

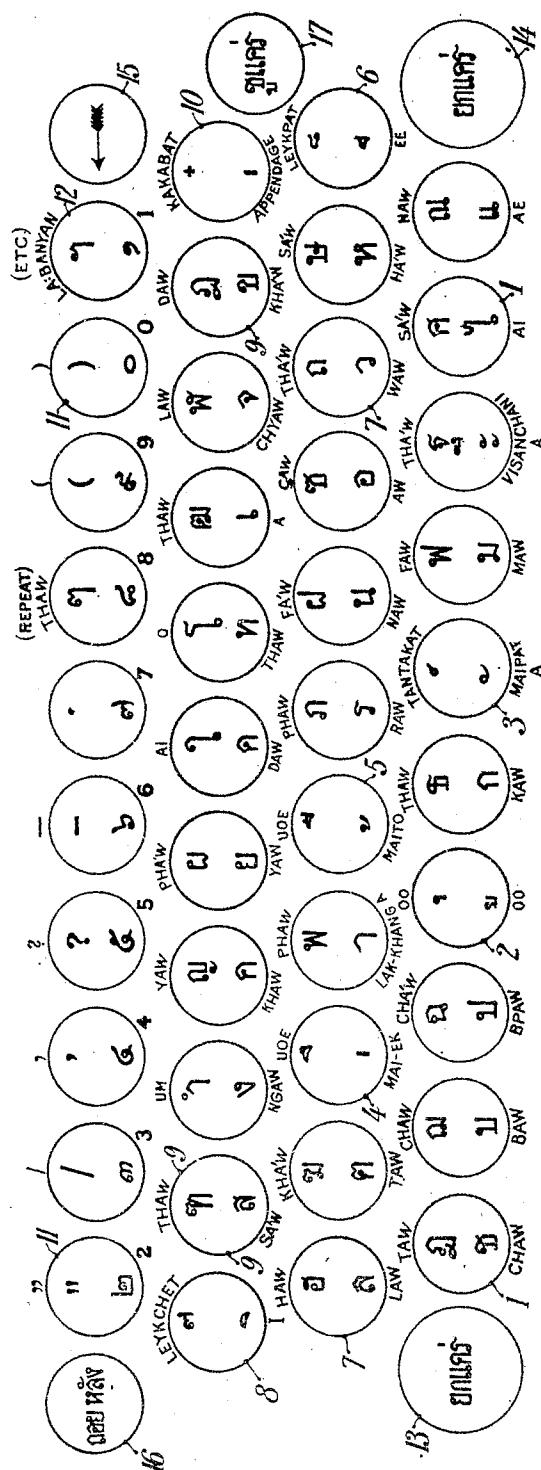
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TYPEWRITING MACHINE

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TYPEWRITING MACHINE

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This invention relates to a typewriter-key-board for typing the Siamese Thai alphabet.

It was at one time attempted to organize a standard machine with the 44 consonants all placed on the lower-case shift together with 8 vowels (or auxiliary signs), making it necessary to have 52 keys in the typewriter. This increase in the key-board was found to be a practical impossibility, and the problem 10 was left unsolved of adapting the Siamese language to a standard typewriter keyboard, which has only 42 keys.

The Siamese language comprises 44 consonants and 32 vowels. The 32 vowels consist of signs written above, below, before, or after the consonants. The vowel-signs have no sounds, but act upon the sound of "aw", which is inherent in consonants, converting them into a, i, o, ee, ow, etc. Four of the five 20 simple tones in Siamese, whereby words are given distinct meanings, are marked in the typed character by signs placed over the consonant affected. The absence of any mark indicates that the remaining fifth tone is to be used. Difficulty is caused by the fact that the consonants are grouped into three classes, to each of which a special tone applies. Consequently the application of a tonal sound to a letter has a different effect according to 25 the class to which such letter belongs. In some cases, the characters are used with quite a number of different inflections, each of which gives the word a new meaning; thus, for example, the syllable "khao" may be 30 "they" "badly" "rise" "white" "old" or "news", simply according to the tone in which the word is spoken.

Provision must also be made for typing 10 Siamese numerals and 8 punctuation marks, 40 such as quotation, divisor, apostrophe, question mark, underscore, period, and two parenthesis marks. These characters total 94. Formerly Smith-Premier machines of the old style (having double keyboard) were 45 equipped with Siamese types and characters, but the manufacture of double-keyboard Smith-Premier machines has been abandoned. Oliver two-shift typewriters, in which each key controlled three types, were 50 also supplied with Siamese types and key-

board, but did not meet with success, because there was so much necessity for using shift-keys.

The main aim of the present invention is to adapt a typewriter of standard manufacture, by equipping it with Siamese keys and types, so that it may be used successfully in typing Siamese for ordinary purposes. The standard typewriter, however, as, for example, the Underwood machine, is limited to 42 55 keys, so that it has a capacity of only 84 types. It is an object of this invention to provide an improved keyboard and at the same time reconcile the discrepancy which exists in the requirement for 94 characters, to be typed 60 upon a 42-key-machine, since the latter is capable of operating only two characters for each key, or 84 characters in all.

It will be understood that the standard manufactured typewriter is produced by special dies and fixtures, and is of limited and fixed construction, and incapable of extension or enlargement at will. The room for the closely-compact types is limited and fixed, not permitting the use of additional 70 types; and the same is true of the keys of the keyboard. Hence, unless the Siamese alphabet can be reconciled to the standard typewriter keyboard, it would be impracticable to equip typewriters of standard manufacture 75 for use in Siam. The cost of making a small number of enlarged machines sufficient to supply the market, each having many extra types and keys, would be prohibitive, as it would involve practical redesigning of the 80 machine throughout, and would make it necessary to incur prohibitive outlay for 85 newly designed manufacturing dies, patterns and equipment.

One of the primary objects of the present 90 invention is to contrive so to equip the 42 keys of a standard typewriter keyboard, as to admit of the practical use of the same for ordinary Siamese typing, and thus to make it feasible to supply the typewriters without 95 alteration of the same from standard practice, except by the substitution of Siamese types and keys for English types and keys; so that the cost of the machine to the consumer will be kept down to a point sufficiently 100

low to enable the machines to be purchased and used in substantial quantities.

It has been attempted to market standard typewriters in Siam, having all of the vowels and accents placed at the right-hand side of the keyboard; these being dead or silent keys, that is being incapable of feeding the work-sheet. It was found, however, that the typing of the vowels and accents formed as much as 25% of the labor, and that all of this labor would normally fall upon the weak third and fourth fingers of the right hand, so that the machine was found to be impracticable.

In devising the machine made the subject-matter hereof, an exhaustive study was made of the Siamese language, and of the frequency of each letter, and also of the frequency of the most common combinations; and the novel keyboard has been contrived not only to meet the conditions above mentioned, for reconciling the large number of characters to a standard typewriter keyboard, but also to provide for the most common letters to be typed by the best and strongest fingers of the two hands, namely, the first and second. It is also provided that each finger may keep its home position at the second row of the keyboard. It is also provided that the same finger shall only seldom be made to strike adjoining keys consecutively; the keyboard being so designed that letters that frequently adjoin are placed upon opposite sides of the keyboard, and not in any case are such keys operable successively by the same finger.

It was long considered impracticable by those skilled in the typewriter art, to employ a shift-key machine in typing successfully and rapidly the Siamese language, owing to the necessity of using the shift-keys very frequently; there being many more Siamese characters than can be accommodated by the front three rows of keys upon which the bulk of typewriting is usually done. The idea was considered impracticable because it would become necessary to place many of the ordinary characters upon the upper-case set, which is undesirable and impracticable, and would involve too much shifting. But it is contrived by the present invention to reduce to unobjectionable minimum the necessity for using the shift-key.

The present invention provides a practical adaptation of Siamese to a 42-key typewriter keyboard, of standard manufacture, by presenting a novel arrangement and novel features, which facilitate mastering and operating the improved keyboard. Various accents and other characters are superposed or subscribed relatively to main characters, and for this purpose are placed upon silent keys, which do not feed the work-sheet. These silent keys it is contrived to interpose among those keys which act to feed the work-sheet.

65 The "silent" keys are placed in position to be

operated by the nimble and strongest fingers of the operator's hands. It is also contrived to include in said standard keyboard the required English punctuation marks.

In foreign languages of the Asiatic groups, certain difficulties present themselves when the attempt is made to utilize the typewriting machine for typing the characters thereof, in view of the fact that the characters are often so numerous, and, just as often, very irregular in regard to size and form, not to mention that some characters may be entirely displaced from normal alignment. The Siamese or Thai alphabet partakes, to a certain degree, of this nature, and in order to overcome the peculiarities of the same, certain novel expedients and provisions have been incorporated to actually constitute decided advantages, which, in a great measure simplify the operation of the typewriter and bring the typing of Siamese substantially on a par with that of modern European languages, as will more fully appear hereinafter.

The keyboard which embodies this invention is practically standard in regard to the number of key-banks and the number of keys therein, and, likewise, in being shiftable to two cases; yet the upper-case characters do not necessarily correspond with those of the lower case, but are primarily thus relatively arranged in order to condense the keyboard, to render all the characters readily accessible, and to take advantage of the fact that it is not necessary to consider upper case as against lower case characters after the manner of roman letters.

Other features and advantages will hereinafter appear.

The accompanying drawing illustrates the arrangement of the keys of a standard Underwood typewriting machine, which is provided with Siamese alphabet characters on the keys thereof, and which arrangement particularly embodies the principles and features of the present invention.

The Siamese alphabet is built up from and about the fundamental aspirate vowel AW of whose form most of the consonants and some of the vowels are but more or less altered modifications, and, at the same time, several of the vowels are normally prefixed or affixed to this fundamental vowel or the various consonant characters, while many of the other vowels are normally superposed above or disposed below this vowel or other characters, in order to acquire recognized vowel sounds or to form diphthongs or syllables with said characters. In addition, several accents or tone-marks are also used to modify both consonants and vowels or syllables by being superposed above the same, while the mentioned arbitrary appendage mark or line is included to lengthen certain characters in such manner as to produce additional characters. Moreover, as also stated,

several of the universally-used punctuation marks and signs have been adopted and are used somewhat similarly as in English. All the consonants, as well as the prefix and suffix vowels, are therefore placed on regular carriage-feeding keys, while the upper and lower vowels, as well as all accent-marks and said appendage-mark, are placed on keys which are incapable of causing letter-space-feeding of the typewriter-carriage. However, the mechanical structure of such a machine, or the means to actually carry out this difference in key-action is no part of the present invention, and, hence, is not pertinent to this application, especially as such structures are known to the art. Suffice it to say, that the machine is naturally equipped with the requisite mechanism to cause the letter-feed of the platen and its carriage only when certain of the regular keys are struck, and to designedly avoid letter-spacing action when striking said special vowel and accent keys.

It is usual in typewriter-keyboards to dispose the letters of the alphabet upon the various banks in such order that those letters which are most frequently used are also located in the most accessible and favorable positions in each bank, and the majority of these in the most accessible bank, which is normally the second. And, in placing the Siamese characters, the same general rule in the lower case has been followed, but the upper-case positions have been devoted to the less frequently used characters, with the purpose in view of avoiding the necessity for case-shifting as much as possible. This arrangement includes all the regular vowels, consonants and accents, as they are all variously used.

On the other hand, the number of special or non-carriage-feeding keys is relatively large, and these keys are used proportionately as often as the regular carriage-feeding keys. This involves a new consideration. The usual disposal of such keys is similar to that of case-shift or other auxiliary keys, that is, in an isolated independent group-position at the right or left extremity of the keyboard, or at its top. This arrangement entails a very disadvantageous difference between the use of the hands of an operator when manipulating the keys, for the fingers of one hand would be principally occupied in striking the normal character-keys, while the third and fourth fingers of the other hand would be practically limited to the non-feeding keys. Because of the limitations of the type-bars of the typewriting machine, such special keys of this nature must be struck before the normal carriage-feeding keys, which bear the characters intended to occupy relatively the same letter-spaces as the special characters of the non-feeding keys. Adding to this the fact that the third fingers of each

hand are far less nimble and dexterous than the index and middle fingers, or even the small fingers, the disadvantages become very apparent. This formidable difficulty has had the effect of rendering the operation of a Siamese typewriter somewhat tedious and far behind the standard of efficiency possible on a machine having a roman letter keyboard.

In order to meet this condition, a radical expedient and rearrangement of the keys and characters have been introduced involving a new principle, in accordance with which most of the non-feeding keys are removed from the side positions and singly interposed among the other carriage-feeding keys in such manner that the combined arrangement of the two classes of keys will appear as a normal and standard keyboard, whose operation approaches that of a standard keyboard in many respects. This point will be illustrated later.

Referring again more particularly to the drawing, the first or front key-bank in which two of the normal carriage-feeding keys are denoted 1, 1 is flanked by the usual case-shift keys 13 and 14, while to the right of the second and third banks is a shift-lock key 17. The fourth bank has a tabulator-key 16 at the left extremity and the common back-space key 15 at the right.

Adjacent each key is given an identification for the character in each case, the upper-case character having its name or sound disposed above the key, while for the lower case the sound name is indicated below it.

All the vowel sounds as well as the consonant and accent names herein are given according to their approximate English pronunciation, although quite a few have no corresponding English sounds, such as the short and long upper-case vowels UOE of keys 4 and 5, their sound being a peculiar cross between an European ö and a German ü, and ur in the English word "cur". These vowels are therefore arbitrarily represented by the letters UOE. Again, the sound of lower-case character CHYAW on the third key from the right in the third bank resembles the German "ch" in "ich" or, in English, the initial T in "Tuesday" when mispronounced like "Chuesday", this character being therefore often represented in grammars by the letters CH. Then, again, the accented vowels in the character-names, such as FÄW, or HÄW, are pronounced in a raised tone of voice. In the consonant sound-names, the beginning letters PH or TH are pronounced simply as an aspirate P or aspirate T, respectively, and are not pronounced as diphthongs, as usual in English, their present spelling being used in order to distinguish them from the non-aspirate P, T, K, etc., forming the initial letters of several other character-sounds appearing on the same keyboard. In fact, all

the character sounds or names are merely given as a means of identification, although impossible of accurate representation in English in the case of some. The sounds of the 5 vowels will be indicated as they are enumerated, several being also given their Siamese names in order to distinguish them from each other.

In the first key-bank, the arrangement of 10 the lower-case characters on the regular keys, as well as the non-feeding keys 2 and 3, when reading the Siamese characters from left to right, is as follows:

CHAW, BAW, BPAW, long OO, KAW, 15 MAIPAT A, MAW, VISANCHANI A, AI, and AE. The pronunciation of the MAIPAT vowel A is like the "a" in "car", whereas the VISANCHANI vowel A is like the short "a" in "Cuba". The AI vowel is 20 pronounced as "ai" in "aisle", while the last vowel AE is pronounced as "ae" in "aeroplane". The upper-case characters of the same keys are in the same order:

TAW, CHAW, CHÁW, short OO, 25 THAW, TANTAKAT, FAW, THÁW, SÁW and NAW.

The second bank or row of keys, as indicated at 7—7, including the keys 4, 5 and 6, 30 has in the lower case the characters LAW, TAW, the MAI-EK accent, LAK-KHANG A, MAITO accent, RAW, NAW, AW, WAW, HÁW and vowel EE, while the upper-case characters in the same row are 35 HAW, KHÁW, short vowel UOE, PHAW, long vowel UOE, PHAW, FÁW, QAW, THÁW, SÁW and the LEYKPAT accent or mark. The character denoted CAW having the form shown in the drawing on the 40 fourth key from the right, of row 2, is pronounced like "c" in "cell".

The third key-bank now occupies our attention, this bank having also a series of regular carriage-feeding keys, as noted at 9—9 and including the special keys 8 and 10, in which row the lower-case characters are, in order:

50 I, SÁW, NGAW, KHAW, YAW, DAW, THAW, A, CHYAW, KHÁW and an appendage-mark which is similar to a lowered MAI-EK accent, although it is really no part 55 of the normal alphabet, but here used to lengthen the right stems of certain characters, such as the upper case PHAW on the middle key in the second bank, or the stem of the lower case LAK-KHANG A on the fourth 60 key from the left in the same key-bank. In this manner, additional characters are produced, this mark being the only means for augmenting characters in this alphabet. The I vowel in this group is pronounced as "i" in 65 "it", and the A as "a" in "ate". The upper-

case characters of the third bank are in similar order:

The LEYKCHET accent, THAW, UM, YAW, PHÁW, AI, O, THAW, LAW DAW and the KAKABAT accent or mark. The 70 AI vowel is pronounced as "ai" in "aisle".

Finally, the lower-case characters of the last or top bank are: 2, 3, 4, 5, 6, 7, 8, 9, 0, and 1, this novel order being purposely arranged 75 to facilitate the operation of the keyboard by an operator who also must frequently use a standard Underwood English keyboard, and hence is an arrangement to avoid confusion. The upper-case characters are in order "/ ?

80 . THAW () and LA: BANYAN, which last character somewhat corresponds with etc., the THAW character being used to repeat whatever precedes it. All keys in this bank are active carriage-feeding keys similar to 11, 11 and 12, the last having an ordinal 1, as above mentioned, although it is located at the right end of the row. A limited number of characters which are practically obsolete are 85 not represented on this keyboard, their omission constituting a decided gain in simplicity.

90 As has already been stated, many of the vowels and all the tone marks and accents are in their normal positions when placed above or below other characters, and this in a Siamese sentence produces a very condensed appearance, only certain of the vowels normally preceding or following other characters in 95 normal alignment.

100 At this juncture certain improvements in the forms of the mentioned characters may well be noted, as they tend to offset this condensed effect and make the characters stand out upon the typed sheet and prevent apparent blending of the characters with the resultant monotony which may cause tedium and eye-strain. Some of the larger characters have been reportioned with a tendency 105 to squareness in order to partially reduce the same to general uniformity. Of these may be mentioned upper-case characters TAW and CHAW of the first two keys in the first bank and in the third bank the upper-case characters THAW, YAW, THAW and DAW of the second, fourth, eighth and tenth keys, respectively. The smaller lower-case character YAW of the fifth key has had its lower left stroke brought out more fully to 110 enlarge and emphasize the letter. General reportioning or even modification of some characters has likewise been carried out, so that such a character as the lower-case NGAW on the third key has a relatively long left stroke, and the upper right stroke of lower-case RAW on the middle key in the 115 second bank has been slightly lengthened tending to the horizontal.

120 A more obvious modification with the above end in view is that of peaking the upper or cap portion of many characters. This 130

is most evident in such characters as lower-case KAW in the first bank on the key between special keys 2 and 3. Ordinarily whether written or printed, such a character would have its top curved, but here it is sharply peaked like a gable roof, which makes the letter sharp and distinct either in a line or in a page of typed matter. This same principle has been applied to a certain degree to lower-case CHAW and upper-case TAW of the first key in the same bank, also in the upper-case characters CHAW, CHÁW, SÁW, and NAW on the second, third and last two keys in said bank, while the same is true of lower-case characters LAW, LAK-KHANG A, AW and WAW of the first, fourth, eighth and ninth keys in the second bank. In the same bank, upper-case character PHAW on the middle key and THÁW on the third key from the right are also peaked, this being similarly true of lower-case SÁW, KHAW, DAW, CHYAW and KHÁW on the second, fourth, sixth, ninth and tenth keys of the third bank, as well as upper-case UM, YAW and DAW of the third, fourth and the next to the last key in said third bank. Of course, in some characters the differences are more marked than in others by their very nature, but, in the aggregate, they are quite apparent.

However, in yet greater measure, certain other modifications in a few characters help to render the alphabet more uniform, as well as distinct. For example, the lower-case BAW, BPAW and OO on the second, third and fourth keys in the first bank have their upper left circles tangent to their vertical staves, and the lower horizontal lines have been extended to the left to balance with the upper circles, these features being also true of upper-case characters SÁW on the next to the last key in the second bank. Also the lower-case NAW on the seventh key in said bank and lower-case THAW on the seventh key in the third bank have their upper left circles disposed centrally on their vertical staves to distinguish the same more readily from lower-case MAW on the seventh key in the first bank and upper-case THAW on the second key in the third bank, respectively. The upper-case OO on special key 2 in the first bank has its upper circle tangent to the left of the vertical line in order to conform the character to lower-case OO of the same key. The lower-case A of the eighth key in the third bank is similarly made to conform with upper-case AI and O of the sixth and seventh keys and with lower-case AI of the ninth key in the first bank, while the lower-case AE of the last key in said bank is merely a doubling of said A character. A few of these mentioned features have been occasionally and unavoidably used in written Siamese

due to the personal handwriting characteristics of the writer, but all of these features have never been used together as in the present combination.

Returning again to the first bank, the consonants, which are always typed normally on the line, are found on the first three keys, beginning with the key noted 1, also on the fifth, and on the seventh to the tenth, being, key by key, in upper and lower case: TAW, CHAW; CHAW, BAW; CHÁW, BPAW; THAW, KAW; FAW, MAW; and solely in the upper cases of the eighth, ninth and tenth keys, THÁW, SÁW and NAW. On the key noted 2, the upper-case vowel OO and the lower-case vowel OO are both typed under the usual line in such manner as to be disposed beneath other characters typed in normal alignment. In the upper case on the key noted 3, the TANTAKAT accent occurs, whose normal position is above the line and is superposed over a letter in order to silence it. In the lower case is the MAIPAT vowel A, whose position is also above the line. Because of these lowered and raised positions of the named vowels and accents, the keys 2 and 3 are made special or non-feeding, so that they are at all times incapable of letter-space feeding the carriage of the machine. In the last three keys of the bank, the lower-case vowels VISANCHANI A, AI, and AE are always typed normally on the line.

The upper and lower case characters of the first two keys in the second bank, namely, the aspirate consonant HAW, consonants LAW, KHÁW, and TAW, are regularly typed on the line, and this is also true of the upper-case consonant PHAW of the fourth key in order. The lower-case LAK-KHANG vowel A is likewise typed on the line. In the sixth to the tenth keys the upper-case consonants PHAW, FÁW, CAW, THÁW and SÁW; the lower-case consonants RAW, NAW, the vowel AW, the semi-vowel WAW; and the aspirate consonant HÁW are all typed on the line in regular fashion. But the upper-case vowels short UOE and long UOE of the keys 4 and 5, and the lower-case vowel EE of the key 6 are always typed over characters, that is, above the line. The MAI-EK accent in the lower case of key 4 is typed above the line over regular characters, and even above superposed vowels to denote a depressed tone or a tone of finality. The MAITO accent in the lower case of key 5 is similarly typed above regular characters and also superposed above vowels such as the MAIPAT A, and is, of course, a tone-mark. The LEYKPAT character or mark in the upper case on key 6 is similarly superposed over words and syllables, its purpose being to shorten the same. The keys 4, 5 and

6 are therefore special silent or non-feeding keys, similar to 2 and 3.

In the third bank of the regular carriage-feeding keys, the normal upper and lower case characters are, key by key, consonants 5 THAW, SAW; vowel UM, consonant NGAW; consonants YAW, KHAW; PHAW, YAW; vowel AI, consonant DAW; vowel O, consonant THAW; another consonant 10 THAW, vowel A; consonants LAW, CHYAW; DAW and KHAW, all of which characters are typed normally on the line. The first key 8 has the LEYKCHET accent 15 in the upper case which is a tone-mark typed above characters, or over the line, short lower-case vowel I being also regularly superposed above the ordinary characters. And the KAKABAT tone-mark in the upper 20 case of special key 10 is the last of the four standard Siamese tone-accents which include the MAI-EK, MAITO, LEYKCHET and KAKABAT, all of which are superposed above the normally aligned characters, while 25 the appendage line or vertical mark already mentioned in the lower case of key 10 is added underneath characters in order to extend them below the line. This brings the number of the special keys up to seven for the whole 30 keyboard, these keys being thus distributed thereover. The ordinal characters in the lower case of the keys in the fourth bank, and likewise in the upper case the repeat character THAW and the etcetera character 35 LA: BANYAN are, of course, typed normally on the line, while the various punctuations and marks are typed in their normal positions, as customary in English, and, for this reason, all the keys in the top row are 40 normal carriage-feeding keys.

By way of illustration, the procedure of 45 typing various characters may be outlined. If the very accessible lower-case AW on the fourth key from the right in the second row is to be typed and the short upper-case OO of key 2 typed beneath it, then an operator versed in the touch-system will first strike key 2 with the index-finger of the left hand while depressing the right shift-key 50 14 with a finger of the right-hand, and immediately thereafter will release the shift-key, and with the middle finger of the right hand strike said second row key for lower-case AW. Or it may be desired to type the 55 same vowel AW with another vowel above it such as the lower-case MAIPAT vowel A on first row key 3. The index-finger of the right hand can be readily used to first strike key 3 and then immediately follow this by 60 striking the second row AW key with the right middle finger. In both cases the first key struck produces a typed character, but no carriage-letter-feed, so that the next character is typed in the same letter-space, though 65 not on the first character, the second key

causing a letter-feed action of the carriage in normal manner.

If, on the other hand, a syllable is to be typed consisting of the lower-case DAW on the sixth or middle key in the third row, the 70 lower-case long EE vowel on key 6 superposed over the DAW character, and then the KAKABAT accent in the upper case of key 10 superposed over the vowel EE, the first key to be depressed by the fourth finger of 75 the right hand would be the non-carriage-feeding key 6. Then the left case-shift key 13 would be depressed by the fourth finger of the left hand, and the fourth finger of the right hand again used to strike the non- 80 carriage-feeding key 10, after which the case-shift key would be released and the right index-finger used to strike the middle key of the third bank in order to type the character DAW on the line beneath the other two characters, which operation would result in three vertically-related characters in the same letter-space. 85

Another illustration should also be given 90 of the use of the appendage-mark on key 10. For example, the lower-case character A or LAK-KHANG, which is considered a suffix-vowel, disposed on the fourth key in the second bank, and the upper-case THAW 95 of the third key from the right in the same bank may both have their right stems lengthened by the addition of the appendage-mark thereto. In the case of the THAW character, the right-hand fourth finger would be used 100 to strike non-carriage-feeding or special key 10, and immediately thereafter, while the left-hand fourth finger is depressing the left case-shift key 13, the right-hand middle finger would strike the third key from the 105 right in the second row, this being a normal carriage-feeding or active key. Finally, in the case of the A or LAK-KHANG character, the right-hand fourth finger is first employed to strike key 10 and immediately 110 thereafter one of the first two fingers of the left hand is similarly employed on the fourth key in the second bank. On the middle key in the second bank, the upper-case PHAW 115 may also be changed in similar manner by subjoining the appendage-mark just mentioned. 120

In view of the fact that the superposed or subscribed vowels, accents and marks are so 125 essentially a part of the Siamese alphabet and almost as constantly used as the regular consonants and vowels which are disposed in normal alignment on the typing line, the same may be considered a subordinate alphabet or character group disposed on silent or non-feeding keys which are herein arranged in an exceedingly novel and useful manner among the regular keys, in positions which practically avoid using the awkward third fingers. The procedure involving the use of 130

the silent keys together with the regular keys, by virtue of their novel arrangement, as described and just illustrated for typing several characters, is typical of the efficiency possible with this keyboard, and its advantages are therefore obvious.

However, I am not limited to the exact locations of the silent or special non-feeding keys or the specific character-forms disclosed herein, but may alter the keyboard as found best by experience, so long as my fundamental principle is followed, that is, in arranging the non-feeding keys among the regular carriage-feeding keys, so that they are not crowded together in a single group, nor, as a rule, arranged consecutively as a series in any one key-bank, such changes and modifications often being obvious upon general application of the invention.

Hence variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others.

Having thus described my invention, I claim:

1. A four-bank, two-case keyboard for a Siamese Underwood typewriting machine, including in the lower case of the keys in one bank the characters, I, SÁW, NGAW, 30 KHAW, YAW, DAW, THAW, A, CHYAW, KHÁW and an appendage mark which when added to a character changes the meaning of the character, and in the upper case of the same keys in order the 35 LEYKCHET accent, THAW, UM, YAW, PHÁW, AI, O, THAW, LAW, DAW and the KAKABAT accent, the first and last keys in said bank bearing the upper-case 40 LEYKCHET accent and lower-case I, and the upper-case KAKABAT accent and the appendage mark being spaced apart by one or more carriage-feeding keys in said bank in order to render said keys directly accessible to several of the more nimble fingers of 45 an operator, said two keys being also silent for the purpose of typing, on the one hand, the LEYKCHET and KAKABAT accents and character I above various other characters which are typed from the normal keys 50 in said bank and, on the other hand, for subjoining said appendage mark to several of the characters on various keys of said keyboard, and the other three banks having 55 various different characters, marks, accents and ordinals together with punctuation marks and symbols to complement the mentioned characters of said first bank and form a Siamese alphabet therewith.

60 2. A typewriting keyboard, including silent keys for vowels and accents, for typing Siamese words, also numerals and punctuation marks, and limited to 42 keys, each controlling an upper-case character and a lower- 65 case character, making 84 characters in all,

said keys arranged in four transverse rows, one behind another, the lower-case characters in the first row being CHAW, BAW, BPAW, OO, KAW, MAIPAT A, MAW, VISANCHANI A, AI, AE, and in the next 70 to the front row being LAW, TAW, MAI-EK accent, LAK-KHANG A, MAITO accent, RAW, NAW, AW, WAW, HÁW, EE, and in the next to the rear row being 75 I, SÁW, NGAW, KHAW, YAW, DAW, THAW, A, CHYAW, KHÁW, an appendage mark, which when added to a character changes the meaning of the character, and in the rearmost row being ten numeral keys; 80 the upper-case characters in the front row being TAW, CHAW, CHÁW, OO, THAW, TANTAKAT, FAW, THÁW, SÁW, NAW, and in the next to the front row being HAW, KHÁW, UOE, PHAW, UOE, 85 PHAW, FÁW, CAW, THÁW, SÁW, KEYKPAT mark, and the next to the rear row being LEYKCHET accent, THAW, UM, YAW, PHÁW, AI, O, THAW, LAW, 90 DAW, the KAKABAT accent, and in the rearmost row being punctuation marks, also THAW and LA: BANYAN: substantially as and for the purpose set forth.

ABEL JOSÉPH CONSTANT COUSIN. 95

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