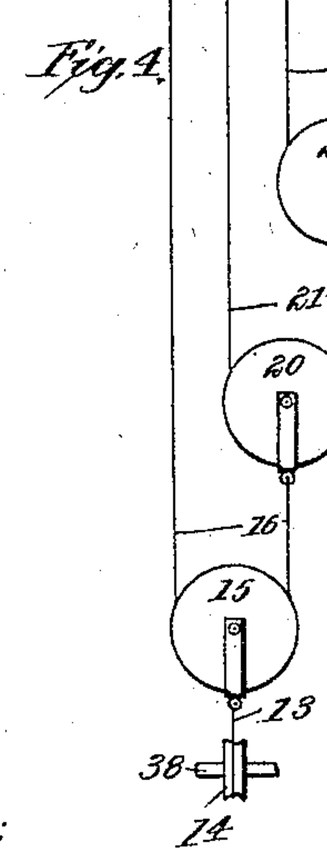
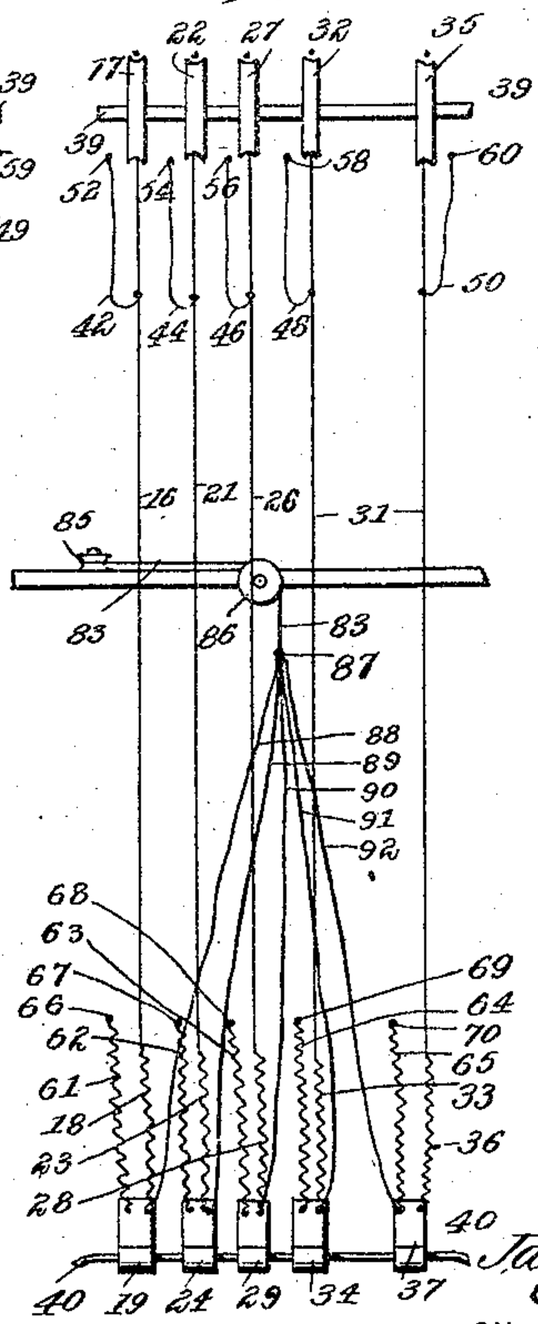


Fig. 5.



WITNESSES:

Fred'k D. Bradford.

Edw'd W. Byrn.

INVENTOR

James D. White,

BY Munn & Co.

ATTORNEYS

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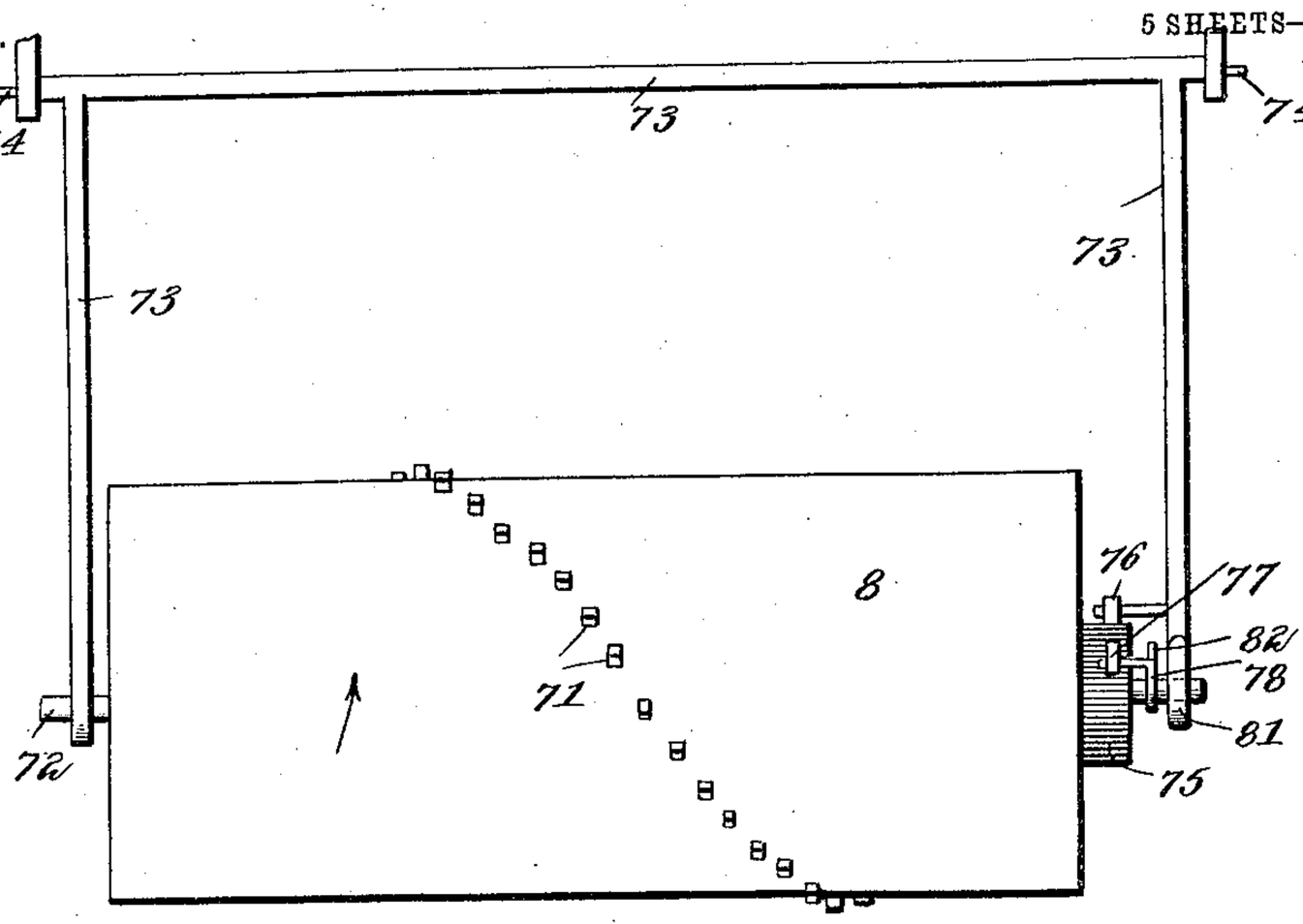
Fig. 6.



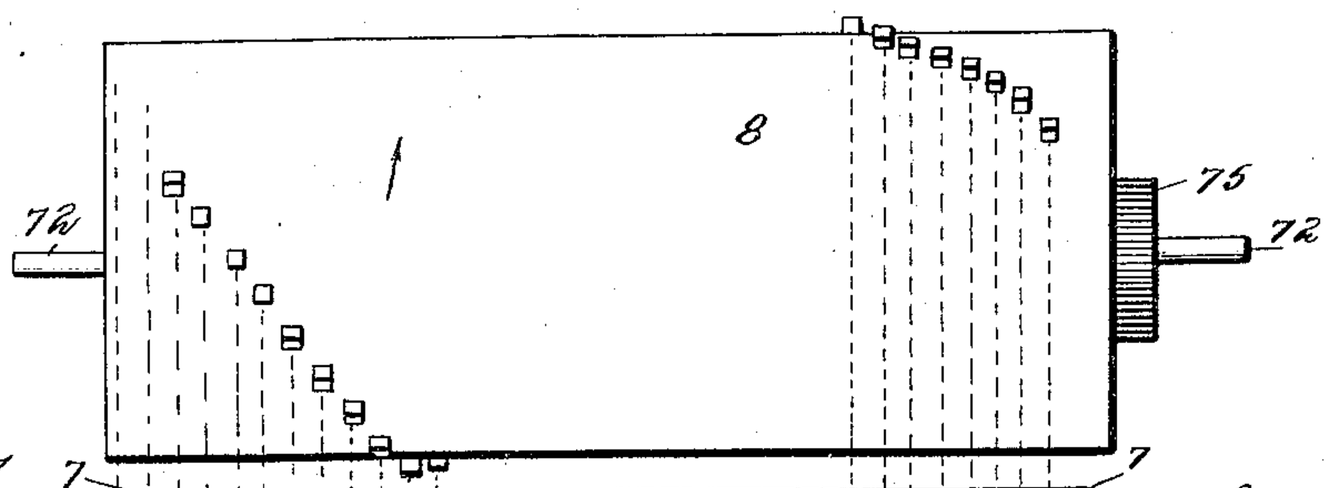


Fig. 7.

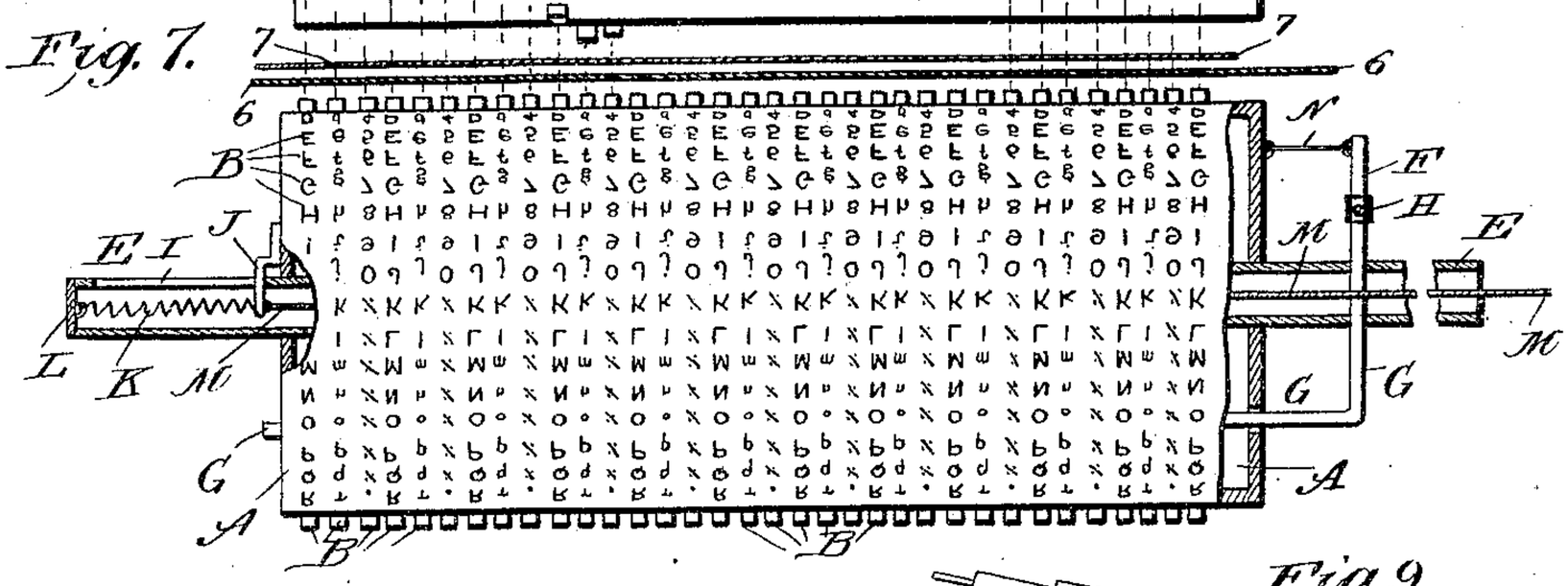


Fig. 8.

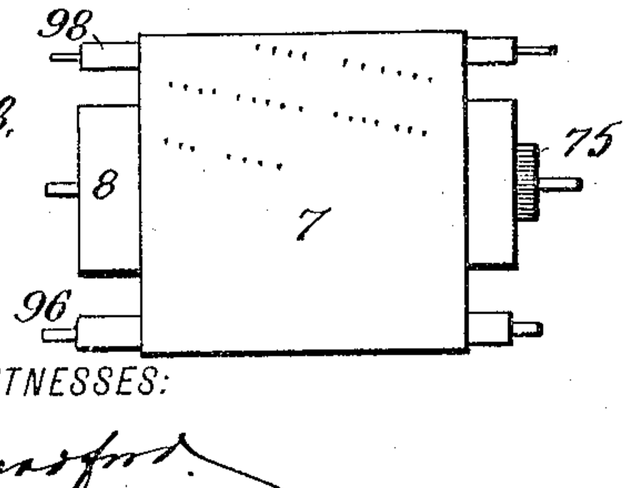
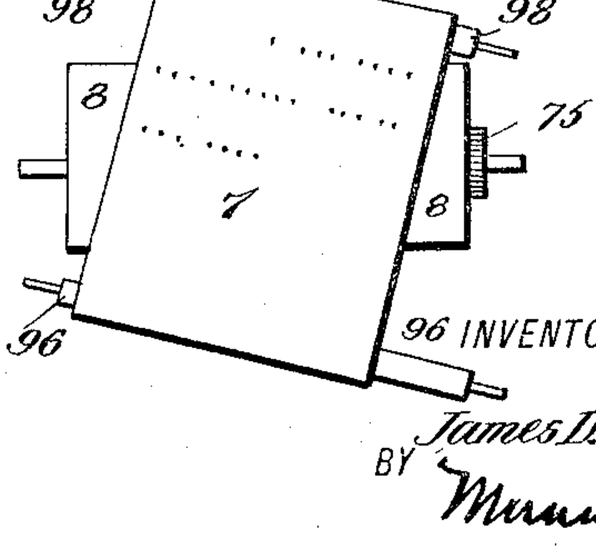


Fig. 9.



WITNESSES:

Fred. P. Brosford.

Edw. W. Byrn.

96 INVENTOR

James D. White.

BY Munn & Co.

ATTORNEYS

No. 775,739. PATENTED NOV. 22, 1904.

J. D. WHITE.

TYPE WRITING MACHINE.

APPLICATION FILED JUNE 14, 1904.

NO MODEL. 5 SHEETS—SHEET 5.

Fig. 10.

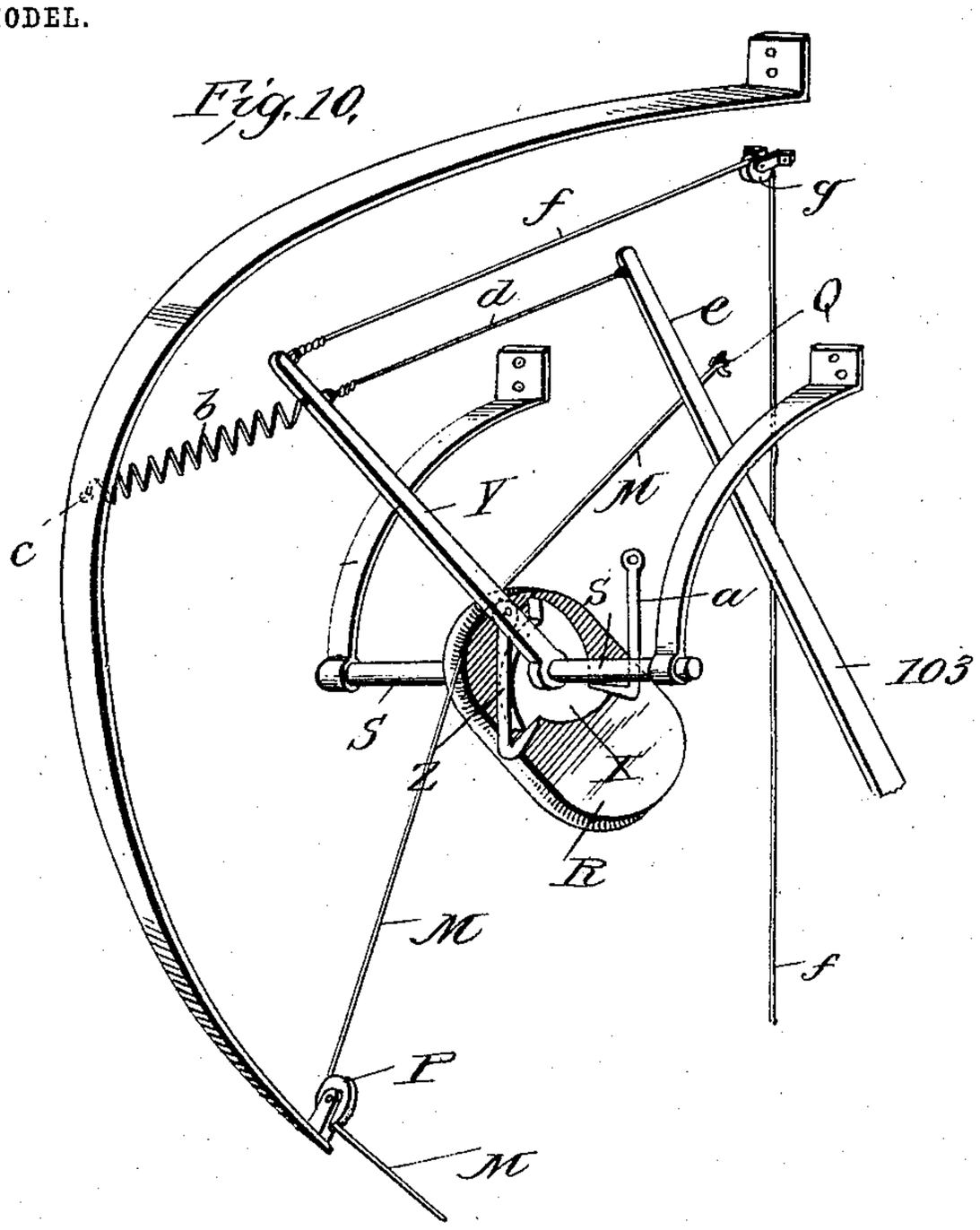
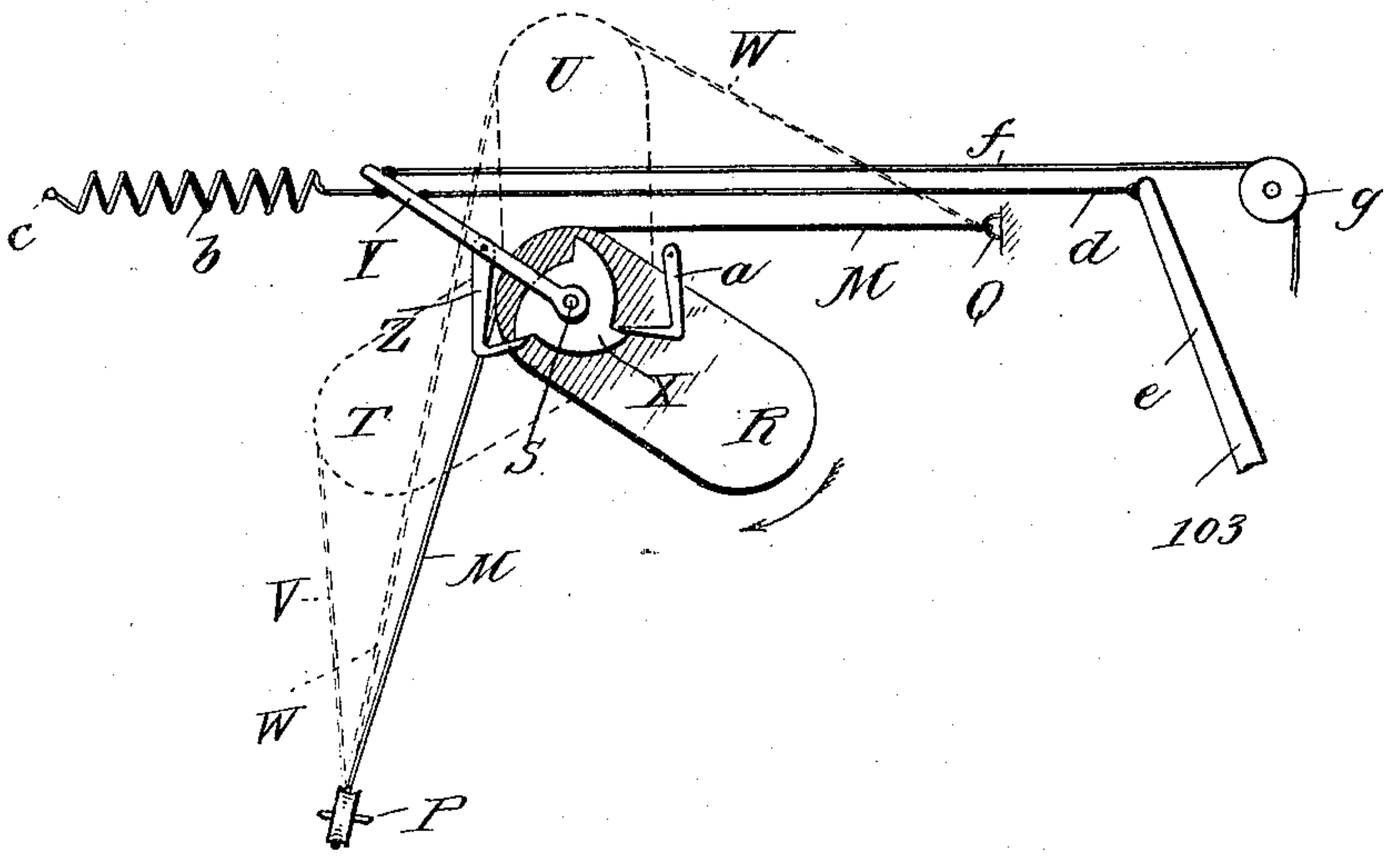


Fig. 11.



WITNESSES:

Fred. D. Bradford

Edw. W. Byrn.

INVENTOR

James D. White,

BY Munn & Co.

ATTORNEYS

No. 775,739. Patented November 22, 1904.

UNITED STATES PATENT OFFICE.

JAMES DUNDAS WHITE, OF LONDON, ENGLAND.

TYPE-WRITING MACHINE.

SPECIFICATION forming part of Letters Patent No. 775,739, dated November 22, 1904.

Application filed June 14, 1904. Serial No. 212,524. (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 invention relates to hand-operated printing-machines of the class which includes type-writing machines and stenographic machines. It is an improvement upon the type-writing machine described in the specification of my Patent No. 765,532, granted July 19, 1904, in which previous machine 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 automatically, the new line commencing after the previous one is completed without any special movement or attention on the part of the operator.

The objects of my present invention are to provide a type-writing machine of a somewhat similar character, but so contrived as (without increasing the series of lines and pulleys or the number of longitudinal rows of characters on the type-cylinder) to afford three times the range of characters afforded by said prior machine. I accomplish this by a modified form of the machine, the arrangement being such that three characters follow each other in succession through each longitudinal row on the type-cylinder and are individually brought into action by giving the type-cylinder a regulated sliding movement along the axle, with which it revolves, and by providing devices by which the type-cylinder may be slid from one of three positions to the next after each printing or spacing stroke and may also be so slid by a further independent movement independently of printing or spacing.

I attain my objects by the mechanism shown in the accompanying drawings, in which—

Figure 1 is a perspective view of the apparatus as a whole. Fig. 1ª is an enlarged view of the type-cylinder. Fig. 2 is a diagrammatic end view of the apparatus. Figs. 3, 4, and 5 are diagrammatic front views showing in three stages the arrangement of the lines and pulleys by which the keys cause the type-cylinder to revolve. Fig. 6 is a front view of the rocking frame and hammer-cylinder as seen from where the type-cylinder is. 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. 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. Figs. 10 and 11 are detail views, on a larger scale, of certain parts shown in Figs. 1 and 2.

In this specification the parts which are the same as those in my earlier invention, above referred to, are denoted by the same reference-figures (1 2 3, &c.) as denote the same parts in that earlier invention. The parts which are varied or which are additional are denoted by the letters of the alphabet, using first the capitals A B C, &c., and then the small letters *a b c*, &c., as far as required.

The type-cylinder A, Figs. 1, 1ª, and 7, which is opposite the hammer-cylinder 8, is preferably a hollow cylinder of light metal and has along its surface a succession of longitudinal rows of type B B. Each row has three different characters, which are repeated on a straight line and which I shall call, respectively, "capitals," "small letters," and "figures," using (in accordance with the drawings) the term "figures" to include figures, fractions, and various marks of punctuation, as well as other signs. Each of these longitudinal rows has different characters from every other, progressing in some convenient order around the cylinder. Every row has the same number of characters, and that number (which is shown in the drawings as thirty-four) exceeds by two the number of letter-spaces which it is proposed to have in the line of print. These rows of type are parallel to the axis of the cylinder, and they are placed

round it one beside another, so that the general effect resembles that of a series of capital-wheels, small-letter wheels, and figure-wheels following in succession regularly from left to right along the same axis, all the capital-wheels and small-letter wheels being correspondingly set and all the figure-wheels being similarly set, so that one capital, the corresponding small letter, and one figure follow in sequence and are repeated regularly through each longitudinal row. These longitudinal rows may be of any convenient 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 (marked C, Fig. 2) is normally at what I shall call the "printing-level," while the other (marked D) corresponds to spacing. The type-cylinder A revolves with the axle E, along which it has a restricted sliding movement, which will presently be described. From the axle E opposite the blank row D projects the arm F, that arm being sufficiently far out to pass outside the printing-ribbon 6 and paper 7 and being continued on the other side of the axle E in the bent arm G, which passes longitudinally through the type-cylinder and causes it to revolve with the axle, and in order to equalize the balance of the parts a counterpoise H is fitted on the arm F.

The type-cylinder A revolves with the axle E, which is caused to revolve by the following devices: Attached to that axle is the line 10, Figs. 1 and 3, which is led round that axle in one direction and has its other end attached through the spring 11 to the stop 12, 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. 2, 3, and 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 round the grooved wheel 17, Fig. 4, and is led downward and made fast to the spring 18, Fig. 5, attached to the key 19, while the other end is made fast to the axis of pulley 20, Fig. 4. Through this pulley is led the line 21, of which one end is led round the grooved wheel 22, Fig. 4, and is led downward and made fast to the spring 23, Fig. 5, attached to the key 24, while the other end is made fast to the axis of pulley 25, Fig. 4. Through this pulley is led the line 26, of which one end is passed round the grooved wheel 27 and led downward and made fast to the spring 28, Fig. 5, attached to the key 29, while the other end, Fig. 4, 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, Fig. 5, 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, 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 becomes slack and one or more of the other series come into play. To show the arrangement more clearly, these check-lines are shown in the drawings as angling to their respective lines at a somewhat exaggerated angle. 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 also the same range, but that 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-cylinder 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 D in Fig. 2,) which 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 more frequently-used letters being all located 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 as here described 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, the five keys are supported, respectively, by the springs 61, 62, 63, 64, and 65, attached to the stops 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, Figs. 6 and 7, is a light cylinder of about the same length as the other, having around it arranged as a single-turn spiral 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. 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. From what has been said it will be evident that any longitudinal row of characters on the type-cylinder has two more characters than there are hammers on the hammer-cylinder. The two cylinders are set opposite one another, so that each hammer has opposite it one of the circular series of type, as shown in Fig. 7, and thus there are two circular series which have not hammers opposite them. These "excess" series will be the two on the entreme left, as shown in Fig. 7, or the one on the extreme left and the one on the extreme right or the two on the extreme right, according to which of the three positions (presently to be referred to) the type-cylinder has been slid to by means of the mechanism presently to be described. The hammer-cylinder 8 is on the axle 72, which is journaled on the rocking frame 73, this latter being pivoted in bearings 74, so that with movement about these bearings the frame 73 may be rocked, so as to make the hammer-cylinder 8 strike against the type-cylinder A, the paper 7 and the printing-ribbon 6 being between them, as seen in Figs. 2 and 7. 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 the pawl 77 on the arm 78, which arm is pivoted at 72 and has a range of movement which is restricted by the lines 79 and 80, one of which is attached to the principal part of the rocking frame 73, while the other 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 around, 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 wheels 85 and 86, which revolve freely on stationary axles, and the other end of it is attached at 87 to five lines, 88, 89, 90, 91, and 92, (see Fig. 5,) 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 keys which is ineffective so far as the type-cylinder is con-

cerned, makes this further line actually tight and causes it to operate the hammer-cylinder in the following way: With the tightening of any of these lines or of any combination of them the resulting tightening of the line 83 first moves the arm 78, Fig. 2, 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 A, 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 stop 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 when 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 Fig. 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 (see Fig. 2) may be adopted for spacing up the paper: The paper 7, 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 that 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 the pawl 102, which is fitted on the arm 103. That arm is attached to the stop 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 A the spring 105 draws the arm 103 toward the stop 104, while the return of the frame 73, by means of the line 106, draws 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 movement is that as character after character is printed each new character besides being next the other is on a slightly lower level, 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 Fig. 8; but if the paper is fed slantingly at a suitable angle the characters may in relation to the paper be printed at right angles to the run of the paper, as shown in Fig. 9.

Spacing without printing is effected thus: When the blank row D on the type-cylinder A is brought to the printing-level and the frame 73 and hammer-cylinder 8 are rocked, the projecting arm 81 encounters the projecting arm F, (these arms passing outside the paper 7 and the ribbon 6,) so that further movement is prevented and printing is not effected; but the proportions are such that this movement besides moving the hammer-cylinder a step round also spaces up the paper in the same way as if printing had been effected.

It will be evident that if the type-cylinder were not slid longitudinally successive strokes of the hammer-cylinder would print capitals, small letters, and figures in succession. To secure the printing of any of these three classes continuously and to provide for shifting from any one of them to the other, the following devices are used. It has already been said that the type-cylinder A while revolving with the axle E can be slid along that axle. That sliding is effected thus: The axle E (see Fig. 7) is hollow, so that spring K can be placed in it and a line or wire M led through it. Along it at one end is the longitudinal slot I, in which slides the projection J on the cylinder A, to the end of which projection is attached on one side the spiral spring K, which lies in the hollow axle E and of which the other end is made fast to the end of that axle, as shown at L. To the other side of the projection J is attached (so that it can revolve freely but will not draw out) the line or wire M, which passes in the other direction through the hollow axle. By means of this spring K the type-cylinder A can be slid to what I shall call the "left position" (in which both the "excess" series are to the left, as shown in Fig. 7.) The middle position (in which the excess series are one on the left and one on the right) and the right position (in which both the excess series are on the right) are obtained by line M. The movement toward the left position is restricted by the flexible but inelastic anchorage N, which prevents the cylinder from being drawn too far by the spring when the line M is slack. The other two positions are controlled directy by the tension of the line M.

It will be seen that sliding the type-cylinder A to the left position, to the middle posi-

tion, and to the right position in regular alternation will bring opposite the several hammers a small-letter series, a capital series, and a figure series in regular succession, and if these movements are made successively between the printing or spacing strokes, a movement after each stroke, the effect, combined with the progression of the hammers, will be to bring in front of the next hammer the same kind of series as was opposite the last one, so that the same class of characters will be printed continuously—small letters, capitals, or figures, as the case may be.

The line M is flexible but inelastic, and the various extensions of it are effected as follows, (see Figs. 1, 2, 10, and 11:) The line is led through a hole at the end of the axle E, around the pulleys O and P, the end of it being made fast at Q. Between P and Q it passes round the grooved eccentric cam R, which is journaled on the axle S. By mechanism presently to be described this cam is revolved through one-third of a circle at each movement, so that it occupies successively the positions indicated by R, T, and U in Fig. 11. When the cam is as shown at R, the line is as shown by M. When the cam is at T, the line is as shown in dotted position at V. When the cam is at U, the line is as shown at W W. These three successive extensions of the line, by taking up more or less of the same, cause the type-cylinder A to slide to its three positions at will.

The cam R is operated as follows: Attached to and revolving with it on the axle S is the ratchet-wheel X, which has three equidistant teeth. Also journaled on the axle S, but with a movement independent of the parts just mentioned, is the lever Y, on which is the pawl Z, which engages the ratchet-wheel X, which is kept from reversing by the detent-pawl *a*. The lever Y is normally kept in the position shown in the drawings by the spring *b*, which is attached to point *c*, but so that it may be oscillated in the other direction by the tension of the line *d*, which connects it to the extension *e* of the lever 103, which extension moves with the lever. The proportions are such that each oscillation of the lever 103, as heretofore described, oscillates the lever Y through at least one third of a circle, thus revolving the ratchet-wheel X through the same angular distance (and causing the pawl Z to catch on a fresh tooth when after the movement in the other direction the spring *b* causes the lever Y to revert to the normal position) and also moving the cam through the same angular distance—that is to say, to the next of the indicated positions. By this means the extension of the line M is varied, as described, and as such a movement occurs after each stroke the type-cylinder is slid after each stroke, so that small letters, capitals, or figures are printed continuously. To effect shifting from any one class of characters to any other, the following additional mechanism is used: The lever Y, besides being moved by the line *d*, may also be similarly moved by the line *f*, which is attached to it and is led through the pulley *g* (see Fig. 1) and has its other end attached to the supplementary key *i*, which is journaled at *j* and normally kept up by the spring *k*, attached to the point *l*, the arrangement being such that as often as the key *i* is depressed (independently of any movement of the lever 103) the lever Y is oscillated, the cam R turned to its next position, and the type-cylinder A slid to its next position. One of such movements effects the shift from any one class to what may be called the "next" class, and two of such movements in succession effects the shift from any one class to what may be called the "third" class.

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 characters disposed around the cylinder in alined groups with each group repeated in direction 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 adjusting it longitudinally 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 characters disposed around the cylinder in alined groups with each group repeated in direction 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 said devices being arranged to adjust the type-cylinder longitudinally to select the character of the group, another set of devices 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 characters disposed in alined groups around the cylinder with each group repeated in direction 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 characters disposed in alined groups around the cylinder with each group repeated in direction parallel to the axis of the cylinder, mechanical devices for turning this cylinder and adjusting it longitudinally, 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 characters disposed in alined groups around the cylinder with each group repeated in direction 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 cylinders together and means for imparting a regulated sliding movement to the type-cylinder substantially as described.

6. A type-writing machine consisting of the combination of a type-cylinder having circularly-arranged series of characters disposed in alined groups around the cylinder with each group repeated in direction 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, 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 characters disposed in alined groups around the cylinder with each group repeated in direction 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 for sliding one of the cylinders and a keyboard with manually-operated keys controlling said means, substantially as described.

8. In a hand-operated type-writing machine, the combination of a type-cylinder having circularly-arranged series of characters disposed in alined groups around the cylinder, with each group repeated in direction parallel to the axis of the cylinder, means for slidably supporting said cylinder, and a regulated means for determining the extent of said slide consisting of a spring pulling the cylinder in one direction, a flexible cord or line adapted to pull it in the other direction, a rotary adjustable eccentric cam bearing against said cord and means for giving a variable throw to the cam to take up more or less of the cord substantially as shown and described.

JAMES DUNDAS WHITE.

Witnesses:
CHARLES LEDGER,
ELIZ. A. KILBY.