

(No Model.)

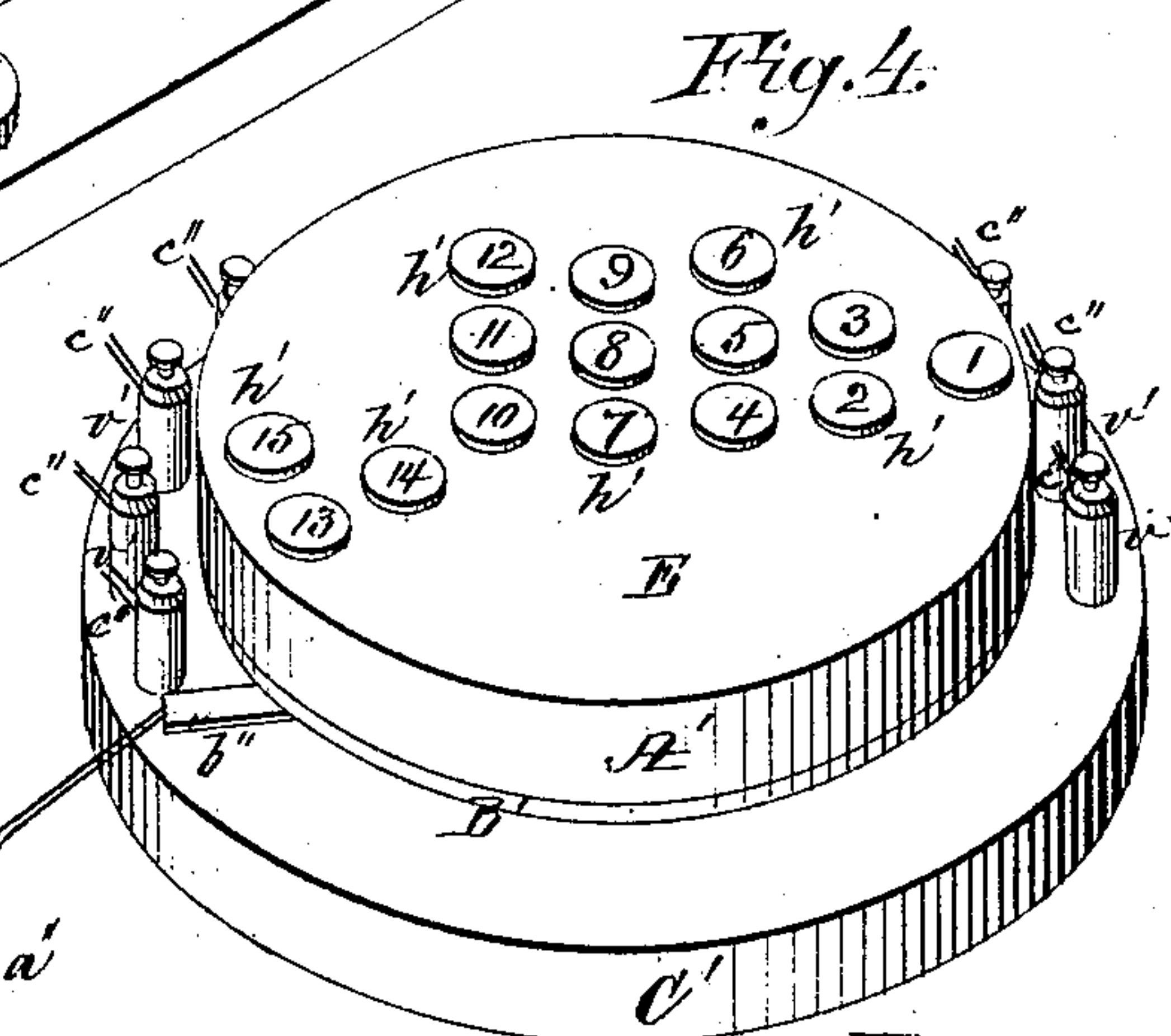
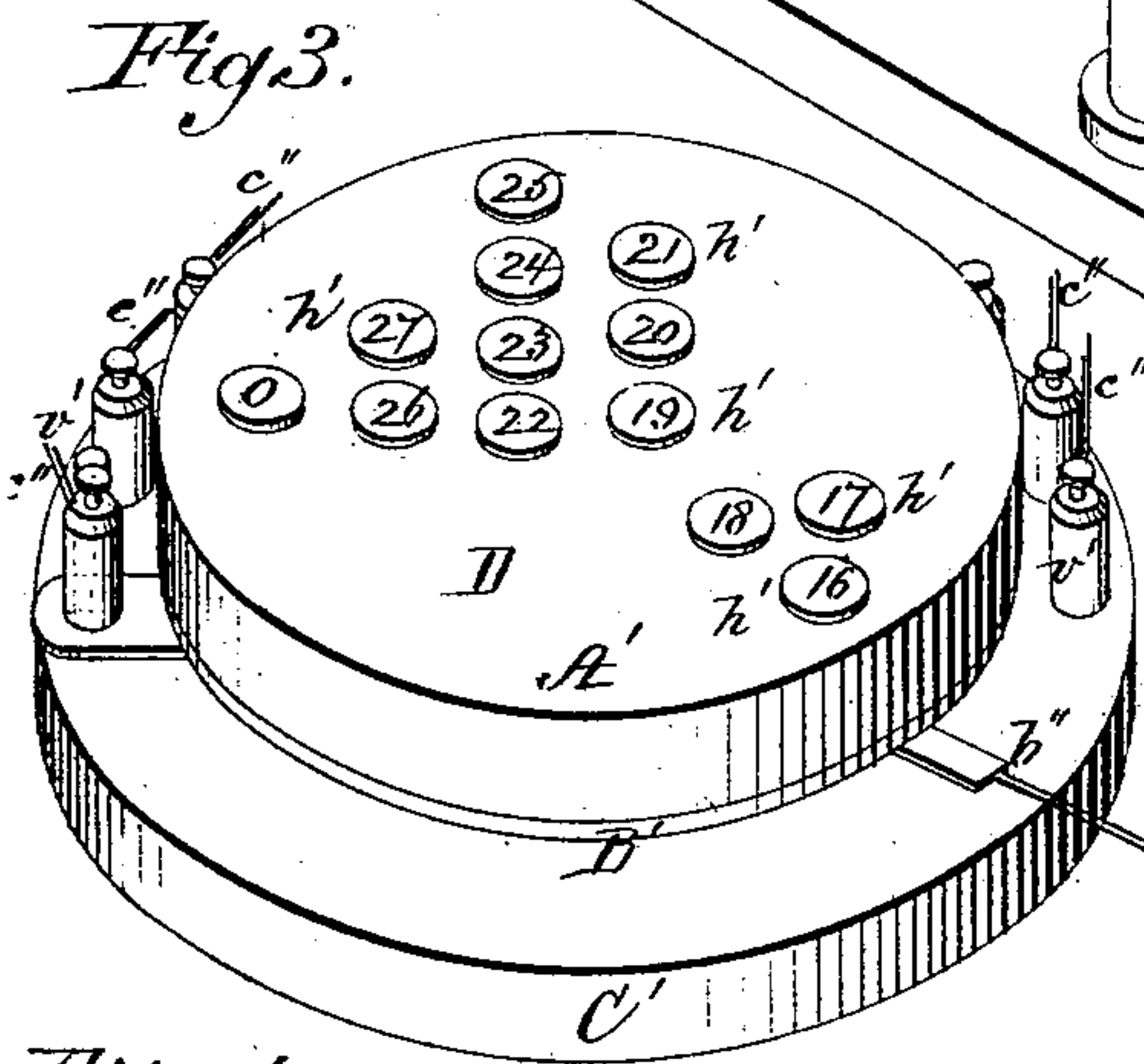
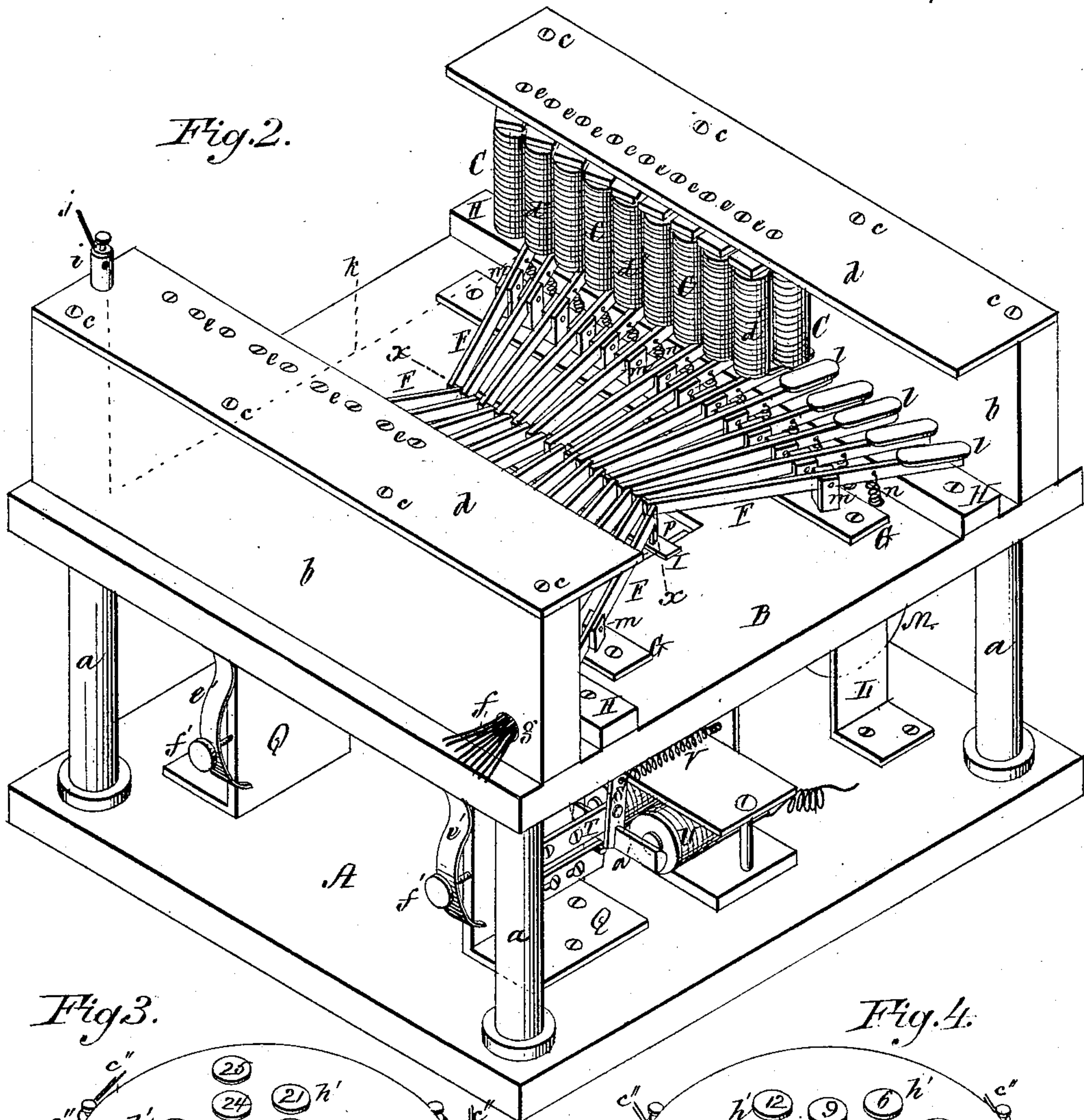
4 Sheets—Sheet 2.

M. WHELESS.

ART OF AND MECHANISM FOR PHONETIC NOTATION.

No. 250,697.

Patented Dec. 13, 1881.



Attest:

H. H. Schott.
H. W. Stearns.

Inventor:

Malone Wheless,
per Norman W. Stearns
Attorney.

(No Model.)

4 Sheets—Sheet 3.

M. WHEELS.

ART OF AND MECHANISM FOR PHONETIC NOTATION.

No. 250,697.

Patented Dec. 13, 1881.

Fig. 5.

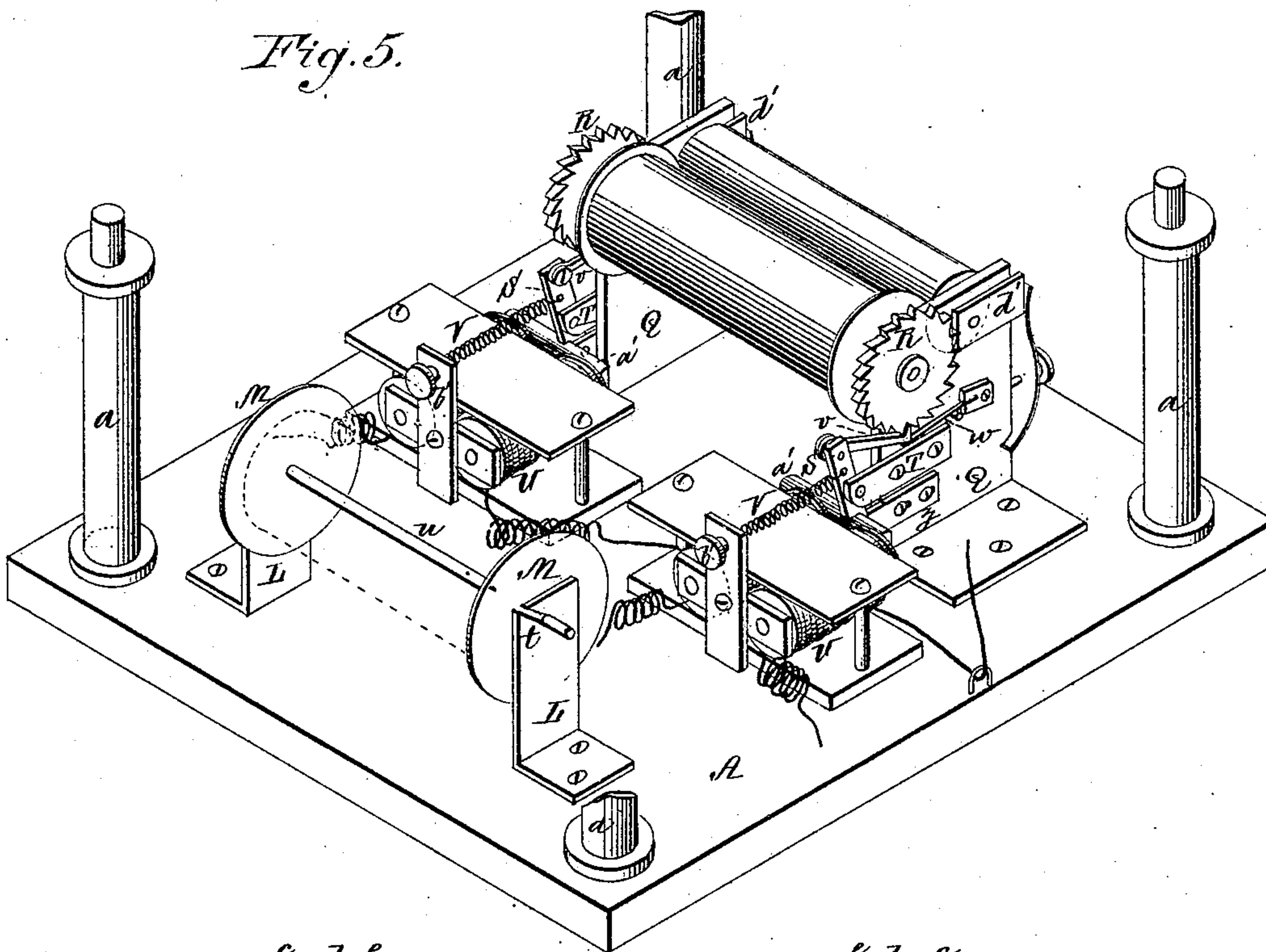
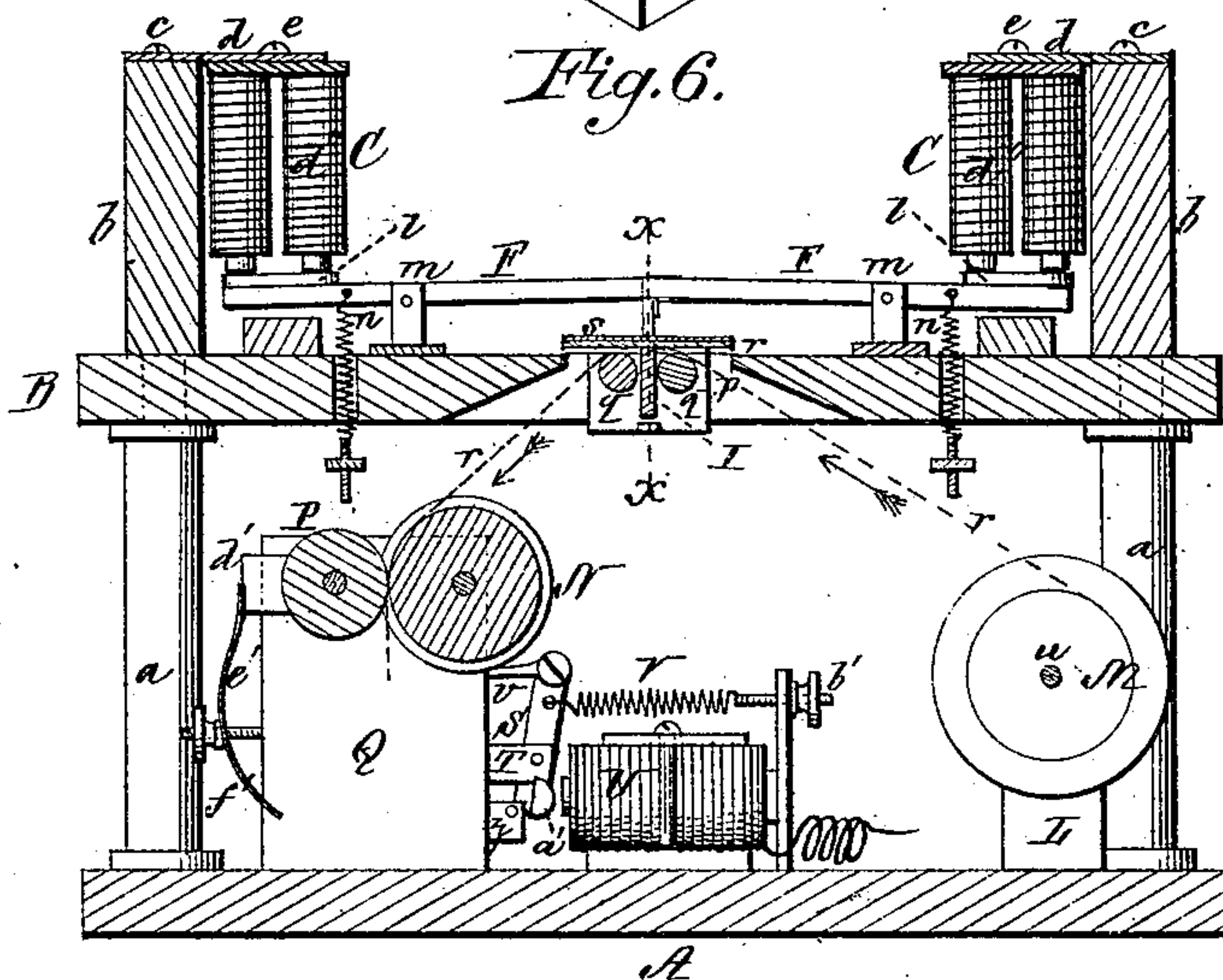


Fig. 6.



Attest:

H. H. Schott.
H. W. Stearns.

Inventor:

Matome Wheels,
per Norman W. Stearns
Attorney.

(No Model.)

4 Sheets—Sheet 4.

M. WHELESS.

ART OF AND MECHANISM FOR PHONETIC NOTATION.

No. 250,697.

Patented Dec. 13, 1881.

Fig. 13.

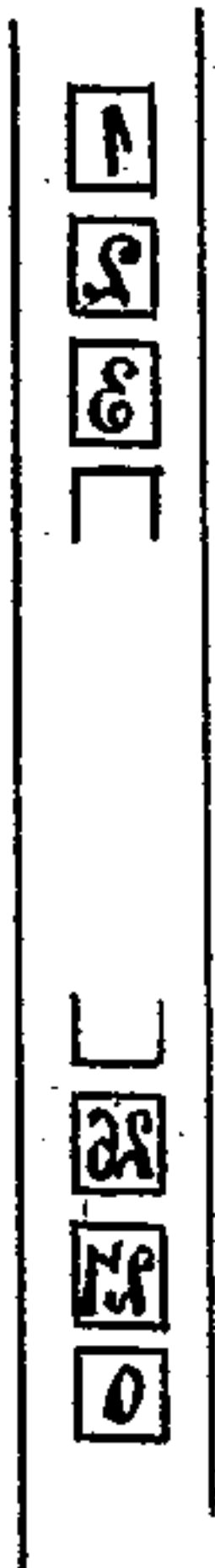


Fig. 7.

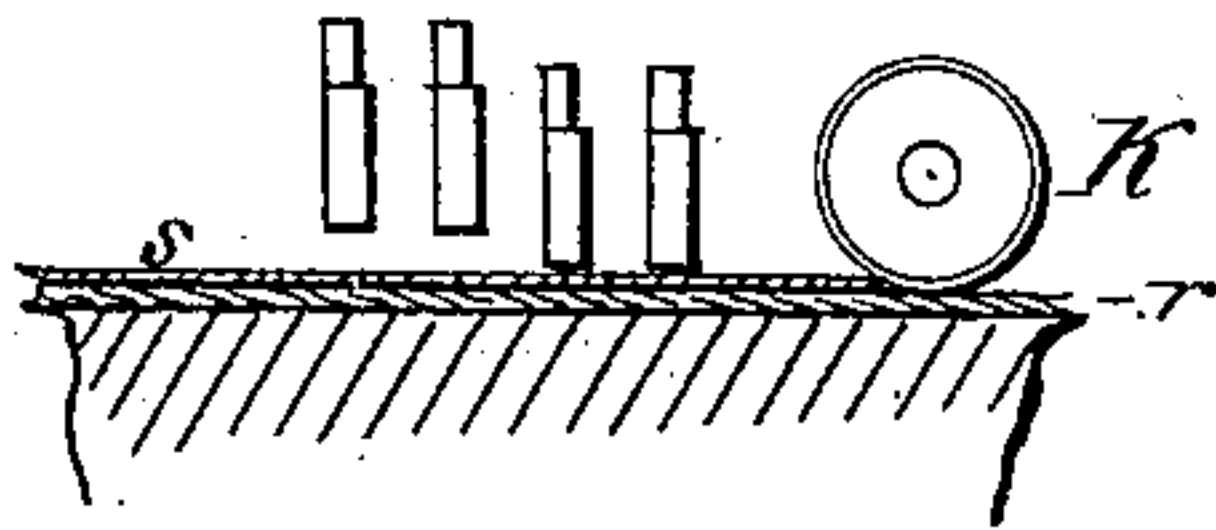


Fig. 8.

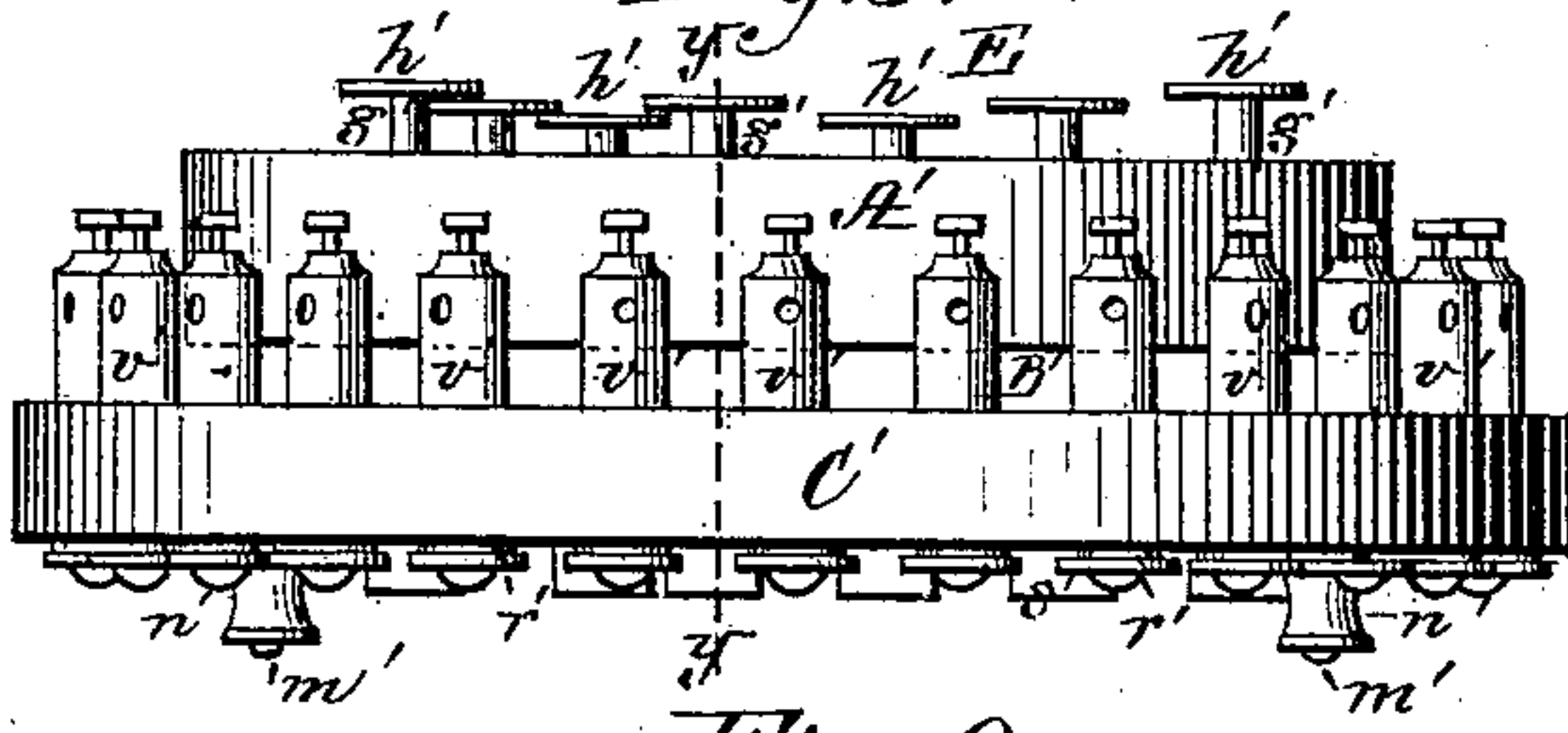


Fig. 9.

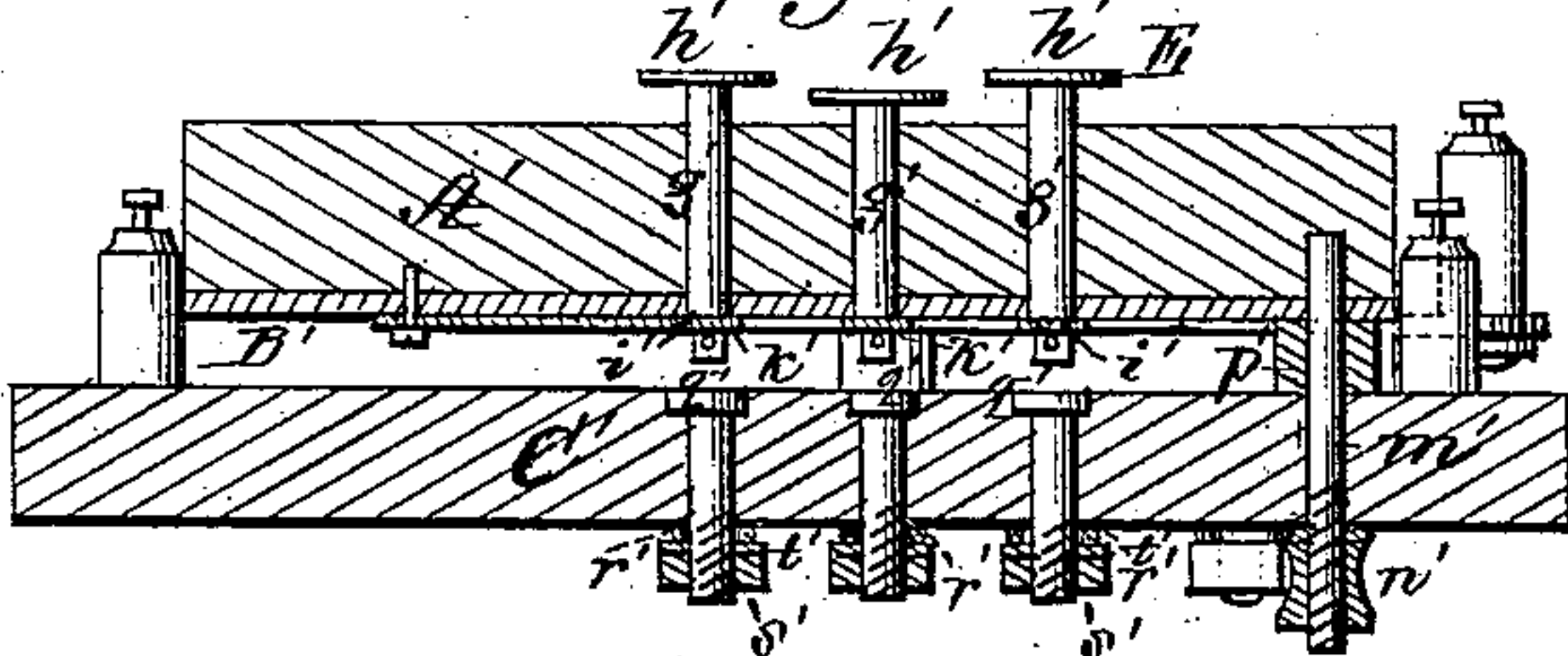


Fig. 10.

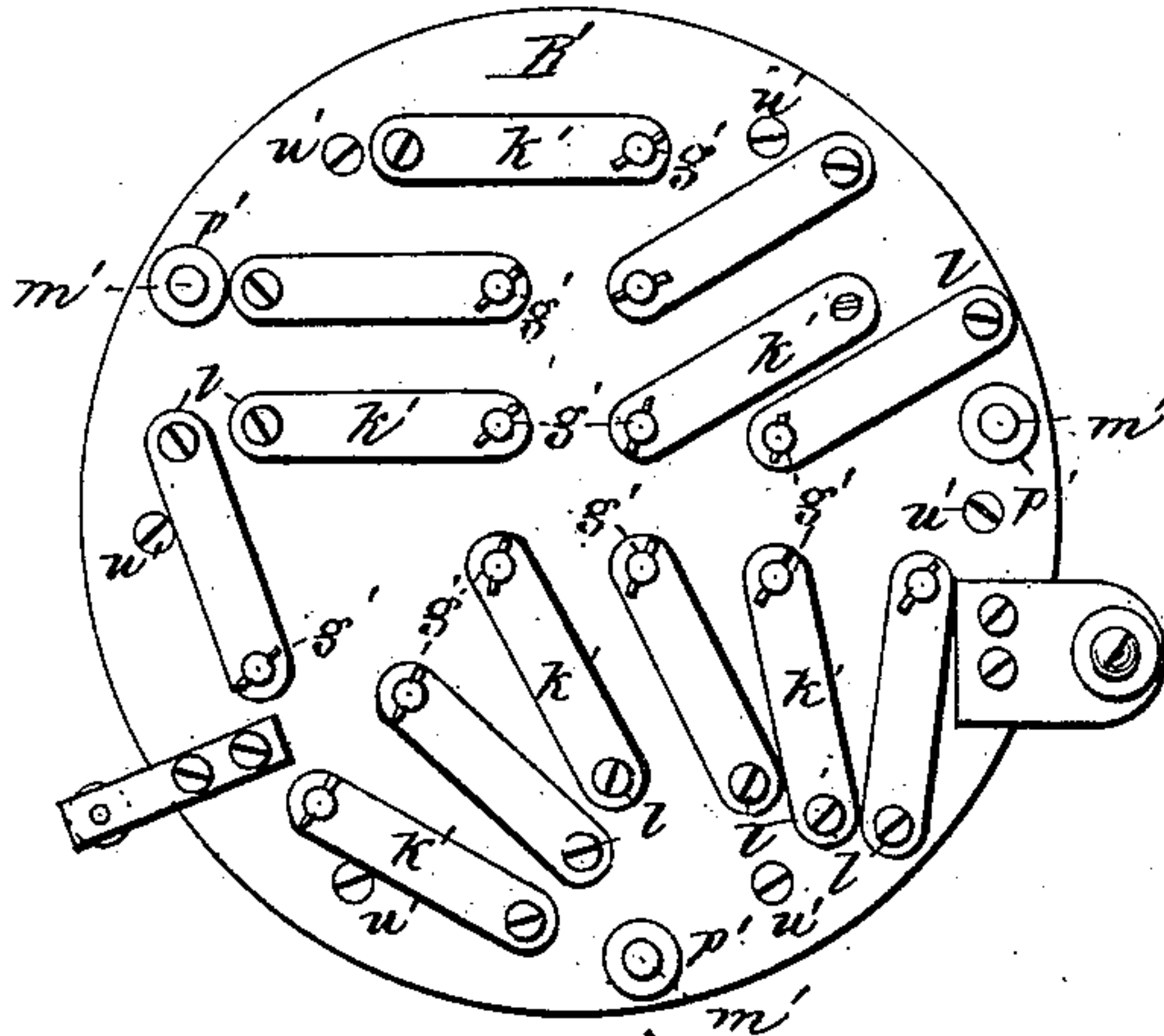


Fig. 12.

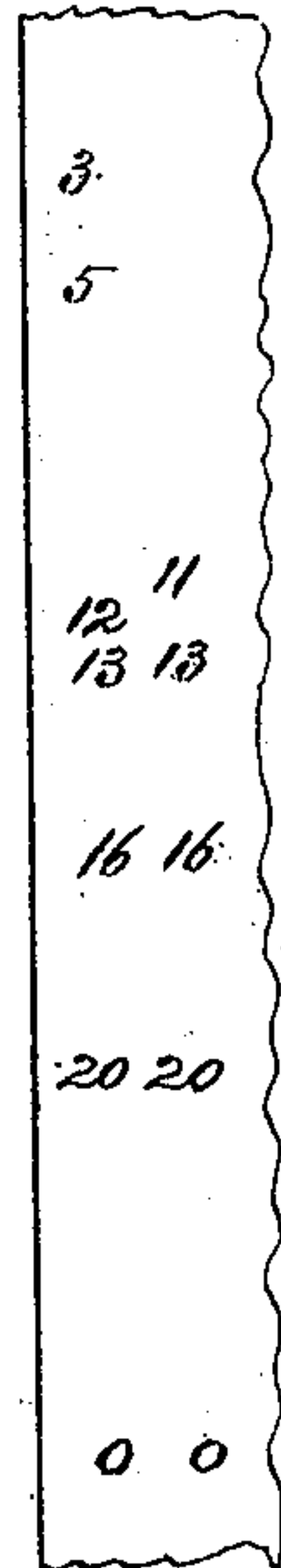
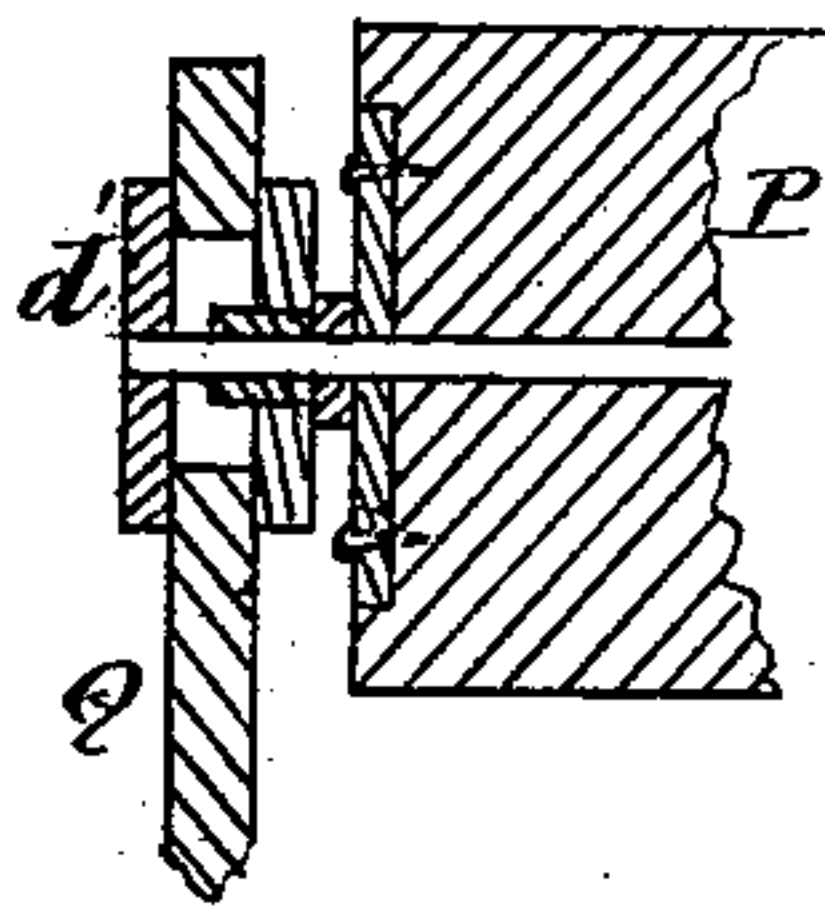


Fig. 11.



Attest:

H. H. Schott
H. W. Stearns.

Inventor:

Malone Wheless,
per Norman W. Stearns
Attorney.

UNITED STATES PATENT OFFICE.

MALONE WHELESS, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR
OF ONE-HALF TO PHILIP WALLACH, JAMES G. SMITH, AND JOHN F.
ANCONA, ALL OF SAME PLACE.

ART OF AND MECHANISM FOR PHONETIC NOTATION.

SPECIFICATION forming part of Letters Patent No. 250,697, dated December 13, 1881.

Application filed May 11, 1881. (No model.)

To all whom it may concern:

Be it known that I, MALONE WHELESS, of Washington, in the District of Columbia, have invented certain improvements in the art of phonetic notation and in mechanism employed for recording characters denoting the consonantal and vowel sounds of the human voice, and by which the simultaneous transmission of a copy thereof through an electric wire or other agent may be effected to similar mechanism located at a remote station, of which improvements the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 illustrates my tabular system or method of arranging characters to serve as exponents of the sounds to be recorded. Fig. 2 is a perspective view of a mechanism constructed in accordance with my invention, to be operated by the reporter in the application of my improved art for recording upon a strip of paper. Figs. 3 and 4 are perspective views of two sets or series of keys, to be manipulated by the operator when the mechanism connected therewith (shown in Fig. 2) is to be actuated. Fig. 5 is a perspective view of the lower portion of the mechanism shown in Fig. 2. Fig. 6 is a longitudinal vertical section through the center of the mechanism shown in Fig. 2. Fig. 7 is a transverse vertical section on the line x of Figs. 2 and 6. Fig. 8 is an elevation of the rear side of the series of keys shown in Fig. 4. Fig. 9 is a section on the line y of Fig. 8. Fig. 10 is a plan of the under side of the keys shown in Fig. 3. Fig. 11 represents a specimen of the work done by the recording mechanism; Fig. 12, a sectional detail, to be referred to. Fig. 13 shows the order in which the characters are arranged at the printing-line xx , Fig. 2 or 6.

In order to make a correct *verbatim* report of speech by the phonographic methods at present employed, the reporter is compelled to perform two or more separate and distinct operations to form a syllable—to wit, one for a vowel and one or more for the consonant or consonants—for a syllable may have one, two, three,

four, or even five consonantal sounds. For instance, the word “thrash” is but one syllable and contains five consonants. Experience, however, teaches us that it is beyond the mental and physical capacity of any stenographer to make a legible report, capable of translation, of all the characters as rapidly as the human voice can articulate if he combines the vowel with the consonantal characters as he transcribes. Consequently, to keep pace with the voice, the reporter discards the characters indicating the vowels of a syllable or word, and writes only the consonantal characters. The omission to write the vowel characters results in much confusion, an incomplete phonetic representation of the language being produced, which is always difficult, and often impossible, to interpret, as the same consonant or combination of consonants, with a vowel prefixed, would have quite a different meaning were the vowel placed thereafter. For instance, in the consonant outlines “t” and “k,” we can make many words by changing the relative location therewith of the fifteen vowel sounds—for example, tāk, take; tūk, took; āttāk, attack; āt-īck, attic. The vowel sounds can be permuted about consonantal outlines so as to make a different word at each permutation, leaving the reporter to translate the greater part of his notes from memory, and even should he, by years of practice, become sufficiently expert to read instantly his own notes, they cannot be utilized by others.

To provide a means by which a positively intelligible *verbatim* record of speech may be obtained with rapidity equal to its utterance is the object of my present invention.

My invention consists in a system of phonetic notation in which the elementary vowel sounds and combinations of vowel sounds in the language, and the elementary consonant sounds and combinations of consonant sounds in any syllable of the language, are represented by characters and permutations thereof; second, in providing three groups of characters, one of which is used to represent the vowel sounds and combinations of vowel sounds, another to represent the consonant sounds and

combinations of consonant sounds coming before the vowel in any syllable, and one to represent the consonant sounds and combinations of consonant sounds coming after the vowel; and my invention further consists in a method of arranging the printing-characters in a phonetic recording-machine, which consists in dividing such printing-characters into groups, one of which represents the vowels, one the consonant sounds preceding the vowel, and one the consonant sounds succeeding the vowel sound in a syllable, whereby I am enabled to simultaneously record the sounds in any one syllable.

My invention finally consists in certain novel arrangements of the keys upon the key-board, as will hereinafter be fully explained and pointed out in the claims.

To enable others skilled in the art to understand my invention, I will now describe (by reference to Fig. 1) a convenient tabular system of notation invented by me, and the application of said system to a simple mechanism manipulated by the fingers for recording instantly, legibly, and in a manner capable of interpretation the characters representing the sounds of the human voice.

In my system of phonetic notation illustrated in Fig. 1 of drawings I have chosen numbers from 1 to 25, which numbers, together with their permutations, I shall use for the purpose of recording the sounds of the language. By reference to this figure it will be seen that the numbers from 10 to 15, inclusive, and their permutations have been chosen to represent the vowels and diphthongs, the numbers from 1 to 9, inclusive, and their permutations to represent the consonant sounds and combinations of consonant sounds which precede the vowel-sounds of a syllable, and the numbers 16 to 25, inclusive, and their permutations to represent consonant sounds and combinations of consonant sounds which succeed the vowel sounds of a syllable. The object which I desire to attain by this selection of characters and the use of permutations of the same to represent sounds or combinations of sounds is to be able to record any syllable of the language without the duplication of a character, even though such syllable contain a repetition of the same sound. Take, for example, the word "did." It will be observed that in this word the consonant sound "d" comes before and after the vowel. Therefore, if the word is recorded by the ordinary system of phonetics, the character representing the sound "d" will be duplicated, while, by my system, the "d" preceding the vowel will be represented by one character, 6, as shown in the drawings, while "d," following the vowel, will be represented by a different character, 22, as shown in the drawings.

It will be observed that by this system not only does the character represent the sound, but indicates positively the position of that sound in the syllable. Another characteristic of my improved system, as will be observed by reference to the drawings, is that where sev-

eral consonant sounds come together, either preceding or succeeding the vowel, this combination of sounds, instead of being represented, as in the ordinary system, by an aggregation of characters which represent the individual sounds of which the combination is composed, is represented by a single character, or permutation of characters, where necessary. For instance, in the word "marl," by the ordinary system of phonetics, it would be written, first, by writing the sign for the sound "m," then the sign for the sound "a," then the sign for the sound "r," and finally the sign for the sound l, while, by my system, I write the sign for the sound "m," then the sign for the sound "a," then, instead of the sign for the sound "r," which is 34, and the sign for the sound l, which is 16, 23, I write the permutation 17, 20, 22, which is the sign for the combined sound "r l" when following a vowel.

While in the ordinary writing of the pen there would be no advantage in the system such as I have here described, yet, when this system of recording is effected by the use of a machine such as is hereinafter described, its advantages become very marked and apparent, the first advantage being, as hereinbefore stated, because of no character being duplicated in a syllable, I am enabled to report the characters representing all the sounds of any one syllable of the language simultaneously; second, by the permutation of characters I am enabled to record characters representing a very large number of sounds and combination of sounds, with the use of a very few keys and printing-characters. This result is shown in a very marked manner in the left-hand diagram of Fig. 1. The number of independent printing-characters and corresponding keys indicated in that figure is only ten; and yet, by the use of these ten printing-characters and their permutations, I am enabled to record all the possible consonant sounds and combinations of consonant sounds which can occur preceding a vowel in any syllable of the language, (fifty-three in all.)

Instead of employing numerical figures and their permutations as representatives for denoting sounds, other signs, symbols, marks, or characters may be used, if desired, without departing from the spirit of my phonetic system. Nor is it necessary that the exact number of twenty-five keys be used, as I could, by a larger or smaller number of permutations, increase or decrease the number of keys.

In Fig. 2 of said drawings, A represents the base of a frame-work, having posts *a* rising from its corners for supporting a table or platform, B, near each end of which is located a transverse strip, *b*, upon the top of which is secured by screws *c* a thin horizontal plate, *d*, of brass, of such width that its inner edge projects considerably beyond the inner face of the strip *b*, on which it rests.

Under the projecting portion of each brass plate *d*, and secured thereto by screws *e*, are arranged a series of fourteen bifurcated or horse-

shoe magnets, C, their inner branches and surrounding coils of wire slightly converging toward each other. The outer end, *f*, of the wire of each magnet C is led through the transverse strip *b*, where it is connected with a wire leading indirectly to each of a series of keys, D E, (to be hereinafter described,) interposed between the magnets C and the battery. (Not shown.) These outer ends, *f*, of the several wires, properly insulated, preferably pass out through the strip *b* at a common convenient point, *g*, located near one of its ends, as this arrangement economizes space. The inner end of the wire of each magnet C terminates in contact with and is brazed to the upper surface of the brass plate *d* at a point immediately thereover.

To an upright binding-post, *i*, rising from the upper side of one of the brass plates *d* is secured a wire, *j*, which returns indirectly to the battery in a manner hereinafter to be explained. The two brass plates *d* are connected by an electric wire, *k*, leading from the binding-post *i* of one to the under side of the other at a point near its corresponding end.

Underneath the bifurcated ends of each magnet C is located the outer end of a long lever, F, bearing a soft piece of iron or armature, *l*. The two series of levers (fourteen in each series)—*i. e.*, one for each magnet—are pivoted to posts *m*, rising from two transverse metallic strips, G, secured by screws to the upper side of the platform or table B, said strips being on opposite sides thereof and parallel to each other. The inner ends of the twenty-eight levers F converge toward each other and extend to a central line passing transversely across the platform or table, the inner ends of one series of levers alternating with the inner ends of the opposite series. The under side of the inner end of each lever is provided with a metal type bearing a numerical figure, the several types being numbered from 0—1 to 27, inclusive. When these levers F are in their normal positions their outer ends are drawn and held down by springs *n*, so as to come into contact with a transverse strip or rest, H, thus holding the armatures *l* out of contact with the magnets C above them when the electric circuit is broken, in which position the types are held above and out of contact with a horizontal bed, I, extending transversely across the center of a rectangular opening, *p*, made in the center of the table or platform B. This bed consists of a strip of wood and a strip of rubber secured to its upper side. Upon this bed and over the tops of two small guide-rolls, *q*, (one on each side of the bed,) rests a strip of paper, *r*, or other suitable material upon which the type are to print or register the figures denoting the phonetic utterances of the voice of the person whose speech is to be recorded. This recording-strip *r* may be of paper chemically prepared by dipping it in a solution of carbonized ink, which paper is colorless until decomposed by the passage of the electric current through the type when it comes into contact with the paper.

In Figs. 6 and 7 I have shown a strip of carbonized ribbon, *s*, between the type and an ordinary strip of soft white paper, said carbonized ribbon *s* resting on the latter and being employed for supplying the inking material or dye-stuff to give color to the impressions made by the type. This carbonized ribbon *s* is fed transversely across the bed I by turning one of a pair of revolving pins or spools, K, on which it is wound, by which means a new portion of the ribbon is brought into place to be utilized when the inking or dyeing material in the portion previously under the type has been extracted thereby.

The mechanism by which the feed of the recording-paper is effected will now be described.

To the upper side of the base A are secured two standards, L L, in the upper ends of which are formed inclined slotted bearings *t*, in which turn the outer ends of the shaft *u* of a metal spool, M. One end of the paper strip on which the record is to be made is secured to the shaft *u* and the paper wound thereon. The outer end of the paper is conducted up through one side of the rectangular opening *p*, over the two small guide-rolls *q* and printing-bed I, down through the other side of the opening *p* in the directions of the arrows, (see Fig. 6,) and between the roll N and the pressure-roll P to a convenient place within the control of the operator.

The feed of the paper strip is produced in the following manner: The roll N revolves in bearings in the tops of standards Q, rising from the base of the frame-work. Each of the outer ends of the shaft of this roll carries a toothed or ratchet wheel, R, into which engages a pawl, *v*, pivoted to the upper end of a rocker arm or lever, S, pivoted to a stud, T, projecting from the side of the standard Q, the pawl *v* being pressed into contact with the teeth of the ratchet R by a bent spring, *w*, the forward movement of the pawl being produced by an armature, *a'*, at the lower end of the lever S being drawn (when the circuit is closed) into contact with the ends of a horseshoe-magnet, U, located in a horizontal position on a bed placed on the base A of the frame-work, the breaking of the circuit allowing a coiled spring, V, to assert itself and carry the armature forward against an adjustable stop, Z, secured to the outside of the standard Q, the location of the stop being such as to limit the throw of the pawl *v* to the space between two teeth, and consequently the same amount of revolution of the roll N. The tensile or retractive power of the spring V is adjusted by turning a nut, *b'*, over a screw-connection, *c'*, at the opposite end of the spring.

The pressure-roll P, between which and the roll N the paper strip passes, has its bearings in blocks *d'*, free to slide in rectangular openings cut in the sides of the standards Q, the degree with which the roll P presses the paper against the roll N being regulated by increasing the tension of the springs *e'* (the upper ends of which rest against said bearings) by turning

in or out the thumb-screws f' , a certain amount of friction being necessary to prevent the slipping of the paper, and thus insure its positive feed at the required times.

5 I will now describe the construction and arrangement of the two series of keys D E. In the left-hand series, D, there are grouped fifteen keys, and in the right-hand series, E, there are thirteen keys. Each key consists of a cylindrical pin or plunger, g' , passing vertically through a circular key-board, A' , of wood, and provided at its top with an annular enlargement or head, h' , of a convenient size for the application of the fingers thereto, the heads being separated sufficiently to avoid the liability of one head being touched accidentally when the head of a contiguous key is being operated on. The heads of the keys are respectively numbered with the figures corresponding to those of the types of the levers operated thereby. The keys are arranged in rows. The heads of the keys—for instance, those of keys 22, 23, 24, and 25—are in one row and are operated solely by the large finger of the left hand. The relative heights to which the heads of the keys project above the key-board A' are also made different to conform to the length of the fingers by which they are respectively operated. Thus the key o , operated by the little finger, projects up higher from the surface of the board A' than the keys 26 27, operated by the contiguous finger, while the heads of the keys 22 23 24 25, operated by the long finger, are arranged in a horizontal plane nearest the surface of the disk A' , this difference in the relative heights of the keys and the arrangement of them in independent rows serving to guide the fingers to their proper places.

To the under side of each circular board A' is affixed a circular plate, B' , of brass, of the same diameter, the pin of each key also passing through this plate B' , and being reduced in diameter at its lower projecting end, so as to form a shoulder, i' , against which bears the free end of a flat spring, k' , pivoted to the plate by a screw, l' , the free end of the spring k' being provided with a circular opening to admit of its encircling the lower reduced end of the pin g' , by which construction it will be seen that each key is depressed by the application of a finger upon its head against the resistance of the spring under it, the removal of the finger allowing the key to be returned to its normal position by the resiliency of the spring.

55 The plate B' , of brass, under the wooden key-board A' is located above and separated a short distance from a lower circular block, C' , of wood, of larger diameter than the board A' , the latter with its circular plate B' being secured to the block C' by three screw-posts, m' , over the lower end of each of which is turned a circular screw-nut, n' , the space between the under side of the brass disk B' and the top of the wooden block or disk C' being limited by three metallic sleeves, p' , passing over the three screw-posts m' , this space being sufficient to allow of the

unrestrained action of the springs k' on the keys D E.

Within the lower disk, C' , directly in line with each key and a short distance under its point or lower end, is located the brass head q' of a screw, the point of which projects through the disk C' , and has connected therewith the end of a wire, r' , which is held in place by a nut, s' , turned down upon a washer, t' , slipped over the screw-thread. From this brass-headed screw, which I term a "contact-block," the wire r' is led around and under the head of a screw, u' , passing through the disk C' , a washer being interposed between the head of the screw u' and the wire, to prevent its being disengaged.

Over the upper end of the screw u' is turned a cylindrical post, v' , designated a "binding-post," which thus holds it in a vertical position on the upper side of the disk C' , a circular opening being formed diametrically through the binding-post for the reception of one end of a wire which leads to and is coiled around one of the magnets C , a small clamping or set screw being employed for securely confining the end of this wire.

The various electric connections will now be briefly recapitulated. A copper wire, a'' , leads from one pole of a galvanic battery (not shown) to each horizontal brass plate b'' , projecting out from the periphery of the under side of the circular brass plate B' on the under side of each wooden disk A' , through which the keys pass. The galvanic current passes through said wire a'' to this brass plate B' , thence to the keys D E, which, on being depressed, come into contact with their respective circular contact-blocks q' in each lower disk C' . The current passes through the blocks q' , touched by the keys, thence through the wires r' which connect the screws of these blocks q' with the screws u' of the corresponding binding-posts v' , thence through the wires c'' , connecting said binding-posts with the outer ends, f , of the wire coils d'' surrounding the corresponding magnets C , said ends f being grouped together and conducted out at the corner g of the frame-work. The current then causes the lower bifurcated ends of the operating magnets to attract their armatures l , which consequently elevate the outer ends of their respective levers, and depress, with a prompt and forcible impact, the types at their inner ends, making a clean legible impression on the recording-strip of the figures representing the exact sounds uttered by the human voice. Simultaneous with the depression of the keys the current, after attracting the armatures l , passes through the inner end of the coiled wire d'' to the brass plate d , to which it is brazed, thence through said plate to the binding-post i , thence through the wire j , secured thereto, into and through the wire coils surrounding the electro-magnets U , which attract the armatures a' of the paper-feeding mechanism, the drawing of the armatures a' into contact with the ends of the magnets causing the hooked pawls v'' to be advanced under and to engage with the next teeth of the ratch-

ets R, and being returned to their normal position by the retraction of the spring V on the release of the armatures *a'* at the instant the pressure of the fingers is removed from the operating-keys.

Operation: In order to illustrate the application of my invention, I will now give an example of the manner of manipulating the mechanism in recording a sentence. Suppose, for instance, a person during a speech remarks, "When in the course of human events," and it is desired to record his remarks as rapidly as they are delivered, for the word "When" I depress key No. 3 of the right-hand series, E, with the little finger of the right hand, and at the same time key No. 5 of same series with the third finger of the right hand; also, at same time, I depress key No. 12 with the forefinger of the right hand, and key 13 with the thumb of same hand. Simultaneously I depress key 16 of left-hand series, D, with the thumb of left hand, and key 20 with forefinger of same hand. This completes the record of the word "When." At the same time I depress the key 0 of series D with the little finger of the left hand, this character indicating the termination of a word.

In the foregoing operation the various fingers and thumbs of both hands are brought down on their respective keys, as it were, at one operation, the result of the depression of these keys being that the type bearing the figures corresponding to the phonetic sounds of the word "when" are, through the electric connections explained, brought down on the recording-strip, the impressions being legibly made thereon. The fingers are now instantly removed together, causing all the types corresponding to the keys touched to rise at once from the recording-strip, the feeding-pawl which (during the time when the circuit was closed) was carried forward, now engages with the next tooth of the ratchet, the retracting-spring V on the breaking of the circuit gives the required revolution to the feed-roll, and thus advances the recording-strip about one-eighth of an inch to present a new surface to be acted on by the next series of operating-types in imprinting the figures corresponding to the next word "in," in which the keys Nos. 11 and 13 of the right-hand series, E, are depressed with the forefinger and thumb of the right hand simultaneously with the depression of keys Nos. 16 and 20 of the left series, D, with the left thumb and left forefinger, respectively. Each of the remaining words "the course of human events" is recorded with the same facility, each syllable at one operation, by the descent of the proper fingers simultaneously upon their respective keys.

It is evident that a record of speech in any language may be made, even should the reporter not understand how to translate the same without the assistance of one familiar with the language.

I intend to simplify the construction and more conveniently arrange the various por-

tions of the mechanism described, and I shall make essential changes therein and omit many of its details which will materially reduce its cost, render it more compact, and give the reporter greater facility of action. For instance, I shall locate all of the keys on one board and place it directly over the type and paper-feeding mechanism.

I intend to make the frame-work of the mechanism of circular form.

I also intend to so arrange the keys that they will make a passing contact in descending, and not rest upon the contact-blocks, as is now the case.

I intend to dispense with the use of levers and have the type directly under or attached to the keys. I may also retain the type in a stationary position and cause the recording-strip to feed and receive their impressions during its motion without departing from the spirit of my invention.

From the foregoing it is evident that the keys of the instrument may be located at one point and the recording or printing mechanism at a distant point, the two being connected by an electric circuit, and the message be recorded at such distant point with the same facility that it might be recorded by the instrument located at the station where the keys are, or the record may be taken down by a series of recording-instruments located at distant points, the whole being connected by an electric circuit.

I claim—

1. The combination of a set of different printing-characters representing consonant and vowel sounds arranged, substantially as described, in three groups, those of one group representing consonantal sounds which precede vowels, those of another group vowel sounds, and those of another group consonant sounds succeeding vowels, whereby the several sounds are represented by different characters and permutations thereof, and the impressions of said characters and permutations occupy fixed positions in the order specified.

2. The combination of the different printing-characters arranged in a single line with the keys for the two hands arranged in groups, as described, whereby a simultaneous pressure upon a number of keys will print in the order named, in a single line, characters or permutations thereof representing consonant sounds preceding vowels, vowel sounds, and consonant sounds succeeding vowels.

3. The hereinbefore-described method of phonetically recording words, which consists in providing a set of characters which singly and by permutation shall represent the vowel sounds and combinations of vowel sounds and the consonant sounds and combinations of consonant sounds, and then, by simultaneously impressing single characters or permutations thereof, record a whole syllable or more at a single operation.

4. Two series of keys, each series arranged in rows for the application thereto of the re-

spective fingers and thumb of each hand of the operator, one row of keys for each finger, in combination with a printing mechanism provided, substantially as described, with type-
5 characters, which singly and by permutations represent the elementary sounds arranged as "precedents" and "terminals," as described, constructed to operate substantially as set forth.
10 5. The hereinbefore-described method of arranging the printing-characters in a phonetic recording-machine, which consists in dividing said printing-characters into three groups, one for consonant sounds preceding the vowel
15 sound of any syllable, one for the vowel sounds, and one for the consonant sounds succeeding the vowel sound of any syllable, the sounds being represented by single characters and permutations thereof, arranging these groups, sub-
20 stantially as described, so that when impres-

sions are made from two or more groups simultaneously the record of characters and permutations will appear in the order named in a single line, substantially as described.

6. A series of keys of relative heights corresponding to the relative lengths of the respective fingers operating the same, as and for the purpose specified. 25

7. Two series of keys, D E, of relative heights corresponding to the relative lengths of the respective fingers operating the same, one series operated by the right hand and the other series by the left hand, substantially as set forth. 30

Witness my hand this 3d day of May, 1881.

MALONE WHELESS.

In presence of—

NORMAN W. STEARNS,
H. W. STEARNS.