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APPARATUS FOR CODING AND DECODING MESSAGES

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This invention relates to apparatus for use in coding and decoding messages and provides an apparatus of simple construction by the use of which a word may be readily transposed into a code word capable of pronunciation for transmission by telegraph letter telephone broadcasting or other means The device permits of a multitude of different combinations to give different code words for the same original word a correspondingly arranged apparatus at the other end of which the message is sent serving to decode the message Thus the original word cannot be ascertained from the code word unless the particular code is known

The invention consists essentially in an arrangement of letters in the form of a column on an endless band or equivalent a number of such columned bands being furnished adjustable in relation to one another Each column contains two or more complete alphabets of letters arranged in varied sequences and the original word it is desired to transpose into code form is spelled across the column having one letter of each column and the corresponding code word appears at a predetermined distance away from the point where the original word appears said code word also having a letter of each column That is to say that for every letter making up the original word there is a definite letter on the same column (actually a different letter) which serves to make up the code word The original word is found from the code word in similar fashion and in order to facilitate the description the word which is known whether the original or code word will be hereinafter referred to as the known word and the word to be ascertained therefrom as the unknown word

The apparatus may have a plurality of set points provided around the columns for the formation and reading of the known and unknown words respectively any pair of which may be used at the same time, for the formation of the known word and the reading of the unknown word respectively giving different key combinations without changing the position of the columns or alphabet

The apparatus employed for carrying out the invention consists either of a number of endless strips of suitable material arranged side by side and adjustably mounted or a plurality of disc wheels or pulleys rotatably mounted on a spindle such discs or pulleys having the letters arranged on their peripheries or on their side faces near their peripheries as hereinafter described

The invention will be more readily understood by reference to the accompanying drawings and following description

Fig 1 is a diagrammatic view illustrating the relative arrangement of letters in adjacent columns

Fig 2 is a front elevation of one form of apparatus embodying the invention

Fig 3 is a side elevation partly in section of the construction shown in Fig 2

Fig 4 is a front elevation of a modified type of apparatus

Fig 5 is an end view thereof

Fig 6 is a vertical cross sectional view of the construction shown in Figs 4 and 5 the line of section being taken through the center of the disc and showing a preferred way of mounting the same

Fig 7 is a cross sectional view illustrating in detail one of the spindle mountings

Fig 8 is a plan view of a further modified type of apparatus

Fig 9 is a side elevation of the apparatus shown in Fig 8

Fig 10 is a plan view showing a modified arrangement of the construction shown in Figs 8 and 9

Fig 11 is a side elevation of the construction shown in Fig 10

Referring to Figure 1 of the drawings this is merely given an example of an arrangement of letters and columns to render the invention clear

In this view the spaces or sight window 2 2 through which the known and unknown words are indicated are shown disposed such distance away from one another that there is a complete alphabet of twenty six letters on each column 1 1 between them The separate alphabets on a strip differ from one another in their sequence of letters and each has an index number or key to identify it and as the strips may be interchanged each strip has an index number so that any particular one may be determined Thus on the extreme left hand strip considering the upper space 2 is the numeral 1 the first figure viz 1 of which indicates the particular strip and the second figure viz 2 of said number the particular alphabet on that strip said numeral 12 constituting what will be termed "a key It is to be understood that

if each strip or band 1 had four alphabets thereon it would be equipped with four keys each key being arranged in the space between the adjacent alphabet and the alphabet numbered consecutively 1 2 3, 4 the numerals being placed at the right of two digits the left digit being the one indicating the number of the strip on which the alphabets were applied For instance as above pointed out, the key 12 shown in Fig 1 would indicate that the strip was numbered 1 and the alphabet numbered 2 Likewise the numeral 13 on said strip would indicate alphabet number 3 and strip number 1 and so on

Considering the second and third strips from the left, it will be observed that the vowels are equidistantly spaced apart For example a number of vowels might occupy consecutive spaces provided a vowel in the known word gives a corresponding vowel in the unknown word The spaces 2 are arranged such a distance apart that when a vowel appears on one strip through one space 2 a vowel also appears in the other space on the same strip The same applies to consonants As an example the word "five" is spelled in the upper space and gives the word "somo" (in this particular instance), in the lower space, which is capable of pronunciation Both the vowels and the consonants are arranged in a specially calculated order so that all the letters in the unknown words will always be different from the corresponding letters in the known words

Since the alphabets on a single strip each have a different sequence of letters, the code may be altered by turning any one or more strips so that another alphabet comes into use and, if the arrangements of letters on various strips each differ from one another the code may be altered by interchanging the strips That is to say it is possible in a practical and easy way to continuously change combinations of keys for each word of a message, without changing once the respective positions of columns and alphabets For instance with four alphabets to a column one has at his disposal twelve different combinations of keys which one can use in any sequence that may be prearranged with a correspondent The absolute difference from one another of the translations resulting from these twelve combinations of keys, can be proved by transposing the same "known" word in each of the twelve combinations of keys and by comparison it will be found that the resulting twelve "unknown" words will have all of the consonants different from one another This so far as known has never been effected before and insures absolute secrecy Thus the device is capable of a vast number of different codes, and the code word if picked up can only be transposed to the original word if the particular arrangement of sets and alphabets on the decoding machine is in agreement with that by which the word was originally coded The apparatus at the decoding end may be set with the original by communicating the particular index or key numbers in use

The remaining figures of the drawing illustrate various forms of apparatus constructed in accordance with and incorporating the invention

One approved construction of apparatus embodying the invention is shown in Figures 2 and 3, being front elevation and part sectional side elevation respectively This construction employs a number of endless bands constituting the strips in Figure 1 on which the letters are arranged The said apparatus comprises a frame constituted by side members 3 3 and cross members 4, 4 Transverse rods 5 are arranged near the respective ends of the frames, and rollers 6 are rotatably mounted thereon Endless bands 1 1 are carried on said rollers and the spaces for the known and unknown words are formed between spaced pairs of transverse bars 7, 7 each two forming sight windows or frames transversely of the movable members or bands through which the code notes and index symbols of the index members will appear Each pair of bars 7 is slidably mounted on the side members of the frame by extension parts thereof running in longitudinal grooves 8, 8 in the said side members A similar arrangement may be furnished at each side of the device The endless bands 1, 1 may be of rubber tape or any other desired material and may be made adjustable as to tension by mounting one of the rods 5 in slots and employing plates 9 9 pivoted to the frame and furnished with alternative notches for pressing against said rod, giving a stretching effect to the strips

Another convenient form of apparatus for carrying out the invention is shown in Figures 4, 5, 6 and 7, and employs a number of discs 10 10 having the letters formed on their periphery, said discs being independently rotatably mounted on a spindle 11 Figure 4 is a front view and shows the spindle 11 carried by bearings in standards 12 at each of its ends Figure 5 is an end view thereof Figure 6 is a cross section through the centre of the discs and shows a preferred method of mounting same That is to say the discs are revolubly mounted on a sleeve 13 flanged at each end, one of said flanges 14 or both being detachable This arrangement permits easy insertion of the discs into position as same are placed en bloc into position, the spindle 11 being simply passed through the sleeve 13 and the bearings in the standards 12

When the known word has been formed, the discs are rotated en bloc in order to ascertain the unknown word, and in order to

retain the discs in fixed relation, and to ensure using the correct alphabet of a single disc, the following mechanism is incorporated.

Two bosses each having a number of radial arms 16 are revolubly mounted on the spindle, one on each side, on the outer sides of the discs and the respective arms are connected across by spindles 17. One of said spindles is constituted by a split tube 18, hingedly mounted to one of the arms 16 so as to be capable of swinging away from the periphery of the discs and is adapted to receive a spindle 19 as seen in Figure 7 which is a cross section therethrough. Said spindle 19 is furnished with a longitudinal key 20 which key projects through the slit in the tube, and said key is adapted to engage in grooves 20 on the periphery of the discs. That is to say between the adjacent letters of each disc, a transverse groove 20 is formed, and at the division of the alphabets on each disc there is provided a projecting pin 21 the arrangement being such that as the desired letter on the respective discs are consecutively arranged in position they are locked by pushing the spindle 19 into the tube, its key 20 engaging in the grooves 20 adjacent the letters the projecting pins 21 of the unlocked discs, by contacting with the spindle 19, preventing said unlocked discs making a complete revolution, and consequently preventing the erroneous passing from one alphabet into another alphabet while said spindle is in position.

In use, the known word is formed along the edge of the spindle 20, and the unknown word read off along the edge of one of the other spindles 17.

A simpler construction of apparatus embodying the invention is shown in Figures 8 and 9 being a plan and edge view respectively. Such apparatus comprises a base 22 having a spindle 23 on which are concentrically mounted a plurality of discs 24 of varying diameters the largest being at the bottom so that part of one disc overlaps the edge of the disc above it forming in effect a rim 24 on which letters are formed or arranged. Each rim is formed with the same number of letters, which are adapted to register.

In Figures 10 and 11 is shown a modification of the last described construction, Fig. 10 being an elevation and Figure 11 vertical section through line x—x thereof. The discs 25 are of equal diameters arranged in staggered relation, each being pivoted to a strut 26 and the struts are so arranged that the pivots are equidistantly spaced apart so that a crescent shaped part of an underneath disc projects on one side over the edge of the disc above. The discs are arranged on each of their sides with letters near their peripheries said letters being arranged in such a manner that the original word is composed by the letters on the crescent shaped projections such as 25 on one side, the code word appearing on the similar shaped projecting parts 25^b of the discs on their other sides. The struts 26 are held together by means of a support 27 having a part 28 which encircles them and rigidly holds them in position until required to be released for interchanging. The struts 26 and support 27 are formed with apertures enabling the letters on the discs to be seen therethrough.

With a device of this character constructed of ten disks as shown in Figs. 4, 5 and 6 and each disk having four alphabets on its periphery it is obvious that the instrument would contain ten sets of four alphabets each there being four keys and forty alphabets in all. With four keys twelve different key combinations may be formed for the formation of the known word and the reading of the unknown word and if one word of the ordinary language were coded in each of the twelve combinations of keys of one single position of the instrument, it would be found that the resulting twelve code words would have all the corresponding consonants different from one another and from the corresponding consonants in the original word, and the corresponding vowels in the known and the unknown word would never be the same. The arrangement of disks, alphabets and keys is very simple and is obtained as follows:—

The first letter space of each alphabet carries two separate digits the left digit from naught to nine indicating the disk number while the right digit from naught to four indicates the number of the alphabet on the disk, for instance 91 would show that the disk number was 9 and the alphabet number was 1 and since the alphabets of each disk are numbered consecutively 1 2 3 and 4 it is necessary to know only one key of any position of the instrument in order to ascertain the remaining keys at the same position.

It will thus be seen that by employing a predarranged sequence of the twelve combinations of keys it is only necessary to know one key and to register the instrument in that key in order to put all the other keys and all the twelve key combinations also in register ready for operating without bothering about any other indication.

Thus with the four alphabets of this apparatus the same known word may be found in key 1 and the unknown word read in keys 2, 3 and 4, the same known word being formed in key 2 and the unknown word read in keys 1, 3 and 4, the same known word formed in key 3 and the unknown word read in keys 1, 2 and 4, and when the same known word is formed in key 4 the unknown

word is read in keys 1, 2 and 3 thereby providing twelve code words having no similarity whatever one with the other or with the original word, without requiring any interchanging of the columns or moving them forwards or backwards for the purpose of changing keys, using one single position of the apparatus only Thus, these twelve combinations of keys of one single position of the apparatus may be employed in any sequence desired using a different combination for each word of the message

I claim —

1 Apparatus for transforming known words into code words and vice versa, comprising a series of movable units, markers disposed transversely of said units, the surface of each unit being divided into a plurality of alphabet spaces and intervening caption spaces, each alphabet space having thereon the characters of a complete alphabet arranged in abnormal sequence, the arrangement of the characters of the respective alphabets being different from each other, the vowels occuring in one alphabet of each unit occupying spaces corresponding with the spaces occupied by the vowels of the other alphabets of the same unit, different vowels occuring upon the corresponding vowel spaces of the respective alphabets of each unit and designating characters appearing upon the caption spaces

2 For coding and decoding apparatus a unit having a surface divided into a plurality of alphabet spaces and intervening caption spaces, each alphabet space having thereon the characters of a complete alphabet arranged in abnormal sequence, the arrangement of the characters of the respective alphabets of said unit being different from each other, vowels occuring in one alphabet of each unit occupying spaces corresponding with the spaces occupied by the vowels of the other alphabets of said unit, different vowels occurring upon the corresponding vowel spaces of the respective alphabets, alphabet designating characters appearing upon the caption spaces, and unit locating characters appearing upon the caption spaces

3 Apparatus for coding and decoding secret messages consisting of a plurality of columns adjustable to one another and interchangeable with each other each column containing a plurality of alphabets whereby the "known" word can be formed and the "unknown" word can be read across all columns, characterized by this that each column of letters indicated on the columns contains a plurality of alphabets so arranged that each vowel of an alphabet always corresponds to another but different vowel of another alphabet of the same column, and similarly a consonant to another but different consonant in the other alphabet or alphabets, so that for each known word a code word may also be formed containing an equal number of vowels and consonants as the known word,

4 In a coding and decoding apparatus means for forming known words at certain positions across the apparatus, whereby unknown words automatically appear at other positions, said means comprising a plurality of alphabets and a plurality of keys, and means employing a different combination of alphabets for each letter of a word and for each word a different combination of keys

5 In a coding and decoding apparatus means for forming known words at certain positions across the apparatus, whereby unknown words automatically appear at other positions, said means comprising a plurality of separate, interchangeable, columns, said columns being independently movable and adjustable relatively to each other, each column having a plurality of alphabets arranged in an unbroken line and each alphabet comprising twenty-six letters and intervening caption spaces between the alphabets, the letters of the respective alphabets being differently arranged relative to each other, the same sequence of consonants and vowels being maintained for all the alphabets of one column, with the sequence in each column different from that in the others

6 Apparatus for coding and decoding secret messages consisting of a plurality of columns adjustable to one another and interchangeable with each other, each column containing a plurality of alphabets whereby the known words may be formed and the unknown words read across all columns, each column containing a plurality of alphabets, the spacing of the vowels in all the alphabets being irregular, such irregularity being different from each column but similar in all the alphabets of the same columns

7 Apparatus for coding and decoding secret messages consisting of a plurality of columns adjustable to one another and interchangeable with each other, each column containing a plurality of alphabets whereby the known words may be formed and the unknown words read across all columns, each column containing a plurality of alphabets, the vowels and consonants which are arranged in specially calculated order whereby all the letters in the unknown word always differ from the corresponding letters in the known word

In testimony whereof I have affixed my signature hereto this 9th day of May, 1923

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May 1, 1928. 1,667,780

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Fig. 1.

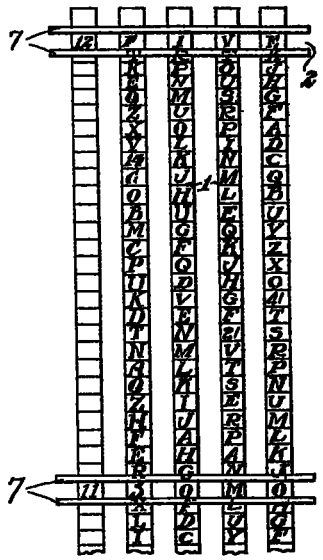

Fig. 2.

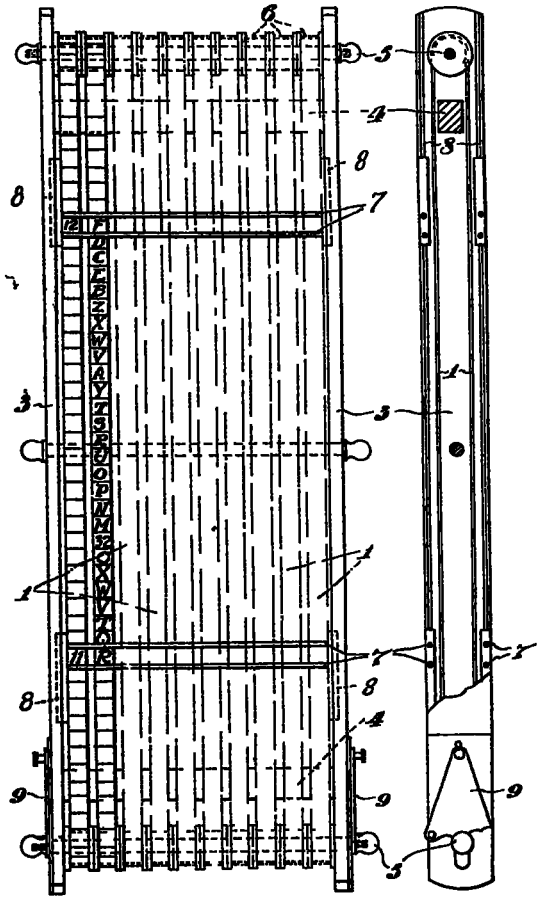

Fig 3

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Fig 4

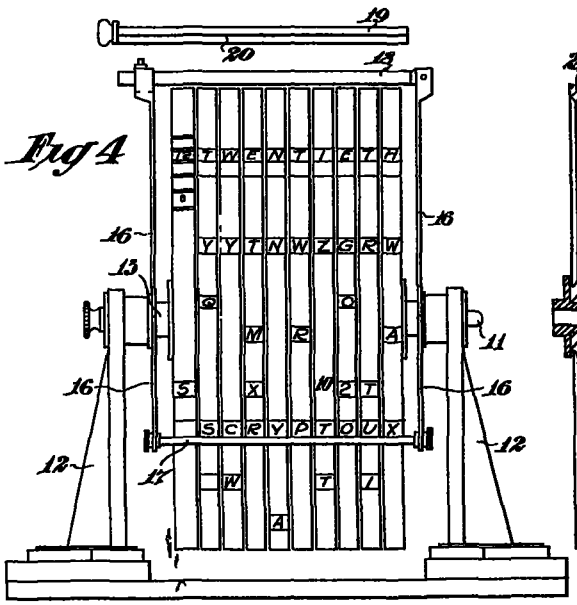

Fig.6.

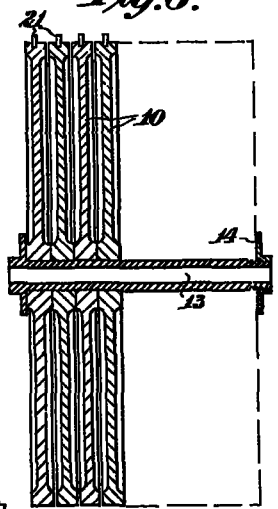

Fig.5

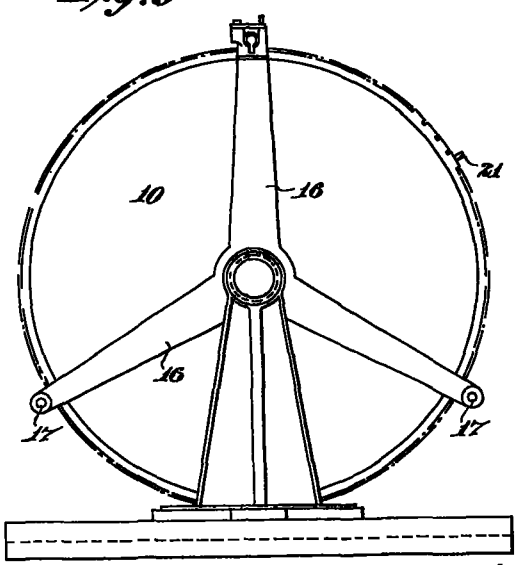

Fig.7.

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Fig. 9.

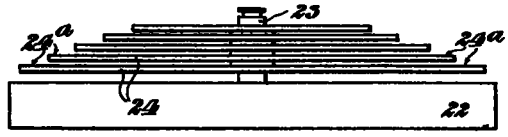


Fig. 8.

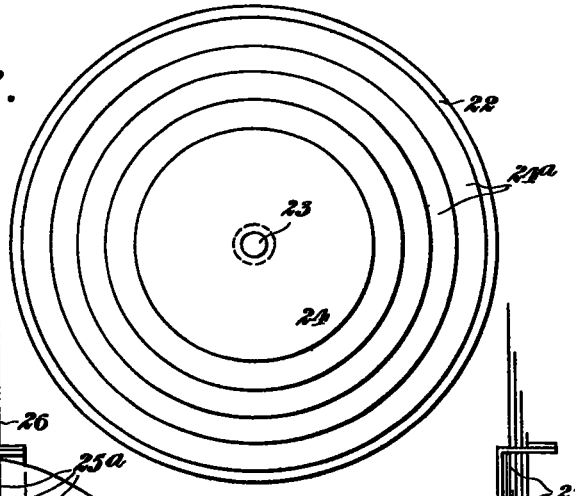


Fig. 10.

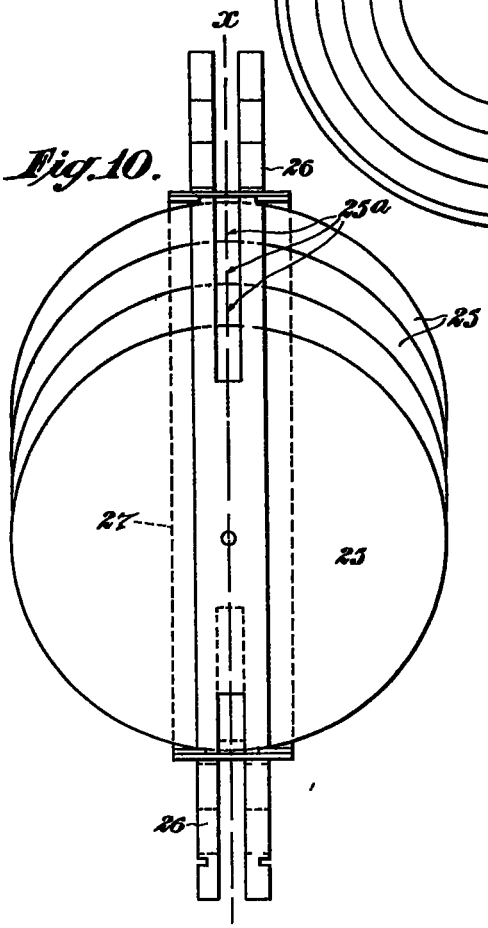
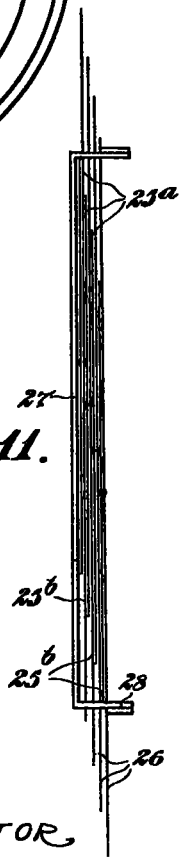


Fig. 11.



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