

(No Model.)

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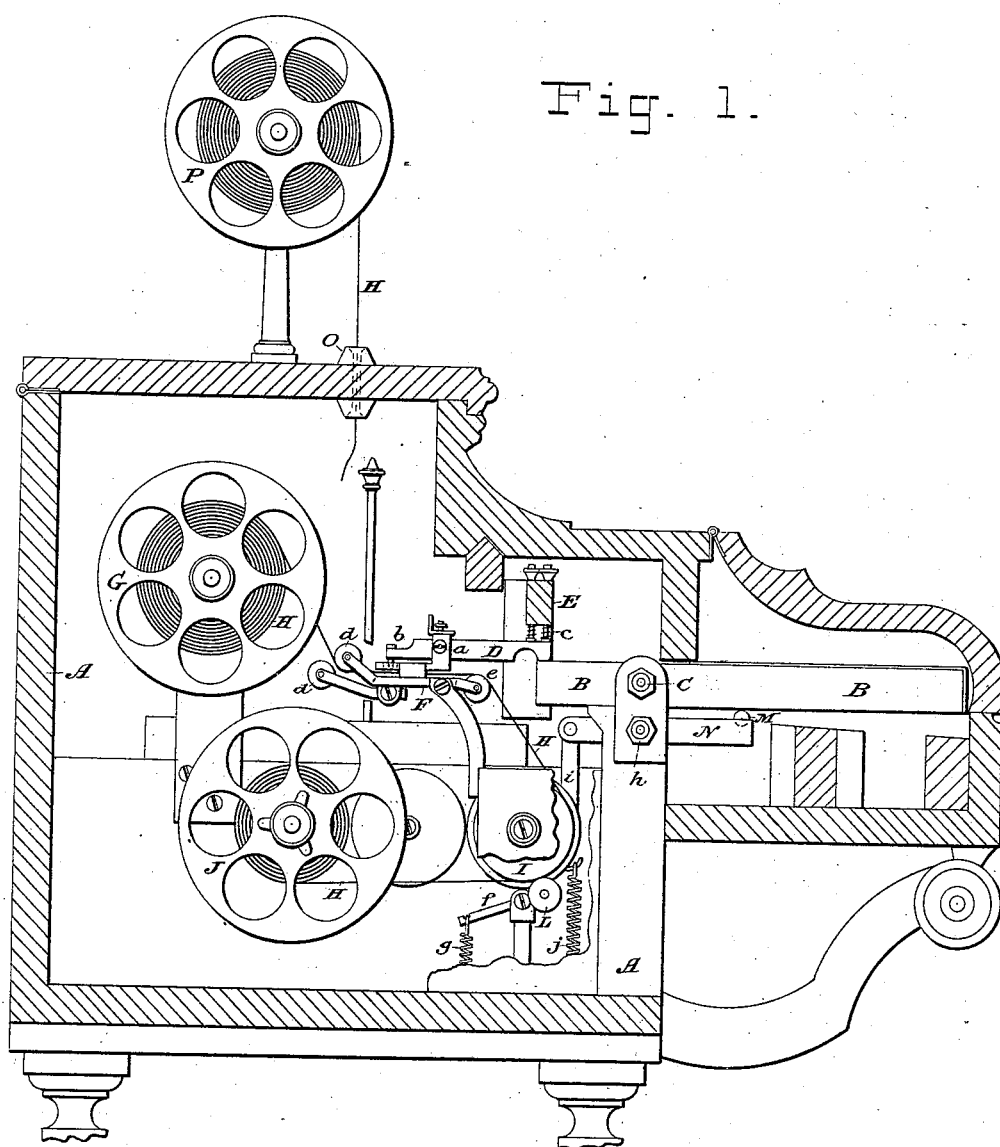
VICENTE ALONSO DE CELADA.

TACHYGRAPHIC APPARATUS.

No. 306,904.

Patented Oct. 21, 1884.

Fig. 1.



WITNESSES:

Geo. H. Fraser.

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INVENTOR:

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By his Attorneys,

Burke, Fraser & Hornett

(No Model.)

5 Sheets—Sheet 2.

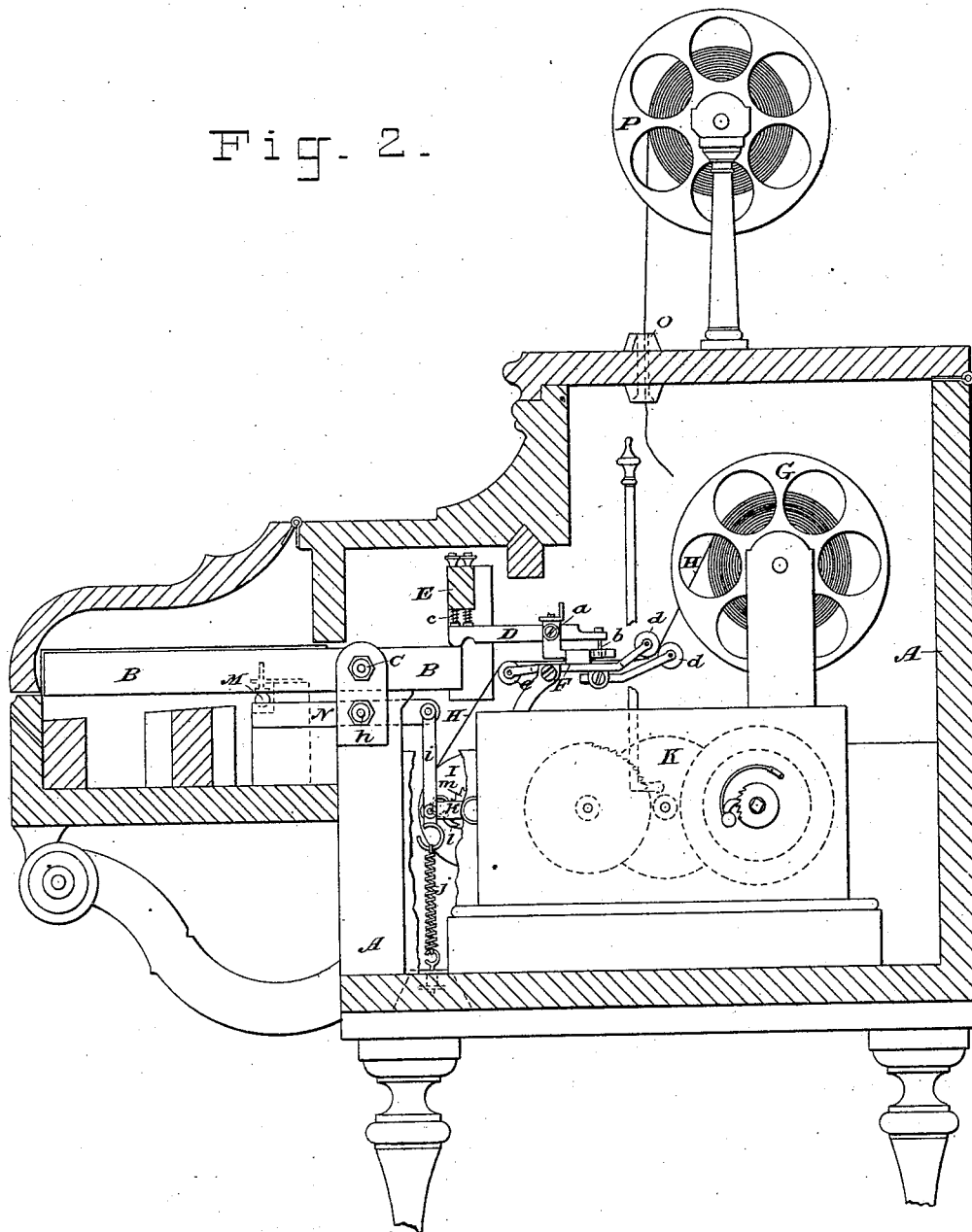
VICENTE ALONSO DE CELADA.

TACHYGRAPHIC APPARATUS.

No. 306,904.

Patented Oct. 21, 1884.

Fig. 2.



WITNESSES:

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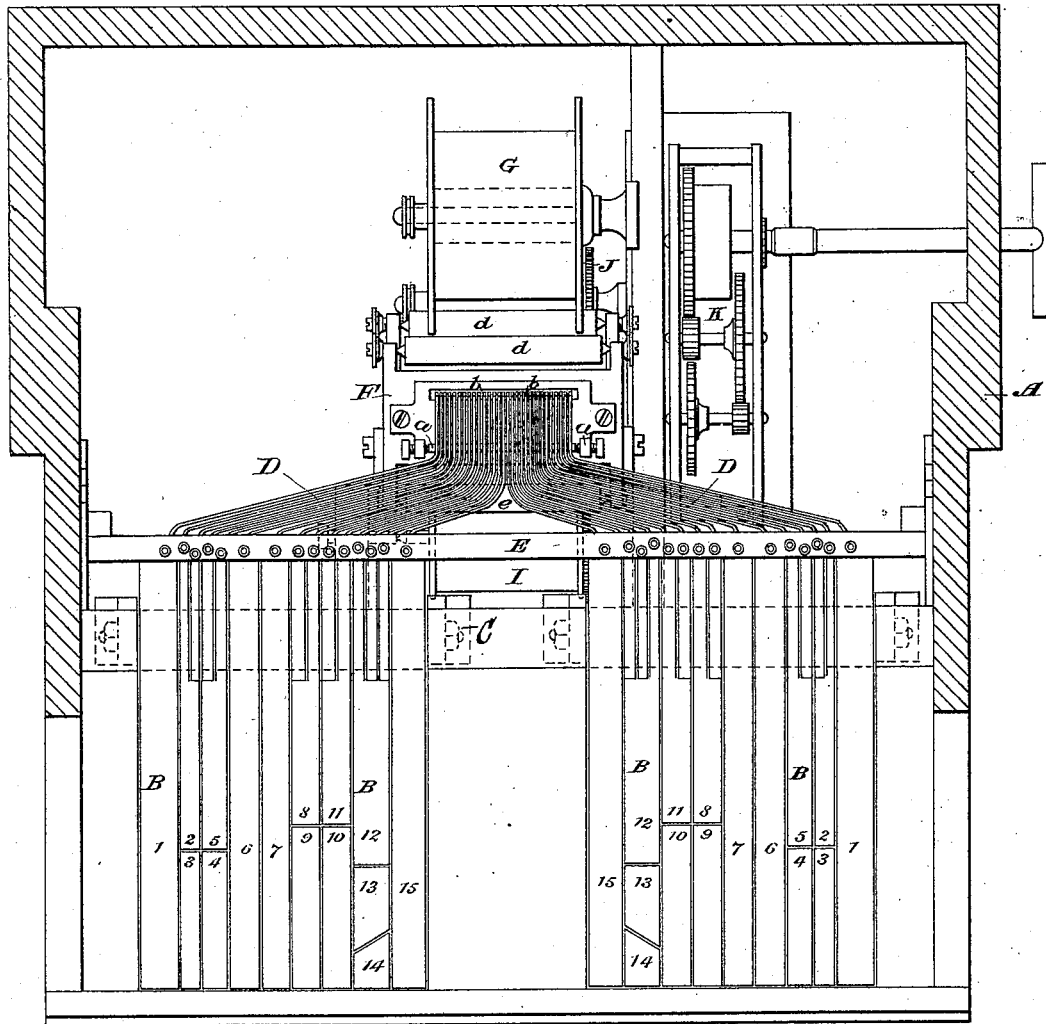
VICENTE ALONSO DE CELADA.

TACHYGRAPHIC APPARATUS.

No. 306,904.

Patented Oct. 21, 1884.

Fig. 3.



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5 Sheets—Sheet 4.

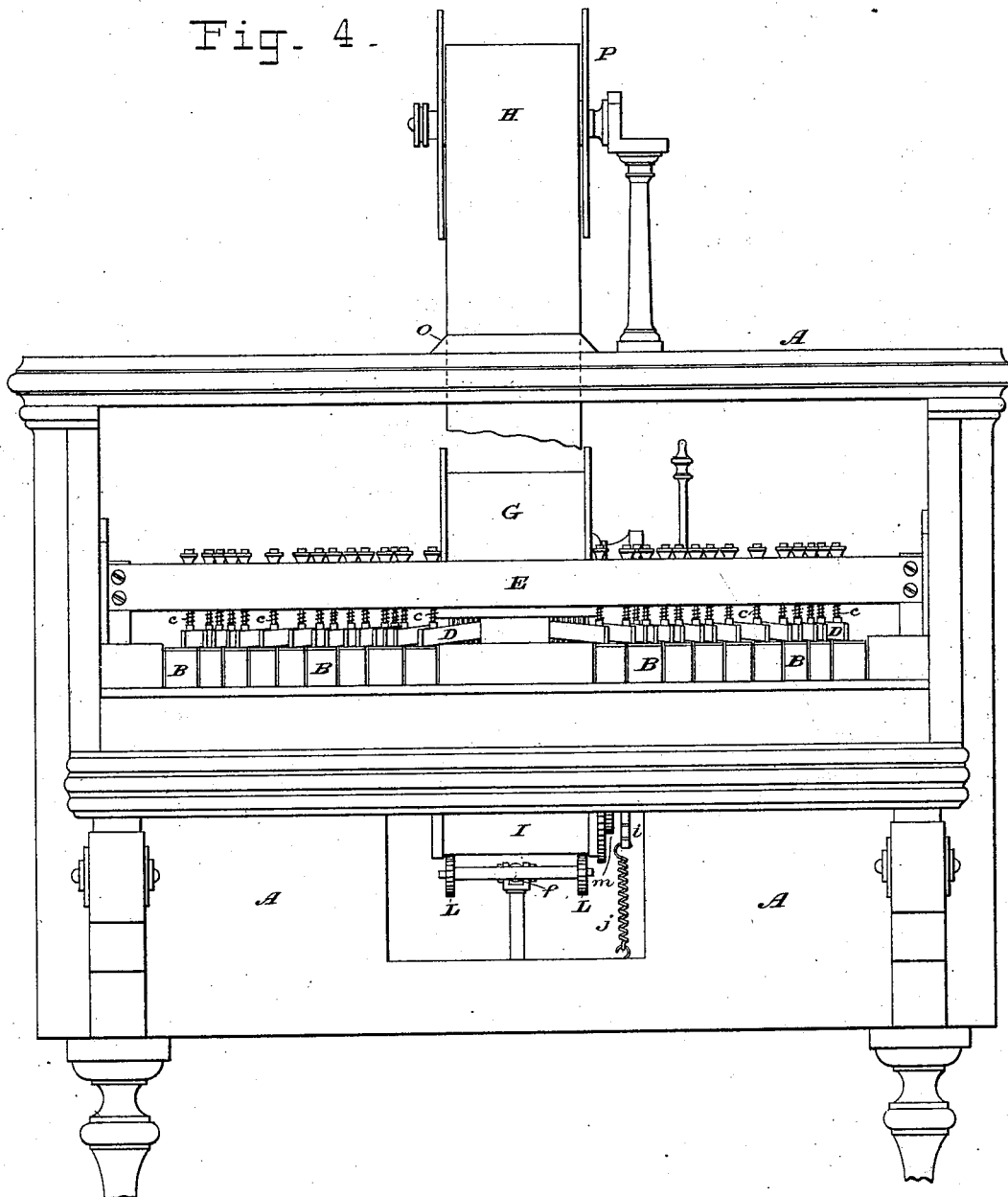
VICENTE ALONSO DE CELADA.

TACHYGRAPHIC APPARATUS.

No. 306,904.

Patented Oct. 21, 1884.

Fig. 4.



WITNESSES:

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(No Model.)

5 Sheets—Sheet 5.

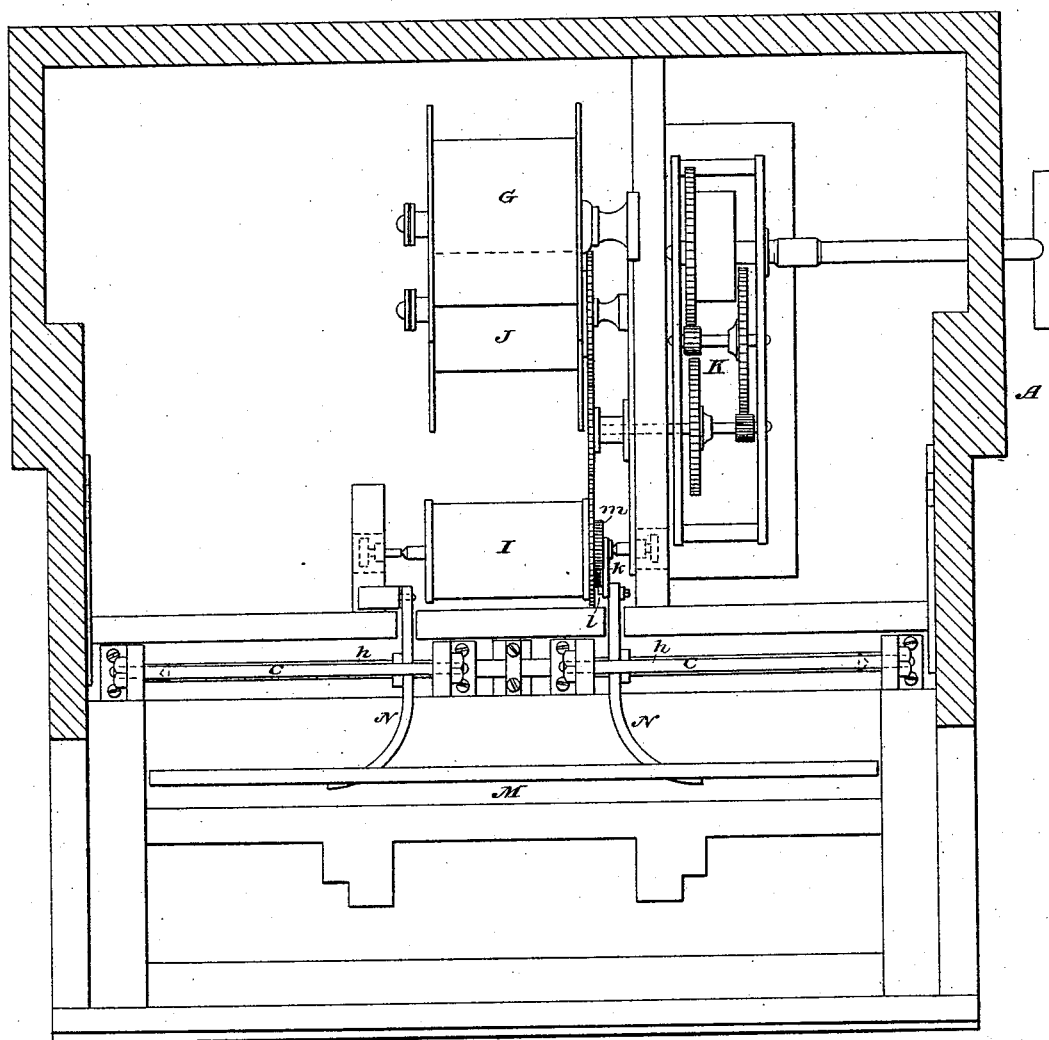
VICENTE ALONSO DE CELADA.

TACHYGRAPHIC APPARATUS.

No. 306,904.

Patented Oct. 21, 1884.

Fig. 5.



WITNESSES:

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UNITED STATES PATENT OFFICE.

VICENTE ALONSO DE CELADA, OF MADRID, SPAIN.

TACHYGRAPHIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 306,904, dated October 21, 1884.

Application filed December 1, 1882. (No model.) Patented in Spain November 17, 1881, No. 2,031; in France July 15, 1882, No. 150,124, and in Eng. and July 31, 1882, No. 3,633.

To all whom it may concern:

Be it known that I, VICENTE ALONSO DE CELADA, a subject of the King of Spain, and a resident of Madrid, Spain, have invented certain Improvements in and relating to Machines or Tachygraphical Apparatus for Printing or Reproducing Speech, of which the following is a specification.

This invention relates to an apparatus and system whose object is to serve for tachygraphy in all its applications—that is to say, to follow and reproduce speech or language by mechanical means and in printed characters. The said apparatus has the form of a small piano or type-writer, its key-board being capable of being constructed in various forms, and being arranged in such a manner as to enable speech or language to be easily followed, taken down, and designated or recorded. The key-board in its normal position is usually horizontal, and has thirty keys. In the ensuing description it is to be understood that the remarks made with respect to one key are applicable to the other twenty-nine keys, their mode of action being identical. Assuming, then, that any one of the keys—for example, the key representing the letter A—is selected, it should fulfill these conditions, namely: First, it should denote the letter, character, or sign which it represents; and, secondly, it should cause the immediate and uniform advance or movement of the paper on which it is designed to produce an impression. In other words, the key having its center of movement upon a certain line and resting against the end of the longest arm of a lever carrying upon its shortest arm a type, stamp, or punch provided with a letter or other character or sign which is desired to be reproduced, it will be evident that by depressing or applying pressure to the said key the aforesaid lever will be raised, thus causing the stamp or punch to descend. By this downward moving of the said punch or stamp the letter or other character or sign which the same carries will be denoted upon a platform or plate. To prevent the key from remaining in its depressed position after it has been caused to descend, and insure its rising to its normal position as soon as the pressure previously exerted there-

on is withdrawn, I employ a series of springs which exert their force upon the short arm of the said key and compel it to return to its normal position. I have thus explained the manner in which the key fulfills the first of the above-named conditions. I will now proceed to describe the manner in which the second of the said conditions is fulfilled—that is to say, the uniform advance or feed of the paper. This paper is wound or rolled upon a drum or reel, and passes thence between two rollers over the impression plate or platform, then over a third, then around a portion of the surface or periphery of another roller or cylinder, to which it is caused to firmly adhere by means of a brake or friction-exerting device consisting of a cylinder, which may be fluted or grooved and arranged tangentially to the said bearing-roller and caused to act by means of a spring. The paper is then finally wound upon a second reel by means of a clock-work movement. This movement concentrates its force or power upon a toothed wheel which gears with the said drum or reel. It follows, therefore, that the resistance which prevents the clock-work movement from withdrawing at any given moment the whole of the paper from the first drum or reel is caused simply by the pressure exerted by the aforesaid brake upon the bearing-roller.

I will now proceed to describe the relation which exists between the said bearing-roller and the key, in order to render more clear the arrangement whereby, when the latter returns to its normal position, the cylinder is caused to advance a certain distance, (three millimeters, for instance,) while the aforesaid second reel receives an equal quantity of paper, considering that the clock-work movement is arranged in such a manner that it is able to turn this drum or reel at all times. With this object in view I have arranged so as to just touch the lower face or surface of the keys a rigid metallic bar, which, being securely attached to symmetrical transverse levers, has its pivot upon a rod. One of the said transverse levers is jointed or pivoted at one end to a connecting-rod, which is connected by a pawl with the aforesaid bearing-roller through the medium of a ratchet. The

said pawl is arranged according to the diameter of the said roller in such a manner that at each movement the latter will be caused to advance the desired distance, (three millimeters, for instance.) A spring connected to one end of the aforesaid connecting-rod by a link retains the above-named mechanism in horizontal position. If any one of the keys—such as the key A, for instance—is depressed, the lever corresponding to the said key will immediately print a character or letter. At the same time the key which is operated upon will carry with it the bar, and consequently one of the said transverse levers will act in the same manner with regard to the connecting-rod, which, as above stated, is connected to its extremity. Immediately the pressure exerted in order to cause the key to descend is removed the said key will be returned to a horizontal position by means of its spring. The stamp or punch of the said lever will then be withdrawn from the paper, which, being moved or drawn along by the roller, is wound or rolled up upon the reel. When the orator has ceased to speak, clock-work mechanism is uncoupled, the brake is released or withdrawn, and the strip of paper thus set free can then return to the first reel. The strip of paper, once wound upon the said reel wherefrom it originally proceeded, is seized by its end or extremity, in order to cause it to pass through a slot. Then by securing this extremity of the strip of paper to a reel parallel to the above-mentioned slot and causing the said reel to turn by hand, the whole of the matter which the strip of paper contains may be read and copied systematically. This small auxiliary apparatus placed upon the lid or cover of the main part of the apparatus consists of a column or standard of suitable height—say, for instance, one decimeter—and of a reel which, as well as the roll of paper, may be easily dismounted and removed as soon as the lecture or speech is concluded.

In the accompanying drawings I have shown my improved apparatus constructed as above described.

Figure 1 is a sectional elevation or view of the left-hand side of the apparatus, the case only being in section. Fig. 2 is a similar view of the right-hand side of the instrument. Fig. 3 is a sectional plan, the upper portion of the casing being removed. Fig. 4 is an elevation or view of the front of the apparatus, a portion of the casing above the key-board being removed to show the interior mechanism. Fig. 5 is a horizontal section or sectional plan taken in a plane just below the keys.

A represents a casing similar to that of a piano or organ, and by preference provided with legs.

B represents all the keys in general, without reference to their significance. These are in the nature of levers, being fulcrumed on a rod, C, common to them all, or on two rods, as shown in Fig. 5, in the same line. The in-

ner or short arm of the key takes under the long arm of the type-lever D, which is fulcrumed at *a*. The other or short arm of the type-lever bears the type *b* for making an impression on the strip of paper. The type *b* and key B are held raised normally by means of a spring, *c*, arranged between the type-lever and a cross-bar, E. Pressure on the key B (by the finger, for example) presses type *b* down upon the strip of paper. As each of the thirty keys B connects with an independent type-lever, D, and all operate alike, one description serves for all, and I have not deemed it necessary to repeat all of the letters of reference.

It will be observed by inspection of Fig. 3 that the type-levers converge in such a manner that the types borne by them may impress their characters on a strip of paper narrower than the key-board; but it will also be observed that the types, while they all make their impressions in the same line across the strip, do not strike in the same spot, as in the ordinary type-writer. Each type has its particular position with respect to the width of the strip—that is to say, the impression any given type makes is always the same distance from the edge of the strip.

F is the impression-plate or bed over which the strip of paper passes, and upon which the types press the paper in printing.

G is a reel which bears the strip of paper H, which is to receive the imprint from the types. This paper passes between two guide-rollers, *d*, over the impression-plate, and over a guide-roller, *e*. From thence it passes over a bearing-roller, drum, or cylinder, I, and thence to the receiving-reel J. This reel is connected with a clock-work mechanism driven by a spring, which tends to wind the paper on reel J. As this mechanism is of the usual kind, and possesses no novelty, I simply indicate it in general by the letter K. I will say, however, that the reel J is coupled to the driving-power by a suitable detent or clutch in such a manner that it may be readily uncoupled at any time.

L is a roughened brake-roller, or there may be two wheels on the same shaft, as in Fig. 4, which is mounted in the end of a lever, *f*, and held up to the bearing-roller I by means of a spring, *g*. The pressure of this brake is sufficient to resist the tendency of the strip of paper to roll up on the reel J.

I will now describe the mechanism for feeding the paper along by means of the manipulation of the keys.

M is a bar arranged to lie directly under the keys, and mounted fixedly on two levers, N N, which are pivoted or fulcrumed at *h*. To the inner short arm of one of these levers is coupled a link, *i*, to the lower end of which is attached a spring, *j*, which tends normally to draw down the link *i* and the lever to which it is attached. To the link *i* is coupled an arm, *k*, which has a loose bearing on the axis of roller

I, and this arm bears a pawl, *l*, arranged to engage a ratchet, *m*, on the roller I or its axis. When any key B is depressed in order to impress its type on the strip of paper, the pawl *l* is lifted or rotated backward through the medium of bar M, lever N, link *i*, and arm *k*, and when the finger is lifted from the key the spring *j* draws down the pawl, thus rotating roller I and feeding the paper along, and the reel J receives the paper as it is fed along. Thus it will be seen that each stroke of a key B brings into play the mechanism which feeds the paper strip along far enough to receive the next impression from the type, and if a number of successive depressions of a single key are made this will impress on the paper a row of the particular characters controlled by the key, one character over the other, and extending lengthwise of the strip; but all of the keys may be struck at once, which will impress all the characters in a row extending across the strip. Should the keys be struck in succession—from left to right, for example—the row of impressions will extend diagonally across the strip.

I mention the above simply to avoid any misunderstanding of the manner in which the impressions of the several types may be made to appear on the strips, as this is an important feature of my apparatus.

As before stated, after the speech or oration has been taken down, the strip H, or at least the printed portion of the same, will be found wound upon reel J. This reel is now uncoupled from the clock-work mechanism K, and the strip wound back upon the reel G, so as to get at the beginning of the speech. The end of the strip is now passed up through a slit, O, in the cover of the apparatus, and wound slowly upon a reel, P, mounted upon said cover. I may say that as the strip moves upward to be read the characters or letters should be imprinted on it, so as not to appear inverted. Care should also be taken with reference to the positive or negative character of the type-face. If the strip is to be read from its under side, the type-face must be positive; if not, negative. The types may emboss the characters, so as to stand out on the lower face of the strip; or the ordinary ink-ribbon or transfer-paper may be employed, arranged either under or over the paper.

In lieu of the pawl-and-ratchet device for intermittently rotating the roller I, I may employ a friction device similar to those employed for rotating the feed-wheels of sewing-machines. The cover of case A may be hinged, as shown, and a hinged cover may also be provided for the key-board or manual.

Having thus explained the construction of my improved apparatus, it now becomes requisite to elucidate its mode of operation in order to obtain reading and writing, which it is proposed to place within the reach of all, and which combines clearness and brevity.

The object of this invention is to follow and

record speech by mechanical means, and thus to do mechanically the work of stenographers and short-hand writers.

Among the advantages of doing this work by mechanical means may be mentioned that it can be done more rapidly; that it does not require long experience and special skill to learn, and that the recorded speech can be easily read and by any one besides the operator.

To enable the operator of a stenographic apparatus to keep up with a speaker, it is necessary that at least a syllable should be struck at a time. Now the most complicated syllable can consist only of an initial consonant or consonants, an intermediate vowel or vowel sound, and a final consonant or consonants. Thus all syllables can be embraced in a system which includes one complete set of consonants for the initial consonants, one set of vowels, and one complete set of consonants for the final consonants. If, then, an apparatus is constructed with three groups of letters—one for each of the above-named sets and in the order named—it is clear that with a careful arrangement of the letters each syllable can be recorded with the letters in their proper order; and if complete alphabets be used with the arrangement of the printing-types and the recording-papers in my improved apparatus, a printed sentence would appear printed somewhat as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|-----|
| f | r | i | e | n | d | s | |
| c | | o | u | n | | | |
| t | r | y | | | | | 100 |
| m | | e | | n | | | |
| | l | e | | n | d | | |
| m | | e | | | | | |
| y | | o | u | r | | | |
| | | e | | a | r | s | 105 |

Now as the letters constituting each syllable must be struck at a time, it follows that as many keys must be struck at a time as there are sounds in the syllable. The greater the number of keys employed the fewer keys will be required to be struck at a time—that is, it will be found that where a separate key is assigned for each letter or phonetic character a fewer number of keys will be required to be struck at a time than if some system is adopted where permutations of keys are used to express the different letters or sounds, to say nothing of the complications and other difficulties which would arise from the adoption of such a system. But in a system where a separate key is assigned to each letter or phonetic character, to strike some of the longer syllables becomes very difficult, and this difficulty becomes practically an impossibility where a permutation system is employed.

I know of no syllable in the English language which contains over seven separate sounds; but in other languages eight and even nine sounds are sometimes included in a single syllable. Now, it is from attempting to record a single stroke a syllable of this phonetic length that the main difficulty of other tachygraphic

systems and apparatus has arisen. Now, attentive observation will make it evident that the number of distinct articulate sounds which can be uttered by a single impulse of the voice is never greater than five, and if more than that number of sounds are produced by a single impulse of the voice the sound ceases to be articulate—that is, the sound ceases to be distinct and the word or syllable is not recognizable. It will be found that in attempting to pronounce clearly and distinctly a syllable containing more than five sounds—"strands," for example—more than one impulse of the voice will be required, and hence that the time of enunciation will be proportionally prolonged; and it is also to be remarked that the maximum of five sounds is only reached in a syllable where there are two initial and two final consonant sounds—that is, it will be found that if no final consonants are used and three initial consonant sounds be attempted to be pronounced more than one impulse of the voice will be required. Syllables containing five or less sounds will be found to occupy nearly the same length of time, since but one impulse of the voice (which determines the length of time occupied) will be required. A few examples will demonstrate this principle and make it clear.

a—pay—pray—play—plate.
a—pay—pail—pelf—part.
a—pay—pray—prate—pralt.

Now, if these syllables be pronounced rapidly one after the other, it will become evident that there is no perceptible difference in the duration of time for each; but endeavor to extend their limit by placing before or after (or before and after at the same time) only one letter or sound, and it will be found how completely impossible rapid diction becomes in all the instances expressed, particularly when the pronunciation is repeated several times clearly, distinctly, and rapidly. If to the syllable plain, prate, pralt, &c., a consonant is made to precede or follow—as,
s—plain, s—prate, s—pralt, &c.,
plain-s, prate-s, pralt-s, &c.—
the first mentioned syllables will appear brief compared with the last; but when a letter is made to precede and another to follow simultaneously the same syllables the time employed in pronouncing them will appear much longer—for example,

s—plain-s, s—part-s, s—pralt-s, &c.
Hence it follows that in case a syllable contains more than five sounds the time of enunciation will be doubled, or nearly so, if a single sound is added, and will be proportionally increased if more sounds are added, and consequently, in applying this principle to recording speech, it becomes evident that the operator of a tachygraphic apparatus will never be required to strike more than five keys at a single time, for if a syllable should contain more than that number of sounds the time of pronouncing will be so lengthened as to give

the operator opportunity to make separate records of the additional sounds; and the application of the results of this investigation to the arrangement of the key-board of a tachygraphic instrument constitutes one of the most important features of my system. In the arrangement of the keys, then, I have to provide for expressing one or two initial consonants, one or two final consonants, and the intermediate vowel sounds.

For convenience in use, I construct the key-board so that the initial consonants are operated by the fingers of the left hand, the final consonants by the fingers of the right hand, and the vowels by the thumbs of both hands; and, also, I preferably assign particular keys to each finger, and in the arrangement of the vowel-keys I provide that each thumb shall control keys representing all of the vowels, the result of the entire arrangement being that each hand controls a set of keys representing all of the letters, or all of the phonetic sounds of a language; but it is to be noted that the consonant-keys controlled by the left hand can only be used to record initial consonants, while the consonant-keys controlled by the right hand can only be used to record final consonants. These duplicate keys for the vowels form a very important feature of my invention, and important advantages result from their use. With those stenographic machines which employ but a single set of keys for the vowels it is obvious that but a single syllable can be recorded with a single stroke, whereas by duplicate arrangement, in a great many instances, two syllables can be recorded at a single stroke, for in all those cases, which are exceedingly numerous, where a syllable having no terminal consonant is followed by a syllable having no initial consonant, ("obvious" and "the-earth," for example.) both syllables can be recorded by a single stroke. This is a very great gain in the rapidity with which the instrument can be used; also, owing to the large proportion of vowels, rapidity requires that additional means be furnished for the record of the vowels. Complete alphabets for each hand would require in English twenty-six keys for each hand if the letters were used, at the lowest calculation, and forty or forty-one keys if phonetic characters be adopted. This number of keys, however, would be found cumbersome; so I prefer to use thirty keys—fifteen keys for each hand—which number I have shown in the drawings. As with thirty keys only for both hands it will be necessary to strike two keys sometimes, or even more, to represent some of the letters or sounds, it is to be observed that the arrangement of the keys is somewhat similar to the arrangement of the white keys of a piano, so that two or more keys can be depressed by a single finger, as will appear from an inspection of Fig. 3.

In the arrangement or assignment of particular keys to particular letters the following rule is to be observed. Regarding the left

hand only, as the arrangement of the key-board of the right hand will in general be the exact reverse of that of the left, those letters are to be placed first (on the left side) which can never be the second letter in any possible combination of two consonants, and between these letters and the vowels are to be placed those letters which can come second in a combination of two consonants. The consonants of nearly every language can be so arranged as to provide for nearly every possible combination of two consonants, so that but a single set of letters will be required, and the very few exceptional cases are so rare that a very few arbitrary combinations will be sufficient to cover them.

I shall particularly show, first, an arrangement of the consonants adapted for recording the Spanish language, and which will indicate the method to be adopted in arranging the keys for other languages. I will also show the capabilities of the apparatus for recording all languages and dialects. The arrangement of the key-board of my apparatus is based upon this principle. In order to enable it to be readily understood, it is necessary to remark that there are two main sections or parts in the apparatus—one to the right and the other to the left—each section or part containing fifteen keys, from which accrue the two alphabets hereinafter referred to. By first referring to the section or part to the left hand, considering at the same time that that is manipulated or operated upon by the left hand, it is to be understood that the auricular finger (little finger) is employed for operating successively upon the first, the second, the third, the fourth, and the fifth keys, representing, respectively, the letters g k b p f, that the ring-finger is employed for acting upon the sixth key, representing the letter t, that the middle finger is employed for acting upon the seventh key, representing the letter d, and that the forefinger is intended to be passed successively over the eighth, ninth, tenth, eleventh, and twelfth keys, representing, respectively, the letters l r r r m j. If, then, the little finger effects the five movements above indicated, (in accordance with the forefinger, which at each of these movements is resting upon the twelfth key,) the forefinger remaining constantly in contact with the twelfth key, the ring-finger resting upon its own key, and, last, the middle finger being passed from the seventh to the eleventh key—in other words, if we say these fingers realize these eleven correlative binary combinations—it results that the eleven letters (out of the twelve above indicated) change their original import (their proper one) into a totally different signification by reason of the addition of the letter j, which is the twelfth letter. The combinations, therefore, which will result with their respective conventional significations may be stated to be as follows—that is to say: (g j=h) (k j=ch) (b j=x) (p j=u) (f j=w) (t j=s)

(d j=z) (l j=y) (r j=l) (r r j=n) (m j=ñ.) When the forefinger is then drawn back upon the eleventh key, and is kept in contact with this key at the same time that the little finger is passed over its first two keys, two combinations are obtained—namely, g m=c and k m=q—and there still remains a sufficiently extended number of possible combinations to permit the completion of the initial consonants according to the particularities of each language. It is possible, then, thus to form twenty-five consonants. The thumb produces the three vowels a i u by being pressed upon the thirteenth, fourteenth, and fifteenth keys, and the vowels e o y by being applied to the junction between the thirteenth and fourteenth, the fourteenth and fifteenth, and the thirteenth and fifteenth keys, which, although they are double and compound keys, are considered as single keys. There remains the compound or combined sign or indication a i u, the employment of which will be hereinafter explained, and which results from the combination of the thirteenth, fourteenth, and fifteenth keys. The right hand exactly imitates the left hand, the employment of each of its fingers being precisely the same. It should, nevertheless, be observed that in this case the order of the keys is as follows—that is to say: a i u are produced by the fifteenth, fourteenth, and thirteenth keys, and e o y by the fifteenth and fourteenth keys, the fourteenth and thirteenth keys, and the fifteenth and thirteenth keys. There are, therefore, twenty-five consonants and six vowels under the control of the left hand, and the same number of consonants and vowels under the control of the right hand. I thus arrange a key board which permits the designation at one and the same time, or with a single blow, of an initial consonant, either single, (where it is not one of those which assimilate to the letters l or r,) or compound, (when it assimilates to either one of these letters the following seven consonants being assimilable: g k b p f t d—gl gr dr,) one or two vowels, and any final consonant whatever. Thus it will be understood that each sign or character has a proper import or meaning, and another which is conventional, as already determined by the formula above established. This circumstance indicates the manner of proceeding in order to construe the signs or characters, so that all persons can read one after another that which is indicated, without a difficult apprenticeship or study, the syllable which is formed corresponding in all cases to its particular meaning or signification.

I will now proceed to describe that part of my invention relating to the indication or notation of numerals. As thirty keys are provided, they can be formed into seven groups of four keys each, when there will still remain two keys. Consequently it is possible to distinguish, one after the other, seven categories or numerical orders or classes. It is already known that the little fingers and

the forefingers operate upon four keys, where-
upon nine turns or indications are obtained.
In addition, the ring-fingers and the middle
fingers control two keys, or together four keys.
5 Finally, the thumbs act upon three keys, of
which one remains free to each of the fingers.
Thus this group, in the same manner as the
preceding, but independently, furnishes more
than nine combinations. Now, as we have
10 seven categories, each of which is arranged
independently of the others, we can consider
as or term "units" the nine signs or indica-
tions produced by the little finger of the right
hand, "tens" the nine first or primary signs
15 or indications of the fifteen that the ring and
middle finger can produce, "hundreds" the
signs or indications that the forefinger is ca-
pable of producing, "thousands" the nine first
or primary signs or indications of the fifteen
20 which the four keys adapted to be operated
by the two thumbs are capable of producing,
"tens of thousands" the signs or indications
produced by the forefinger of the left hand,
"hundreds of thousands" the signs or indi-
25 cations produced by the middle and ring fin-
gers, and "millions" the signs or indications
produced by the little finger. In this man-
ner a single passage of the fingers over the keys
suffices to indicate or denote all the correlative
30 numbers from 1 up to 9,999,999. If these
numbers are multiplied by the three signs or
indications of the two keys which remain and
are adapted to be operated upon by the
thumbs, it is possible to arrive at a total of
35 forty millions, less four units. Before or af-
ter the number can be placed as an annotation
the word "number," or some suitable expres-
sion which does not necessitate a supplement-
ary traverse or passage of the fingers over the
40 keys. In this manner the numerical expres-
sions or indications can never be confounded
with the others. The employment of a cipher

is unnecessary, for the reason that as the va-
rious categories always occupy the position
set apart for them, a cipher which is wanting 45
or deficient at any point or place is readily
taken into account.

I have described the application of my sys-
tem of tacyhgraphy to a key-board of thirty
keys arranged as shown; but it is evident that 50
the system is applicable to key-boards having
other arrangements and with different num-
bers of keys without a detailed description of
the different tacygraphic formulas necessary
for each particular number and arrangement 55
of keys.

Having thus described my invention, I
claim—

1. In a tacygraphic apparatus, a key-board
or manual arranged in two sections, each 60
adapted to be operated by one hand, the in-
itial consonants being controlled by one hand,
the terminal consonants being controlled by
the other hand, and the vowels being dupli-
cated and arranged in two intermediate groups 65
controlled separately and independently by
the two hands, substantially as set forth.

2. The combination of the primary reel G
for the paper H, the guide-rollers *d* and *e*, the
drum I, the receiving-reel J, a suitable driv- 70
ing mechanism, K, arranged to wind up the
strip of paper on the reel J, a brake mecha-
nism comprising the roller L, lever *f*, and spring
g, and the means, substantially as described,
for imparting an intermittent rotary motion 75
to the drum I through the medium of the keys
B, substantially as set forth.

In witness whereof I have hereunto signed
my name in the presence of two subscribing
witnesses.

VICENTE ALONSO DE CELADA.

Witnesses:

PABLO CANTERO,
ANASTASIO PASCUAL.