

Oct. 16, 1928.

1,687,939

R. McK. JONES

TYPEWRITING MACHINE

Filed May 19, 1927

3 Sheets-Sheet 1

Fig. 1

1	2	3	4	5	6	7	8	9	0
レ	ル	ロ	リ	ラ	ナ	ニ	ノ	ヌ	ネ

ユ	セ	シ	ソ	サ	カ	ク	キ	コ	ケ	ク
ユ	ス	ソ	ッ	サ	カ	ク	キ	コ	ケ	ク

ヤ	イ	ツ	ッ	シ	ソ	サ	カ	ク	キ	コ
ヤ	テ	ツ	ト	チ	タ	マ	ミ	モ	ム	メ

ヨ	(	ヘ	フ	)	ア	イ	ウ	オ	エ	
ヨ	ホ	ヒ	ハ	ン	ア	イ	ウ	オ	エ	

Fig. 2

1	2	3	4	5	6	7	8	9	0
re	ru	ro	ri	ra	na	ni	no	nu	ne

yu	se	L	7	/	—	%	¥	=	wo	
yu	su	so	shi	sa	ka	ku	ki	ko	ke	wa

ya	i	tsu	tt	:	.	,	—	?	me	
ya	te	tsu	to	chi	ta	ma	mi	mo	mu	

yo	(	he	fu	)		a	i	u	o	ye
yo	ho	hi	ha	n	a	i	u	o	ye	

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TYPEWRITING MACHINE

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3 Sheets-Sheet 2

1	2	3	4	5	6	7	8	9	0	77
40	58	49	39	30	28	29	38	48	57	52
レ	ル	ロ	リ	ラ	ナ	ニ	ノ	ヌ	ネ	ヲ

7	83	78	63	64	66	67	68	65	84	82	9
17	42	25	45	33	51	26	36	35	54	45	19
エ	セ	ス	ソ	ッ	サ	カ	ク	キ	コ	ケ	ワ

6	69	41	70	71	72	73	61	74	81	62	39
16	23	50	32	31	22	37	55	56	46	47	60
ヤ	イ	ツ	ン	:	.	,	-	?	!	=	〇

Fig. 3

8	79	80	44	75	76	2	21	3	5	4
18	11	20	53	34	27	12	24	13	15	14
ヨ	フ	ホ	ヘ	(	)	ア	イ	ウ	オ	エ

85a	1	2	3	4	5	6	7	8	9	0	77
85	40	58	49	39	30	28	29	38	48	57	52
	re	ru	ro	ri	ra	na	ni	no	nu	ne	wo

85a	7	83	78	63	64	66	67	68	65	84	82	9
85	17	42	25	43	33	51	26	36	35	54	45	19
	yu	se	su	so	shi	sa	ka	ku	ki	ko	ke	wa

85a	6	69	41	70	71	72	73	61	74	81	62	39
85	16	23	50	32	31	22	37	55	56	46	47	60
	ya	te	tsu	to	chi	ta	ma	mi	mo	mu	me	

85a	8	79	80	44	75	76	2	21	3	5	4
85	18	11	20	53	34	27	12	24	13	15	14
	yo	fu	ho	hi	ha	n	a	i	u	o	ye

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Fig. 4

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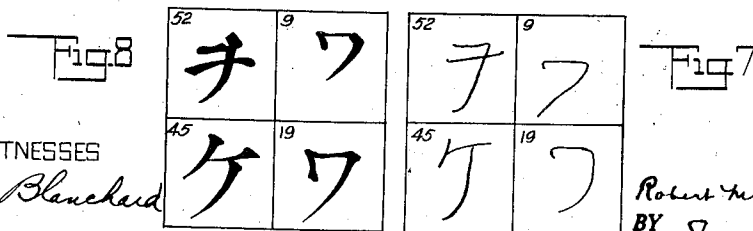
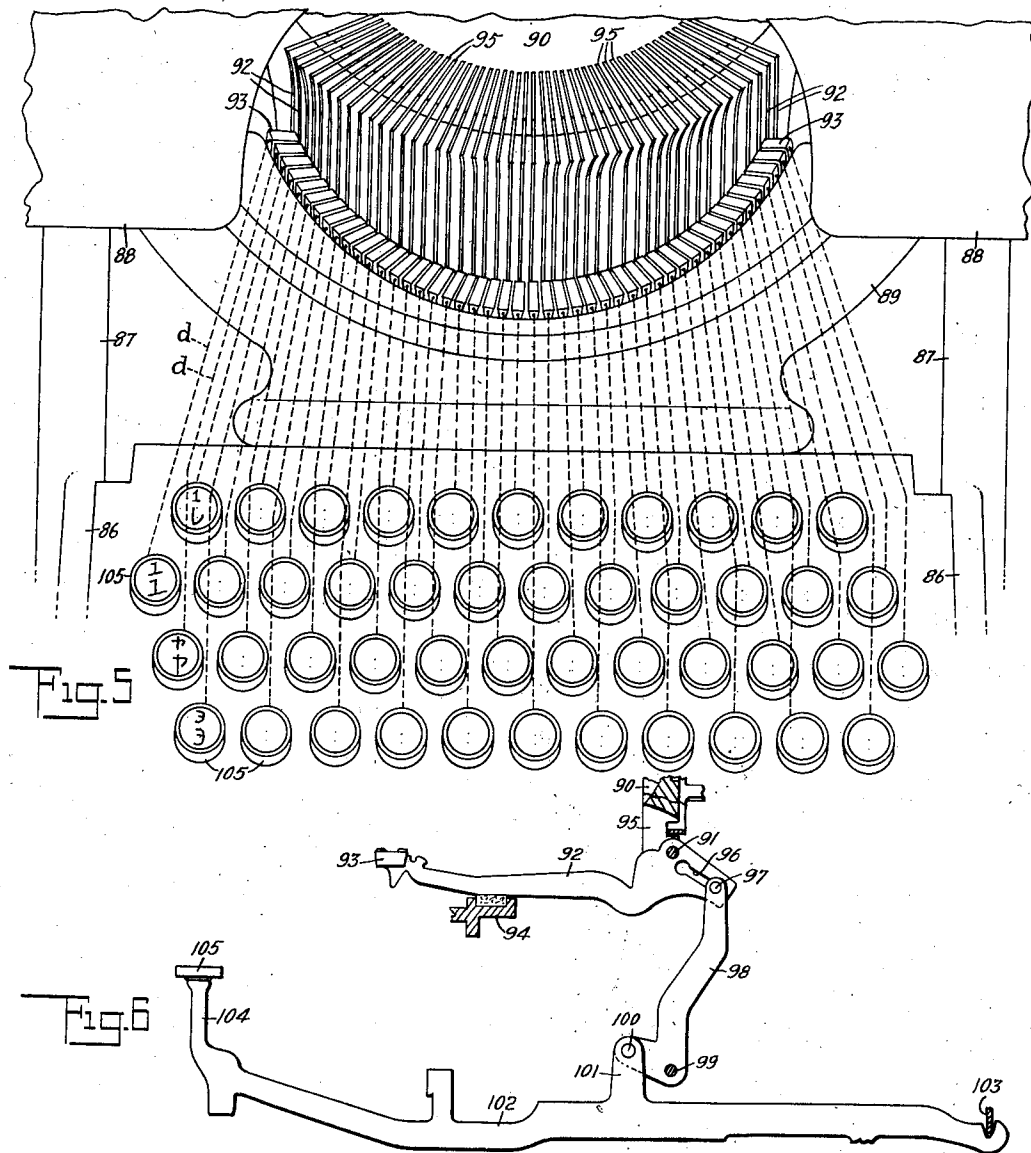
1,687,939

R. McK. JONES

TYPEWRITING MACHINE

Filed May 19, 1927

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE.

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TYPEWRITER COMPANY, OF ILION, NEW YORK, A CORPORATION OF NEW YORK.

TYPEWRITING MACHINE.

Application filed May 19, 1927. Serial No. 192,656.

My present invention relates to improvements in keyboards for the katakana characters of the Japanese language, and the main object of the invention is to provide a new and improved keyboard arrangement for the Japanese katakana characters.

Until quite recently the katakana characters were written only in perpendicular columns, the columns running or being arranged from right to left. The new system of writing the characters adopted by the Japanese, however, makes use of an arrangement whereby the characters are horizontally disposed and extend from left to right as is common to the English and other occidental languages. The new system has also simplified the form of the characters so as better to adapt them for printing and typewriting purposes while still retaining resemblance to the original form for easier identification. The new system also uses ordinary Arabic numerals instead of the clumsy Chinese system heretofore employed and at the same time it favors the use of punctuation signs and other signs common to occidental languages and many of which have now been introduced into oriental writing systems.

One of the purposes contemplated by the present improved arrangement is to facilitate learning and use of the new katakana system in typewriting machines by making a convenient and logical arrangement of the characters in my new and improved keyboard.

The original language of the Japanese is phonetic and is chiefly expressed in characters equivalent to a combination of an initial consonant and a final vowel of the Roman alphabet.

Each syllabic combination is represented by a different form, as, for instance: ka, ku, ki, ko and ke for each one of which there is a different katakana form. This syllabary numbers about forty-eight forms which for the sake of greater distinctiveness are termed "main" characters in the present discussion. Additional characters are chiefly duplicates of some of the "main" characters in a smaller size and used in connection with other "main" characters to indicate certain modifications of the sound of the "main" characters. There are also two accents to indicate a harder or softer pronunciation of the characters to

which they are added, thus practically adding additional syllables.

For example, the character for the sound ko identified in both of the illustrated keyboards by the numeral 54 when marked with the "dakuon" sign, becomes go; and when the character for the sound so, identified by the numeral 43, is marked with the "han-dakuon", it is pronounced zo.

In the accompanying drawings, I have illustrated two keyboards embodying the principles of my inventions, one of said keyboards being for an 84-character single shift machine and the other for a 92-character single shift machine.

In said drawings:—

Fig. 1 is a conventional or diagrammatic illustration of the 84-character keyboard showing the Japanese katakana characters of a design that may conveniently be employed for types in writing machines.

Fig. 2 illustrates a transliteration of the Fig. 1 keyboard.

Fig. 3 is a view similar to Fig. 1 but illustrating the 92-character keyboard.

Fig. 4 shows a transliteration of Fig. 3 keyboard.

Fig. 5 is a fragmentary perspective view of a Remington typewriting machine embodying one form of my invention, the view showing the keyboard and the type-bar system of a ninety-two character machine.

Fig. 6 is a front-to-rear vertical sectional view illustrating one of the type-bar actions of the machine.

Fig. 7 is a view showing several characters substantially as they appear when cut for printing, or in other words, a style of reformed characters; and

Fig. 8 illustrates the corresponding katakana characters as they appear when written with the use of a brush pen.

For convenience of reference the transliterated characters that go to make up both the eighty-four character and ninety-two character keyboards are set forth below, associated with a series of numbers running from 1 to 84 inclusive. Owing to the difficulties encountered in printing, no attempt will be made to illustrate the actual katakana characters in the text, but it is to be understood that where the transliterated charac-

ters are employed, they represent the actual Japanese katakana characters, the latter and their transliterations being identified by the same numerals. The numerals and their as-

5 sociate characters are as follows:

- 1 indicates the numeral 1.
- 2 indicates small a.
- 3 indicates small u.
- 4 indicates small ye.
- 10 5 indicates small o.
- 6 indicates small ya.
- 7 indicates small yu.
- 8 indicates small yo.
- 9 indicates small wa.
- 15 10 indicates the cipher.
- 11 indicates fu.
- 12 indicates a.
- 13 indicates u.
- 14 indicates ye.
- 20 15 indicates o.
- 16 indicates ya.
- 17 indicates yu.
- 18 indicates yo.
- 19 indicates wa.
- 25 20 indicates ho.
- 21 indicates small i.
- 22 indicates ta.
- 23 indicates te.
- 24 indicates i.
- 30 25 indicates su.
- 26 indicates ka.
- 27 indicates n.
- 28 indicates na.
- 29 indicates ni.
- 35 30 indicates ra.
- 31 indicates chi.
- 32 indicates to.
- 33 indicates shi.
- 34 indicates ha.
- 40 35 indicates ki.
- 36 indicates ku.
- 37 indicates ma.
- 38 indicates no.
- 39 indicates ri.
- 45 40 indicates re.
- 41 indicates small tsu.
- 42 indicates se.
- 43 indicates so.
- 44 indicates he.
- 50 45 indicates ke.
- 46 indicates mu.
- 47 indicates me.
- 48 indicates nu.
- 49 indicates ro.
- 55 50 indicates tsu.
- 51 indicates sa.
- 52 indicates wo.
- 53 indicates hi.
- 54 indicates ko.
- 60 55 indicates mi.
- 56 indicates mo.
- 57 indicates ne.
- 58 indicates ru.
- 59 indicates the Han-Dakuon accent mark.
- 65 60 indicates the Dakuon accent mark.

61 indicates the dash or prolongation mark.

62 indicates the double or Japanese hyphen.

63 indicates the bracket mark.

64 indicates the opposite bracket mark.

65 indicates the yen sign.

70

66 indicates the diagonal mark.

67 indicates the underscore.

68 indicates the percentage sign.

69 indicates the apostrophe.

70 indicates the quotation mark.

75

71 indicates the colon.

72 indicates the period.

73 indicates the comma.

74 indicates the interrogation mark.

75 indicates the parenthesis mark.

80

76 indicates the opposite parenthesis mark.

77 indicates small wo.

78 indicates @.

79 indicates small fu.

80 indicates small ho.

85

81 indicates the exclamation point.

82 indicates the dollar sign.

83 indicates the pound sterling sign.

84 the tael sign.

Referring first in detail to the eighty-four 90
character keyboard illustrated in the origi-
nal Japanese katakana in Fig. 1 and which
is transliterated in Fig. 2, it will be seen that
the key-caps for the four banks are repre-
sented diagrammatically each by a double 95
square, this being the ordinary conventional
or diagrammatic means of representing the
characters in a single shift keyboard. For
convenience of reference, the lower square in
each instance which represents the lower-case 100
character, is designated by the numeral 85,
the upper square, representing the corre-
sponding upper-case character, being indi-
cated by the numeral 85^a. Taking up the
eighty-four character keyboard in detail, it 105
comprises a top bank which has in the upper
case, printing when the shift key of the ma-
chine is depressed, a set of the so-called Ara-
bic numerals, one to nine inclusive and zero.
Only the "1" key is specifically indicated by 110
a numeral, in this instance 1, as appears from
the drawing and from the above list. In the
lower-case of the top bank, which prints when
the shift key is in normal position, the forms
illustrated correspond to re, ru, ro, ri, ra, na, 115
ni, no, nu, ne. These characters, as appears
from Fig. 2, bear respectively the identify-
ing numerals 40, 58, 49, 39, 30, 28, 29, 38, 48
and 57. Comparing these characters with
the corresponding numbers in the lower-case 120
squares 85 of the top row in Fig. 1, it will
be seen that they correspond, enabling the
transliterated characters in Fig. 2 to be com-
pared with the original Japanese katakana
characters in Fig. 1. 125

Similarly a comparison of the upper-case
characters in the second bank from the top of
the Fig. 1 keyboard with the corresponding
bank in Fig. 2, shows that the characters in
the upper-case squares 85^a are, in order, those 130

designated by the numerals 7, 42, 63, 64, 66, 67, 68, 65, 62, 52 and 9, these being respectively small yu, se, the bracket sign, the opposite bracket sign, the diagonal sign, the underscore sign, the percent mark, the yen sign, the Japanese sign for the double hyphen, wo and small wa. The lower-case characters in the second row from the top of the eighty-four character keyboard, Fig. 1, are numbered respectively 17, 25, 43, 33, 51, 26, 36, 35, 54, 45 and 19, these corresponding respectively to the transliterated characters yu, su, so, shi, sa, ka, ku, ki, ko, ke and wa. Similarly the upper-case characters in the third row from the top, represented by the numerals 6, 69, 41, 70, 71, 72, 73, 61, 74, 47 and 59, correspond respectively with the transliterated characters small ya, the straight apostrophe sign, small tsu, the quotation mark, the colon, the period, the comma, the dash or prolongation sign, the interrogation mark, me and the handakuon accent. The lower-case characters in this row, identified by the numerals 16, 23, 50, 32, 31, 22, 37, 55, 56, 46 and 60, correspond respectively with the transliterated characters ya, te, tsu, to, chi, ta, ma, mi, mo, mu and the dakuon accent. The upper-case characters in the bottom row of the eighty-four character keyboard, identified by the numerals 8, 75, 44, 11, 76, 2, 21, 3, 5 and 4, correspond respectively to the transliterated characters, small yo, the parenthesis sign, he, fu, the opposite parenthesis sign, small a, small i, small u, small o, and small ye. The lower-case characters in the bottom row, identified by the numerals 18, 20, 53, 34, 27, 12, 24, 13, 15 and 14, correspond respectively with the transliterated characters yo, ho, hi, ha, n, a, i, u, o and ye (e).

The convenient arrangement of the initial consonants in the eighty-four character keyboard will be apparent from an inspection of Fig. 2. The consonants s and k occur most frequently in writing, and these are accordingly placed in the second row of the keys at the left and right of the middle position. Next in order of frequency of use are the consonants t and m, and the characters involving these are accordingly placed at the left and right-hand sides of the middle in the third bank of the keys. These positions provide for an approximately even division of labor between the right and left-hands of the operator, and, according to my analysis, comprises nearly one-half of the entire work of writing the Japanese language.

A further improvement resulting from the present arrangement is calculated greatly to facilitate the use of the typewriting machine in writing Japanese katakana characters; namely, the vowel sounds of the syllabic characters are also arranged in an orderly fashion up and down or vertically of the keyboard in such a manner, that as a rule, the same vowel in any of the syllabic characters

is found in about the same position in each bank and will come naturally under the control of the same finger of each hand. Thus, the vowel sound of "a", being the most frequently used, is located at or about the middle of each bank of keys, and the other vowel sounds are distributed towards the right and the left in order of frequency of use as ascertained by me. Generally, the order of frequency of use is a, i, o, u and e, but some slight variation of this order will be observed due to the fact that the combination of certain vowels with some consonants occur much more frequently than the same vowels do with other consonants. For example, the "ku" occurs more frequently than does the k sound with any other vowel excepting "a". This fact justifies the placing of the ku character nearer to the middle of the keyboard in the line of k's than where the frequency of its use would rightly place it, that is in or near the fourth place.

On account of the insufficient number of keys in the eighty-four character keyboard, it is necessary to put a few of the least-used characters in the upper-case to be operated when the shift-key is depressed. This number, however, is very small, the total relative use of the characters so placed being approximately three per cent of the whole.

In the ninety-two character keyboard, illustrated in the original in Fig. 3 and in transliterated form in Fig. 4, all of the main characters except the seldom used one for "he", are conveniently located in the lower-case disposed in order of relative frequency of use. Those used most often are located near the middle of the keyboard under the strongest and most supple fingers of the operator's hands, and thence proceeding to the right and left in the order of relative use, so that the least used characters are located where they will be struck by the least active fingers. Also, as in the eighty-four character keyboard, the vowel sound of the syllabic characters are disposed up and down or vertically in order, so that the same vowel is found in or about the same position in the several banks and will come naturally under the control of the same finger of the operator.

Referring specifically to the ninety-two character keyboard, Figs. 3 and 4, the upper-case in the top row contains the nine Arabic numerals and the zero, and in addition at the extreme right-hand contains the character represented by small wo, this being identified by the numeral 77. In the lower-case, the uppermost bank contains the characters identified by the reference numerals 40, 58, 49, 39, 30, 28, 29, 38, 48, 57 and 52; and the corresponding transliterated characters are in order, re, ru, ro, ri, ra, na, ni, no, nu, ne and wo. Next to the top bank in the upper-case are the characters identified by the reference numerals 7, 83, 78, 63, 64, 66, 67, 68, 65, 84, 82

and 9. For the most part these are sign characters and are respectively as will be seen from the corresponding transliteration in Fig. 4, small yu, the pound sterling sign, the @ sign, the bracket sign, the opposite bracket sign, the diagonal sign, the underscore sign, the per cent sign, the yen sign, the tael sign, the dollar mark and small wa. The lower-case characters in the second row from the top, identified by the reference numerals 17, 42, 25, 43, 33, 51, 26, 36, 35, 54, 45 and 19, correspond respectively to the transliterated characters, yu, se, su, so, shi, sa, ka, ku, ki, ko, ke and wa. In the third bank from the top in the upper-case are found the characters mostly punctuation marks and the like, which are identified by the reference numerals 6, 69, 41, 70, 71, 72, 73, 61, 74, 81, 62 and 59; corresponding respectively to the transliterated characters small ya the apostrophe sign, small tsu, the quotation mark, the colon, the period, the comma, the dash or prolongation sign, the question mark, the exclamation point, the Japanese hyphen, and the han-dakuon accent mark. The lower-case characters in this third bank from the top are identified respectively by the reference numerals 16, 23, 50, 32, 31, 22, 37, 55, 56, 46, 47 and 60, corresponding respectively to transliterated characters as follows: ya, te, tsu, to, chi, ta, ma, mi, mo, mu, me, and the dakuon accent mark. In the upper-case the lowest bank of keys contains characters identified by the reference numerals 8, 79, 80, 44, 75, 76, 2, 21, 3, 5 and 4, corresponding respectively to the transliterated characters small yo, small fu, small ho, he, the parenthesis sign, the opposite parenthesis sign, small a, small i, small u, small o, and small ye. The lower-case characters in the bottom bank of keys are identified respectively by the reference numerals 18, 11, 20, 53, 34, 27, 12, 24, 13, 15 and 14 corresponding respectively to the transliterated characters yo, fu, ho, hi, ha, n, a, i, u, o and ye.

While the two keyboard arrangements above described in detail are of course adapted to various styles of writing machines, I have illustrated them as applied to the standard Remington typewriting machine parts of which are illustrated in Figs. 5 and 6. The main frame of the Remington machine comprises a base 86, upright posts 87 and top plate 88, at the forward side of which is disposed a frame plate 89. The type bar support or segment 90 of the machine has mounted on it a pivot wire 91 which provides a pivot for a set or series of type bars 92 each carrying a type block 93 having two types. The type bars are disposed in an arcuate series below the platen (not shown), and normally rest at their type ends on a support 94, being adapted to be swung upward and rearward into cooperative contact with the platen. The type bars are guided in their swinging movements in radially arranged slots 95 cut in the lower

portion of the segment 90. The heel portion of each type bar is provided with a cam slot 96 with which engages an actuating pin 97 projecting laterally from the upstanding arm of a bell crank 98 having a stationary pivot 99 and pivotally connected at 100 with a projection 101 upstanding from a key lever 102 and integral therewith. The set of key levers is horizontally disposed, each lever being fulcrumed at its rear at 103, and thence extending forward, terminating in a stem 104 which is provided with a key cap or button 105. (It will be understood that these key caps 105 are identified in the diagrammatic views Figs. 1 to 4, by the reference characters 85 and 85^a.) There are four rows of caps or keys 105 constituting the keyboard, the stems 104 being of graduated height so that the rows are in banks or steps as is well understood, the highest bank at the rear. The keyboard is contained within the forward portion of the base frame which is made rectangular in shape for the purpose. When any one of the keys 105 is depressed it will, through the described train of connections comprising the key lever 102, the connected bell crank 98 and the actuating pin 97, swing the type bar 92 on its pivot 91 and cause one or the other of the types at its free end to contact with the platen. Normally the platen is in what is termed "lower-case" position and the lower-case types of the type bars will print through the usual ribbon (not shown). When the platen is shifted and maintained in shifted position, an actuation of one of the type bars will cause its upper-case type to print. The lower-case types are the inner types on the blocks or those nearer to the pivot wire 91, the upper-case types being the outer types.

For the purpose of promoting understanding of the relationship between Figs. 5, 6 and the diagrammatic views (Figs. 1 and 3) of the keyboard, I have shown in Fig. 5 the complete or full keyboard of a standard Remington typewriting machine having ninety-two characters, this keyboard being represented by the key caps or buttons 105, and in a few instances showing the characters on the tops of the key caps. These characters it will be understood, correspond throughout with the full set of characters shown in the diagrammatic view, Fig. 3, wherein as stated each double square 85, 85^a corresponds with one of the key caps 105. Fig. 5 further illustrates the full set of type bars of the machine with their type blocks, the keys 105 each being shown as connected with its associate type block by a dotted line *d*. The lines *d* may be assumed as representing diagrammatically the actual connections or trains of devices between the keys and the type bars, one of such trains being fully shown in Fig. 6.

In the style or design of types illustrated in Figs. 1 and 3, and heretofore described, I have

followed generally the style and design employed for printing types, and although I have made changes in various details, no claim of course is made for such differences as they are merely specific matters of design. As heretofore stated, the Japanese katakana characters shown in Figs. 1-4 are to be preferred to the old style or design of types. It is to be understood, however, that if found desirable for any reason the characters of the sort made with the brush pen may be employed within the scope of my invention. In order to make this point clear, I have illustrated in Fig. 7 several of the katakana characters of the sort I have preferred to employ, these corresponding with those shown in Figs. 4 and 3 and identified by the reference numerals 52, 45, 9, and 19, the corresponding brush pen characters identified by the same reference numerals being illustrated in Fig. 8 immediately to the left of Fig. 7.

One of the obvious advantages of my improved key-board arrangement is that it will greatly promote the memorizing of the positions of the characters in the keyboard, and will facilitate the rapid acquirement of the best method of operating the typewriting machine; that is, the touch system in which the typist does not look at the keyboard when writing. It will be observed that the small characters for modifying sounds are in each instance placed in the upper-case position upon the same type bar that carries the corresponding main characters. The characters representing certain sounds partaking of the nature of the vowels, yet sometimes used as initial consonants, are grouped along the sides of the keyboard. These are yu, ya, yo on the left-hand side; and on the right-hand side are wo, wa, ye (often used in place of "e") in the lower-case position, each having the corresponding small-sized character on the same type bar but in the upper-case position.

My improved keyboard arrangement is based on the tabulated results of a full and careful examination of the frequency of use of more than two thousand characters of the Japanese katakana syllabary. Experience has shown that such a result affords a very fair approximation of the actual average used. The tabulation shows that the syllables beginning with k, s, m, and t include about forty-five per cent of the whole. These syllables have all been located in the central portion of the keyboard and are readily accessible to each other, as well as to other syllables which they precede or follow. The vowel components of the syllables are also placed with similar reference to comparative accessibility and frequency of use. The "a" sounds which comprise about thirty per cent of occurrence are in the central portion of the keyboard. The next sound in order of usage is the "i" sound which comprises about twenty-five per cent and these characters are

nearer the central portion on the right and left-hand sides. Adjacent to these are the "o" sound characters with a usage of twenty-per cent followed by the "u" sound characters with a usage of over fifteen per cent, and the "e" sound characters with a usage of about nine percent.

Comparing Figs. 1 and 2, that is the eighty-four character keyboard and ninety-two character keyboard, by the aid of the transliterated characters in Figs. 3 and 4, it will be observed that the keyboards are to a large extent identical in the topmost bank. All the characters except the two at the right-hand end in Fig. 3 are found in both key-boards arranged in the same order. In the second bank the following characters in the lower-case together with their corresponding upper-case characters are found in both key-boards, viz, yu, so, shi, sa, ka, ku, ki and wa. In the third bank from the top the following characters are found in the lower case, together with corresponding upper-case, are found in both key-boards, viz, ya, te, tsu, to, chi, ta, ma, mi, mo and dakuon accent. In the lowermost bank the two keyboards have the following transliterated characters in common, reference being had to the lower-case characters, the upper-case characters likewise corresponding, viz, yo, hi, n, a, i, u, o and ye.

Various changes may be made without departing from my invention.

What I claim as new and desire to secure by Letters Patent, is:—

1. In a typewriting machine for writing the Japanese katakana alphabet, a keyboard and type bar system wherein the characters employing the same vowel sound are arranged substantially vertically or up and down in the keyboard.

2. In a typewriting machine for writing the Japanese katakana alphabet, a keyboard and type bar system wherein the characters employing the same vowel sound are arranged substantially vertically or up and down in the keyboard, the vowel sound most frequently used being in the middle of the keyboard, those next frequently used being disposed at either side of the middle, and those of least frequent usage being at the outside.

3. In a typewriting machine for writing the Japanese katakana alphabet, a keyboard and type bar system wherein the characters employing the same vowel sound are arranged substantially vertically or up and down in the keyboard, the characters embodying the "a" sound being disposed at about the middle of the keyboard, the characters embodying the "i" sound being placed to the right and left of the "a" sound characters, the characters embodying the "o" sound being placed at the right and left of and generally outside the "i" sound characters, the characters embodying the "u" sound being disposed at the right and left of and outside the "i" sound

characters, and the characters embodying the "e" sound being disposed at the right and left of and outside the "o" sound characters.

4. In a typewriting machine for writing the Japanese katakana alphabet, a keyboard and type bar system wherein the characters employing the same vowel sound are arranged substantially vertically or up and down in the keyboard, the vowel sound most frequently used being in the middle of the keyboard, those next frequently used being disposed near the middle at either side of the middle, and those of least frequent usage being at the outside, the other characters in the keyboard being relatively arranged so as to present those most frequently used in the most convenient position for operation by the typist.

5. In a typewriting machine for writing the Japanese katakana alphabet, a keyboard and type bar system wherein the following transliterated characters are found in the lower-case of the uppermost bank, re, ru, ro, ri, ra, na, ni, no, nu, ne; the following transliterated characters are found in the lower-case in the second bank from the top, yu, su, so, shi, sa, ka, ku, ki, ke and wa; the following transliterated characters are found in the lower-case in the third bank from the top, ya, te, tsu, to, chi, ta, ma, mi, mo, mu and dakuon accent, and the following transliterated characters are found in the lower-case of the bottom row of keys, yo, ho, hi, ha, n, a, i, u, o and ye.

6. In a typewriting machine for writing the Japanese katakana alphabet, a keyboard and type bar system wherein the characters involving the consonant sounds s and k are placed in the second row of keys, counting from the top, at respectively the left-hand and right-hand sides of the middle, and the characters involving the consonant sounds t and m are placed respectively at the right and left-hand sides of the middle in the third bank of keys.

7. In a typewriting machine for writing the Japanese katakana alphabet, a keyboard and type bar system wherein the following transliterated characters are found in the lower-case of the uppermost bank re, ru, ro, ri, ra, na, ni, no, mu, and ne; the following transliterated characters are found in the lower-case in the second bank from the top, yu, so, shi, sa, ka, ku, ki and wa; the following transliterated characters are found in the lower-case in the third bank from the top, ya, te, tsu, to, chi, ta, ma, mi, mo and dakuon accent; and the following transliterated characters are found in the lower-case of the bottom row of keys, yo, hi, n, a, i, u, o and ye; also the following characters are found in the upper-case of the top bank of the keyboard 1, 2, 3, 4, 5, 6, 7, 8, 9 and the cipher; the following

small yu, the bracket sign, the opposite bracket sign, the diagonal mark, the underscore mark, the per cent sign, the Yen sign and small wa; the following characters in the upper-case in the third bank from the top, small ya, the apostrophe sign, small tsu, the quotation mark, the colon, the period, the comma, the dash or prolongation sign, the question mark, and the han-dakuon sign; and in the upper-case of the lowermost bank the following characters, small yo, he, the parenthesis sign, small a, small i, small u, small o and small ye.

8. In a typewriting machine for writing the Japanese katakana alphabet, a keyboard and type bar system wherein the characters employing the same vowel sound are arranged substantially vertically or up and down in the keyboard; and the small characters for modifying sounds are in each instance placed in the upper-case position on the same type bar that carries the corresponding main character.

9. In a typewriting machine for writing the Japanese katakana alphabet, a keyboard and type bar system wherein the following characters are found in the lower-case of the uppermost bank, re, ru, ro, ri, ra, na, ni, no, nu, ne and wo; the following characters are found in the upper-case of the topmost bank, 1, 2, 3, 4, 5, 6, 7, 8, 9, the cipher and small wo; the following characters are found in the lower-case of the bank next to the top, yu, se, su, so, shi, sa, ka, ku, ki, ko, ke and wa; the following characters are found in the upper-case of the bank next to the top, small yu, the pound sterling mark, the @ sign, the bracket sign, the opposite bracket sign, the diagonal mark, the undescoring mark, the per cent sign, the yen sign, the tael sign, the dollar sign and small wa; the following characters are found in the lower-case of the bank next to the bottom, ya, te, tsu, to, chi, ta, ma, mi, mo, mu, me and the dakuon accent; the following characters are found in the upper-case of the bank next to the bottom, small ya, the apostrophe sign, small tsu, the quotation mark, the colon, the period, the comma, the dash or prolongation mark, the question mark, the exclamation point, the double or Japanese hyphen, and the han-dakuon accent; the following characters are found in lower-case in the lowest bank of keys, yo, fu, ho, hi, ha, n, a, i, u, o and ye; and the following characters are found in the upper-case of the lowest bank of keys, small yo, small fu, small ho, he, the parenthesis mark, the opposite parenthesis mark, small a, small i, small u, small o and small ye.

Signed at the borough of Manhattan, city of New York, in the county of New York and State of New York this 18th day of May, A. D. 1927.

ROBERT MCKEAN JONES.